ARTIFCIAL INTELLIGENCE & DATA SCIENCE

COURSE STRUCTURE

B. TECH I SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AD1T01	BSC	Linear Algebra and Differential Equations	3	-	-	3	3
2	20AD1T02	BSC	Applied Chemistry	3	-	-	3	3
3	20AD1T03	HSMC	English	3	-	-	3	3
4	20AD1L04	ESC	Computer Engineering Workshop	1	-	4	3	3
5	20AD1T05	ESC	Problem Solving through C	3	-	-	3	3
6	20AD1L06	HSMC	English Communication Skills Lab	-	-	3	3	1.5
7	20AD1L07	BSC	Applied Chemistry Lab	-	-	3	3	1.5
8	20AD1L08	ESC	Problem Solving through C Lab	-	-	3	3	1.5
9	20AD1M09	MC	Environmental Science	2	-	-	2	-
Total Number of Credits								**19.5**

B. TECH II SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AD2T01	BSC	Transform Techniques	3	-	-	3	3
2	20AD2T02	BSC	Applied Physics	3	-	-	3	3
3	20AD2T03	ESC	Computer Organization	3	-	-	3	3
4	20AD2T04	ESC	Data Structures	3	-	-	3	3
5	20AD2T05	ESC	Python Programming	3	-	-	3	3
6	20AD2L06	BSC	Applied Physics Lab	-	-	3	3	1.5
7	20AD2L07	ESC	Data Structures Lab	-	-	3	3	1.5
8	20AD2L08	ESC	Python Programming Lab	-	-	3	3	1.5
Total Number of Credits								**19.5**

B. TECH III SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AD3T01	BSC	Numerical Methods & Vector Calculus	3	-	-	3	3
2	20AD3T02	PCC	Introduction to Artificial Intelligence	3	-	-	3	3
3	20AD3T03	PCC	Object Oriented Programming through Java	3	-	-	3	3
4	20AD3T04	PCC	Data Base Management Systems	3	-	-	3	3
5	20AD3T05	PCC	Operating Systems	3	-	-	3	3
6	20AD3L06	PCC	Object Oriented Programming through Java Lab	-	-	3		1.5
7	20AD3L07	PCC	Data Base Management Systems Lab	-	-	3		1.5
8	20AD3L08	PCC	UNIX and Shell programming Lab	-	-	3		1.5
9	20AD3S09	SC	Data Analysis and visualization with Python	-	-	4		2
10	20AD3M10	MC	Constitution of India	2	-	-		-
Total Number of Credits								**21.5**

B. TECH IV SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AD4T01	BSC	Probability and Statistics	3	-	-	3	3
2	20AD4T02	ESC	Discrete Mathematical Structures	3	-	-	3	3
3	20AD4T03	PCC	Design and Analysis of Algorithms	3	-	-	3	3
4	20AD4T04	PCC	Foundations of Data science	3	-	-	3	3
5	20AD4T05	HSMC	Managerial Economics and Financial Analysis	3	-	-	3	3
6	20AD4L06	ESC	R Programming Lab	-	-	3	3	1.5
7	20AD4L07	PCC	Data Science lab	-	-	3	3	1.5
8	20AD4L08	PCC	Design and Analysis of Algorithms Lab	-	-	3	3	1.5
9	20AD4S09	SC	Basic Web programming	-	-	4	4	2
Total number of credits								**21.5**
Internship 2 Months (Mandatory) during summer vacation								
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH V SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week Lecture	Tutorial	Practical	Contact Hours	Credits
1	20AD5T01	PCC	Theory of Automata	3	0	0	3	3
2	20AD5T02	PCC	Data Warehousing & Mining	3	0	0	3	3
3	20AD5T03	PCC	Machine Learning	3	0	0	3	3
Program Elective-I				3	0	0	3	3
4	20AD5T04	PE-I	Advanced Data Structures					
5	20AD5T05		E-Commerce					
6	20AD5T06		Software Engineering					
7	**Open Elective-I**			3	0	0	3	3
8	20AD5L08	PCC	Machine Learning Lab	0	0	3	3	1.5
9	20AD5L09	PCC	Data Warehousing and Mining Lab	0	0	3	3	1.5
10	20AD5S10	SC	Testing Tools Lab/Text Analytics Lab	0	0	4	4	2
11	20AD5M11	MC	Disaster Management	2	0	0	2	-
12	20AD5I12	I	Summer Internship	0	0	0	1.5	1.5
Total number of credits								**21.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VI SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week Lecture	Tutorial	Practical	Contact Hours	Credits
1	20AD6T01	PCC	NoSQL Databases	3	0	0	3	3
2	20AD6T02	PCC	Computer Networks	3	0	0	3	3
3	20AD6T03	PCC	Big Data Analytics	3	0	0	3	3
Program Elective-II				3	0	0	3	3
4	20AD6T04	PE-II	MEAN Stack Technologies					
5	20AD6T05		Compiler Design					
6	20AD6T06		Software Architecture and Design patterns					
7	**Open Elective-II**			3	0	0	3	3
8	20AD6L08	PCC	NoSQL Lab	0	0	3	3	1.5
9	20AD6L09	PCC	Computer Networks Lab	0	0	3	3	1.5
10	20AD6L10	PCC	BDA Lab	0	0	3	3	1.5
11	20AD6S11	SC	Soft Skills	0	0	4	4	2
12	20AD6M12	MC	Essence of Indian traditional knowledge	2	0	0	2	-
13	20AD6P13	P	Community Service Project	-	-	-	-	4
Total number of credits								**25.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
Program Elective-III				3	0	0	3	3
1	20AD7T01	PE-III	Cloud computing					
2	20AD7T02		Natural Language Processing					
3	20AD7T03		Software Project Management					
Program Elective-IV				3	0	0	3	3
4	20AD7T04	PE-IV	Neural Networks and Deep Learning					
5	20AD7T05		Information Security					
6	20AD7T06		Business Intelligence					
Program Elective-V				3	0	0	3	3
7	20AD7T07	PE-V	Soft Computing					
8	20AD7T08		Computer Vision					
9	20AD7T09		Internet of Things					
10	**Open Elective-III**			3	0	0	3	3
11	**Open Elective-IV**			3	0	0	3	3
12	20AD5L12	HSMC	Universal Human Values 2: Understanding Harmony	0	0	3	3	3
13	20AD5S13	SC	Data Visualization using Tableau	0	0	4	4	2
14	20AD5I14	I	Industrial Internship	-	-	-	-	3
Total number of credits								**23**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VIII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AD8P01	P	Project	0	0	0	12	8
Total number of credits								**8**

OPEN ELECTIVE –I:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE5T04	Architecture and Town Planning	3	0	0	3	CE
2	20CE5T05	Elements of Civil Engineering	3	0	0	3	CE
3	20EE5T04	Basics of Control Systems	3	0	0	3	EEE
4	20EE5T05	Special Electrical Machines	3	0	0	3	EEE
5	20ME5T04	Design Thinking & Product Innovation	3	0	0	3	ME
6	20ME5T05	Nanotechnology	3	0	0	3	ME
7	20EC5T04	Linear System Analysis	3	0	0	3	ECE
8	20EC5T05	Digital Logic Design	3	0	0	3	ECE
9	20EC5T06	Solid State Devices	3	0	0	3	ECE
10	20CS5T07	Introduction to Artificial Intelligence	3	0	0	3	CSE
11	20CS5T08	Operating System	3	0	0	3	CSE
12	20CS5T09	Software Engineering	3	0	0	3	CSE
13	20IT5T07	Computer Networks	3	0	0	3	IT
14	20IT5T08	Computer Graphics	3	0	0	3	IT
15	20HS5T02	Operations Research	3	0	0	3	BED
16	20MB5T01	Principles of Management	3	0	0	3	DMS
17	20MB5T02	Technology Management	3	0	0	3	DMS
18	20AD5T07	Foundations of Data Science	3	0	0	3	AIDS
19	20AM5T07	Introduction to Machine Learning	3	0	0	3	AIML

OPEN ELECTIVE –II:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE6T08	Remote Sensing and GIS	3	0	0	3	CE
2	20CE6T09	Environmental Impact Assessment	3	0	0	3	CE
3	20EE6T08	Renewable Energy Sources	3	0	0	3	EEE
4	20EE6T09	Energy Auditing Conservation and Management	3	0	0	3	EEE
5	20ME6T07	Industrial Robotics	3	0	0	3	ME
6	20ME6T08	Additive manufacturing	3	0	0	3	ME
7	20EC6T07	Electronic Circuits and Networks	3	0	0	3	ECE

8	20EC6T08	Principles of Communications	3	0	0	3	ECE
9	20EC6T09	Microcontrollers & its Applications	3	0	0	3	ECE
10	20CS6T07	Introduction to Machine Learning	3	0	0	3	CSE
11	20CS6T08	Information Security	3	0	0	3	CSE
12	20CS6T09	Agile Technologies	3	0	0	3	CSE
13	20IT6T07	Fundamentals of Machine Learning	3	0	0	3	IT
14	20IT6T08	Database Management Systems	3	0	0	3	IT
15	20HS6T02	Quantitative Aptitude & Reasoning	3	0	0	3	BED
16	20MB6T01	Organizational Behaviour	3	0	0	3	DMS
17	20MB6T02	Project Management	3	0	0	3	DMS
18	20AD6T07	Visual Analytics	3	0	0	3	AIDS
19	20AM6T07	Big data Analytics	3	0	0	3	AIML

OPEN ELECTIVE –III:

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CE7T13	Construction Technology and Management	3	0	0	3	CE
2	20CE7T14	Green Buildings	3	0	0	3	CE
3	20EE7T13	Concept of Power System Engineering	3	0	0	3	EEE
4	20EE7T14	Instrumentation	3	0	0	3	EEE
5	20ME7T10	Green Engineering Systems	3	0	0	3	ME
6	20ME7T11	Hybrid Electric Vehicles	3	0	0	3	ME
7	20EC7T10	Data Communications	3	0	0	3	ECE
8	20EC7T11	Mechatronics	3	0	0	3	ECE
9	20EC7T12	Bio Medical Instrumentation	3	0	0	3	ECE
10	20CS7T10	Artificial Neural Networks	3	0	0	3	CSE
11	20CS7T11	Cyber Security	3	0	0	3	CSE
12	20CS7T12	Software Testing Methodologies	3	0	0	3	CSE
13	20IT7T10	Internet of Things	3	0	0	3	IT
14	20IT7T11	Computer Vision	3	0	0	3	IT
15	20HS7T01	Fuzzy sets	3	0	0	3	BED
16	20MB7T01	Digital Media management	3	0	0	3	DMS
17	20MB7T02	Entrepreneurship Development	3	0	0	3	DMS

18	20AD7T10	Data Analysis and Visualization with Python	3	0	0	3	AIDS
19	20AM7T10	NOSQL Databases	3	0	0	3	AIML

OPEN ELECTIVE –IV:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE7T15	Waste water treatment	3	0	0	3	CE
2	20CE7T16	Repair and Rehabilitation of Concrete Structures	3	0	0	3	CE
3	20EE7T15	Power Quality	3	0	0	3	EEE
4	20EE7T16	Electric Vehicles	3	0	0	3	EEE
5	20ME7T12	Micro-Electro- Mechanical Systems	3	0	0	3	ME
6	20ME7T13	Solar Energy Systems	3	0	0	3	ME
7	20EC7T13	Introduction to Embedded Systems	3	0	0	3	ECE
8	20EC7T14	Internet of Things	3	0	0	3	ECE
9	20EC7T15	Analog and Digital IC applications	3	0	0	3	ECE
10	20CS7T13	Data Analytics	3	0	0	3	CSE
11	20CS7T14	Block Chain Technology	3	0	0	3	CSE
12	20CS7T15	Software Project Management	3	0	0	3	CSE
13	20IT7T13	Cloud Computing	3	0	0	3	IT
14	20IT7T14	Business Intelligence	3	0	0	3	IT
15	20HS7T02	Polymer Chemistry	3	0	0	3	BED
16	20MB7T03	Total Engineering Quality Management	3	0	0	3	DMS
17	20MB7T04	Stress Management	3	0	0	3	DMS
18	20AD7T11	Natural Language Processing	3	0	0	3	AIDS
19	20AM7T11	Deep Learning	3	0	0	3	AIML

HONORS/MINOR COURSES OFFERED BY THE DEPARTMENT

Honors/ Minor Course Fulfillments:

- The 20 additional credits need to be acquired, 16 credits can be earned by undergoing specified courses, with each carrying 4 credits.
- The remaining 4 credits must be acquired through two online MOOCs (SWAYAM /NPTEL), which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of Studies.
- Minor Engineering subjects are offered to other branches by AIDS Department (except for AIDS Students).
- Honors engineering subjects are offered to AIDS Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (SWAYAM/NPTEL).

HONORS COURSES

S.No.	Course code	Course Name	L	T	P	C
Pool-1						
1	20ADHN01	Introduction to cyber Security	3	1	0	4
2	20ADHN02	Computer Networks	3	1	0	4
3	20ADHN03	Distributed Systems	3	0	2	4
Pool-2						
4	20ADHN05	Software Engineering	3	1	0	4
5	20ADHN06	Systems programming	3	1	0	4
6	20ADHN07	Social Network Analysis	3	1	0	4
Pool-3						
7	20ADHN09	Case Tools	3	1	0	4
8	20ADHN10	Adhoc and Sensor Networks	3	1	0	4
9	20ADHN11	Parallel Computing	3	1	0	4
Pool-4						
10	20ADHN13	Pattern Recognition	3	1	0	4
11	20ADHN14	Fault Tolerant Computing	3	1	0	4
12	20ADHN15	Data Centre Design and Management	3	1	0	4

MINOR COURSES

S.No	Course code	Course Name	L	T	P	C	Offered by
1	20ADMN01	Introduction to Data Science	3	1	0	4	AIDS
2	20ADMN02	Introduction to Machine Learning	3	1	0	4	AIDS
3	20ADMN03	Advanced Data Structures	3	1	0	4	AIDS
4	20ADMN04	Social Network Analysis	3	1	0	4	AIDS
5	20ADMN05	Natural Language Processing	3	1	0	4	AIDS
6	20ADMN06	Robotic Process Automation	3	1	0	4	AIDS
7	20ADMN07	MOOC1	-	-	-	2	AIDS
8	20ADMN08	MOOC2	-	-	-	2	AIDS

B.TECH I SEMESTER	BSC	L	T	P	C
		3	0	0	3

20AD1T01 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

Pre-requisite: Basic knowledge about matrices, differentiation and integration

Course Objective: Objective of the course is to impart

- Basic understanding of mathematical methods to solve simultaneous linear systems
- Understanding of formation and solutions of ordinary differential equations
- Knowing the mathematical methods to solve applications of differential equations

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the knowledge to solve a system of homogeneous and non homogeneous linear equations

CO2: Illustrate the methods of computing eigen values and eigen vectors

CO3: Able to analyze the real life situations, formulate the differential equations and then applying the methods

CO4: Determine the solutions of linear differential equations

CO5: Optimize functions of several variables and able to find extreme values of constrained functions

SYLLABUS

UNIT-I: Linear systems of equations:

Rank of a matrix, Echelon form, Normal form, PAQ is in normal form, linear dependence and independence of vectors, Consistency of linear system of equations, System of linear homogeneous equations, Gauss-elimination and Gauss -Jordan methods.

UNIT-II: Eigen values & Eigen vectors:

Eigen values, Eigen vectors, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), finding inverse and powers of a matrix using C-H theorem, Reduction to diagonal form, reduction of quadratic form to canonical form using orthogonal reduction, nature of quadratic forms.

UNIT-III: Ordinary Differential Equations of first order:

Linear equations, Bernoulli's equation, Exact differential equations. Equations reducible

to exact equations, **Applications:** Orthogonal Trajectories, Newton's Law of cooling, Rate of decay & growth, R-L series circuits.

UNIT-IV: Linear Differential Equations higher order:

Definitions, Complete solution (without proof), Operator D, Rules to find complementary function, Inverse operator, Rules to find the particular integral(nonhomogeneous term of the form e^{ax}, sin(ax+b), cos(ax+b), polynomials in x^m, e^{ax} V(x), any other function), Method of variation of parameters.

UNIT-V: Partial Differentiation:

Functions of two variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Jacobian and functional dependence, Taylor's theorem for functions of two variables. **Applications:** Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

			L	T	P	C
B.TECH I SEMESTER		**BSC**	**3**	**0**	**0**	**3**

20AD1T02 APPLIED CHEMISTRY

Pre-requisite: Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the availableresources

Course Objective: Objective of the course is to impart

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of green chemistry and molecular switches

Course Outcomes: At the end of the course, student will be able to

CO1: Analyze the different types of composite plastic materials and interpret the mechanism ofconduction in conducting polymers.

CO2: Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning newengineering products and categorize the reasons for corrosion and study methods to control corrosion.

CO3: Synthesize nanomaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystalsand superconductors.

CO4: Design models for energy by different natural sources.
Analyze the principles of different analytical instruments and their applications.

CO5: Obtain the knowledge of green chemistry and molecular machines

SYLLABUS

UNIT-I: Polymer Technology

Polymerisation: Introduction, methods of polymerization (addition and Condensation), Physical and mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers: Natural rubber-Drawbacks-vulcanization, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics – GFRP and Aramid FRP

Conducting polymers: Intrinsic and extrinsic conducting polymers

Biodegradable polymers: preparation and applications

UNIT-II: Electrochemical Cells And Corrosion

Part I: ELECTROCHEMICAL CELLS: Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Part II: Corrosion: Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings (cathodic coatings, anodic coatings, electroplating and electroless plating)

UNIT-III: Material Chemistry

Part I: Non-elemental semiconducting materials: Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling technique) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Super conductors:-Type –I, Type II-characteristics and applications

Part II: Nano materials: Introduction, sol-gel method, characterization by (Brunauer Emmet Teller[BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals: Introduction-types-applications.

UNIT-IV: Non-Conventional Energy Sources & Spectroscopy

Part I: NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Part II: **SPECTROSCOPY**

UV spectroscopy- Basic principle-Instrumentation-Applications

IR spectroscopy- Basic principle-Instrumentation-Applications

NMR spectroscopy- Basic principle-Instrumentation-Applications

UNIT-V: Advanced Concepts/Topics In Chemistry

Part-I: Green chemistry: Introduction, Principles of green chemistry, Green synthesis-Aquaeous Phase method-Microwave method-Phase transfer catalysis method, R4M4 principles (Econoburette).

PART-II: Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid- base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor.

Text Books:

1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi,(Latest edition).
2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi,(2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

References:

1. K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited,(2009).
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology",University press (latest edition)

B.TECH I SEMESTER	**HSMC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20AD1T03 ENGLISH

Pre-requisite:

Course Objective:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: At the end of the course, student will be able to

CO1	understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
CO2	ask and answer general questions on familiar topics
CO3	employ suitable strategies to master the art of letter writing and email writing
CO4	recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
CO5	form sentences using proper grammatical structures and correct word forms

SYLLABUS

UNIT-I	A Drawer full of happiness (Detailed Study) Deliverance (Non-detailed Study)
UNIT-II	Nehru's letter to his daughter Indira on her birthday(Detailed Study) Bosom Friend (Non-detailed Study)
UNIT-III	Stephen Hawking-Positivity 'Benchmark' (Detailed Study) Shakespeare's Sister(Non-detailed Study)
UNIT-IV	Liking a Tree, Unbowed: Wangari Maathai-biography (Detailed Study)

Telephone Conversation(Non-detailed Study)

UNIT-V Stay Hungry-Stay foolish (Detailed Study)
Still I Rise(Non-detailed Study)

Text Books

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The Individual Society", Pearson Publications.(Non-detailed)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

		L	T	P	C
B.TECH I SEMESTER	**ESC**	**1**	**0**	**4**	**3**

20AD1L04 COMPUTER ENGIENERING WORKSHOP

Course Objectives:

Skills and knowledge provided by this subject are the following:

- **PC Hardware:** Identification of basic peripherals, Assembling a PC, Installation of system software like MS Windows, device drivers, etc. Troubleshooting of PC Hardware and Software issues.
- **Internet & World Wide Web:** Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber attacks.
- **Productivity Tools:** Understanding and practical approach of professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite office tools.

Course Outcomes:

CO1: Identify, assemble and update the components of a computer

CO2: Configure, evaluate and select hardware platforms for the implementation and execution of computer applications, services and systems

CO3: Make use of tools for converting pdf to word and vice versa

CO4: Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, HTML, LaTex

LIST OF EXERCISES

Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.

Task 2: Practicing disassembling and assembling components of a PC

Task 3: Installation of Device Drivers, MS Windows, Linux Operating systems and Disk Partitioning, dual boating with Windows and Linux.

Task 4: Introduction to Memory and Storage Devices, I/O Port, Assemblers, Compilers, Interpreters, Linkers and Loaders.

Task 5: Demonstration of Hardware and Software Troubleshooting

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DSL, and Dialup Connection.

Task 7: Surfing the Web using Web Browsers, Awareness of various threats on the Internet and its solutions, Search engines and usage of various search engines, Need of anti-virus, Installation of anti-virus, configuring personal firewall and windows update.

(Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and popup blockers)

Productivity Tools:

Task 8: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Task 9: Demonstration and Practice of various features of Microsoft Word

Assignment:

1. Create a project certificate.

2. Creating a news letter

Features to be covered:-Formatting Fonts, Paragraphs, Text effects, Spacing, Borders and Colors, Header and Footer, Date and Time option, tables, Images, Bullets and Numbering, Table of Content, Newspaper columns, Drawing toolbar and Word Art and Mail Merge in word etc.,

Task 10: Demonstration and Practice of various features Microsoft Excel

Assignment: 1. Creating a scheduler

2. Calculating GPA

3. Calculating Total, average of marks in various subjects and ranks of students

based on marks

Features to be covered:Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel, Charts, Renaming and Inserting worksheets, etc.,

Task 11: Demonstration and Practice of various features Microsoft Power Point

Features to be covered:Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks Tables and Charts, Master Layouts, Types of views, Inserting – Background, textures, Design Templates, etc.,

Task 12: Demonstration and Practice of various features LaTeX – document preparation, presentation (Features covered in Task 9 and Task 11 need to be explored in LaTex)

Task 13: Tools for converting word to pdf and pdf to word

Task 14: Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Reference Books:

1. Computer Fundamentals, Anita Goel, Pearson India Education, 2017

2. PC Hardware Trouble Shooting Made Easy, TMH

3. Introduction to Information Technology, ITL Education Solutions Limited, 2nd Edition, Pearson, 2020

4. Upgrading and Repairing PCs, 18th Edition, Scott Mueller, QUE, Pearson, 2008

5. LaTeX Companion – Leslie Lamport, PHI/Pearson

6. Introducing HTML5, Bruce Lawson, Remy Sharp, 2nd Edition, Pearson, 2012

7. Teach yourself HTML in 24 hours, By Techmedia

8. HTML 5 and CSS 3.0 to the Real World by Alexis Goldstein, Sitepoint publication.

9. Internet of Things, Technologies, Applications, Challenges and Solutions, B K Tripathy, J Anuradha, CRC Press

10. Comdex Information Technology Course Tool Kit, Vikas Gupta, Wiley Dreamtech.

11. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme, CISCO Press, Pearson Education.

12. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N. B. Venkateswarlu, S. Chand Publishers

		L	T	P	C
B.TECH I SEMESTER	**ESC**	**3**	**0**	**0**	**3**

20AD1T05 PROBLEM SOLVING THROUGH C

Pre-requisite:

Course Objective:

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor. To assimilate about File I/O and significance of functions

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of programming

CO2: Understand and Apply loop construct for a given problem

CO3: Demonstrate the use pointers

CO4: Understand the use of functions and develop modular reusable code

CO5: Understand File I/O operations

SYLLABUS

UNIT-I:

INTRODUCTION TO COMPUTERS: Functional Components of computer, computer software, categories of memory, types of programming languages, Development of algorithms, flow charts, software development process, Computer Numbering system

BASICS OF C PROGRAMMING: Introduction to programming paradigms, Structure of C program, Data Types, C Tokens, Operators: Precedence and Associativity, Expressions Input/output statements, Assignment statements

UNIT-II:

Decision making statements: if, if else, nester if. Multi way decision making statements: else if, Switch statement. **Loop statements**: while, do while, for, Compilation process.

UNIT-III:

Introduction to Arrays: Declaration, Initialization, One dimensional array, Example Programs on one dimensional array, Selection sort, linear and binary search, two

dimensional arrays, Matrix Operations, Multi-dimensional Arrays

Strings: Declaration, String operations: length, compare, concatenate, copy, String handling functions.

UNIT-IV:

FUNCTIONS: Introduction to functions: Function prototype, function definition, function call, Built-in functions, Recursion, Storage classes, Passing Arrays & Strings to the functions, Preprocessor directives

POINTERS: Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers, Parameter passing: Pass by value, Pass by reference, Dynamic Memory Allocation

UNIT-V:

STRUCTURES AND UNIONS: Structure, Nested structures, Pointer and Structures, Array of structures, Example Program using structures and pointers, Self-referential structures, Unions.

FILE PROCESSING: Files, Types of file processing: Sequential access, Random access, Sequential access file, Random access file, Command line arguments

Text Books:

1. Krnighan. B.W and Ritche, D.M, “The C Programming Language”, Second Edition, Pearson Education, 2006

2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.

References:

1. Pradepdey, Manas Ghosh, “Fundamentals of Computing and programming in C”, First Edition, Oxford University Press, 2009.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh Edition, Pearson Publication.
3. E Balagursamy, “Programming in C, Sixth Edition, Tata McGraw Hill.
4. Ajay Mittal, “Programming in C A practical Approach”, Pearson education

		L	T	P	C
B.TECH I SEMESTER	**HSMC**	**0**	**0**	**3**	**1.5**

20AD1L06 ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

- Facilitate effective usage of functional English through role plays
- Focus on vocabulary enhancement
- Foster various nuances of phonetics and accent neutralization

Course Outcomes: At the end of the course, student will be able to

CO1: Acquire basic proficiency in English by learning functional aspects of English language

CO2: Learn the methods of enhancing vocabulary

CO3: Acquaint himself/herself with nuances of Phonetics

LIST OF EXPERIMENTS

1 Greetings and Introductions
2 Requesting Permission & Giving Directions
3 Inviting/Complaining/Congratulating
4 Root Words
5 Phonetics-Sounds and Symbols
6 Pronunciation Rules

References:

1. Strengthen Your Steps, Maruti Publications
2. Interact, Orient Blackswan
3. Word Power Made Easy, Pocket Books

		L	T	P	C
B.TECH I SEMESTER	**BSC**	**0**	**0**	**3**	**1.5**

20AD1L07 APPLIED CHEMISTRY LAB

Pre-requisite: Acquire some experimental skills.

Course Objective: Objective of the course is to impart

- The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations.
- A few instrumental methods of chemical analysis.

Course Outcomes:

At the end of the course, student will be able to

CO1: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

LIST OF EXPERIMENTS

1. Determination of HCl using standard Na2CO3 solution.
2. Determination of alkalinity of a sample containing Na2CO3 and NaOH.
3. Determination of Mn+2 using standard oxalic acid solution.
4. Determination of ferrous iron using standard K2Cr2O7 solution.
5. Determination of Cu+2 using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe+3 by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).

12 Determination of Mg^{+2} present in an antacid.

13 Determination of $CaCO_3$ present in an egg shell.

14 Estimation of Vitamin C.

15 Determination of phosphoric content in soft drinks.

16 Adsorption of acetic acid by charcoal.

17 Preparation of nylon-6, 6 and Bakelite (demonstration only).

B.TECH I SEMESTER	ESC	L	T	P	C
		0	0	3	1.5

20AD1L08 PROBLEM SOLVING THROUGH C LAB

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers &functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

- Demonstrate Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.

2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( )function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name
3. Write a program in C to remove a file from the disk.

B.TECH I SEMESTER	MC	L	T	P	C
		2	0	0	--

20AD1M09 ENVIRONMENTAL SCIENCE

Course objective:

To understand the importance of Environment and the importance of biodiversity

Course outcomes:

- The importance of environment, Natural resources and current global environmental challenges for the sustenance of the life on planet earth.
- The concepts of the ecosystem and its function in the environment.
- 3.The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- The various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices.
- The environmental legislations of India and Social issues and the possible means
- Environmental assessment and the stages involved in EIA.

SYLLABUS

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Introduction- Scope of Environmental Studies- Importance of Environmental Studies- Need for public awareness, Environmental ethics- Contemporary Environmentalists- Environmental Global moves: Stockholm conference, Earth summit

Concept of an ecosystem - Structure of an ecosystem- function of an ecosystem- Food chains, food webs- ecological pyramids- Energy flow in the ecosystem- Ecological succession- Nutrient cycling- 1^{o}production& 2^{o}production- Major ecosystems: Forest ecosystem- Grassland ecosystem, Desert ecosystem- Aquatic ecosystem: pond, Lake Ecosystem- Streams, river ecosystem, Oceans

UNIT-II: NATURAL RESOURCES AND CONSERVATION

Introduction and classification of natural resources-Forest resources**:** Use and over-exploitation- Deforestation-Timber extraction-Mining- Conservation-Water resources**:** Use and over utilization of surface and ground water,- Floods, drought, Dams and associated problems- Water conservation, rain water harvesting, water shed management-Energy resources**:** renewable energy sources –solar-wind-hydro-

tidal- Ocean thermal-geo thermal-bio mass-bio gas-bio fuels- Hydrogen.- Non-renewable energy sources-coal-petroleum-natural gas-Nuclear energy

UNIT-III: **BIODIVERSITY AND ITS CONSERVATION**

Definition, classification- Value of biodiversity-Threats to biodiversity: habitat loss, man-wildlife conflicts- Endangered and endemic species of India-Conservation of biodiversity- Biodiversity at national and local levels, Hot-sports of biodiversity

UNIT-IV: ENVIRONMENTAL PROBLEMS

Global warming, Climate change- Acid rain, Ozone depletion- Air pollution- Water pollution- Soil pollution- Noise pollution, Nuclear hazards- Solid Waste Management: Causes, Consequences and Control methods- Solid Waste Management- Population growth and explosion, effects, control measures- Pollution case studies- Role of an individual in prevention of pollution

UNIT-V: ENVIRONMENTALLEGISLATION & MANAGEMENT

Sustainable development- Air (Prevention and Control of Pollution) Act-Drawbacks- Water (Prevention and control of Pollution) Act- Drawbacks- Wildlife Protection Act- Drawbacks- Forest Conservation Act- Drawbacks- Environmental Protection Act- Drawbacks- Environmental Impact Assessment and its significance- Preparation of Environmental Management Plan and Environmental Impact Statement- Ecotourism

TEXT BOOKS:

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age Publications, New Delhi

2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada

3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCES:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Delhi

B.TECH II SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20AD2T01 TRANSFORM TECHNIQUES

Pre-requisite: Linear Algebra and Differential Equations

Course Objective: Objective of the course is to impart

- Learning the techniques of Laplace transforms to solve ordinary differential equations
- knowledge of Fourier series & Fourier transforms for piecewise continuous functions
- knowledge of solving boundary valued problems

Course Outcomes: At the end of the course, student will be able to

CO1: Able to analyze a class of integrals in terms of beta and gamma functions

CO2: Provide the techniques of Laplace transformations and able to solve problems related to digital signal processing

CO3: Analyze the general periodic functions in the form of an infinite convergent sine and cosine series

CO4: Illustrate the methods to solve the boundary value problems

CO5: Determine a solution of a discrete system using Z- transforms

SYLLABUS

UNIT-I: Special functions:

Beta function, Properties & problems, Gamma function, properties & problems, Relation between Beta and Gamma functions, Evaluation of improper integrals.

UNIT-II: Laplace Transforms (all properties without proofs):

Definition, Transforms of elementary functions, properties of Laplace transforms, Transforms of periodic functions, Transforms of derivatives and integrals, Multiplication by t^n, Division by t, Evaluation of improper integrals.

Inverse Laplace transforms–Method of partial fractions, other methods of finding inverse transforms, Convolution theorem (without proof). **Application:** Application to differential equations.

UNIT-III: Fourier Series & Fourier Transforms:

Euler's formulae (without proof), Conditions of Fourier expansion, Functions having points of discontinuity, Change of inerval, Even and odd functions, Half-range series. Fourier Integral theorem (without proof), Fourier cosine & sine integral, complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, properties of Fourier transforms (without proof), Convolution theorem(without proof), finite & infinite Fourier sine & cosine transforms.

UNIT-IV: Partial Differential Equations:

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of Variables, Applications: One-dimensional wave and heat equations, two-dimensional heat equation.

UNIT-V: Z-Transforms: (all properties without proofs)

Introduction, definition, some standard z-transforms, linearity property, damping rule, some standard results, shifting U_n to the right, multiplication by n, initial and final value theorems, Inverse z-transforms, convolution theorem, evaluation of inverse z-transforms by partial fractions, applications to difference equations.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH II SEMESTER **BSC**

L	T	P	C
3	0	0	3

20AD2T02 APPLIED PHYSICS

Pre-requisite: Knowledge of basic concepts of waves, Optics, Electricity and Magnetism

Course Objective: Objective of the course is to impart

- ***Knowledge*** of fundamentals of Physics which helps them in the study of advanced topics of Engineering.
- ***Develop*** analytical capability and understand various Engineering concepts.

Course Outcomes:

At the end of the course, student will be able to

CO1: ***Impart*** knowledge of Physical Optics phenomenon Polarization and identify these phenomenon in natural processes

CO2: ***Gain*** knowledge of applications of lasers and optical fibers in various fields .

CO3: ***Classify*** magnetic and dielectric materials and their Engineering applications.

CO4: ***Understand*** basic quantum mechanics and free electron theories.

CO5: ***Obtain*** the concept of concept of holes and electrons in semiconductors.

SYLLABUS

UNIT-I: Wave Optics:

Interference*:* Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Colors in thin films-Newton's rings-Determination of wave length nd refractive index.

Diffraction: C Introduction- Fresnel and Fraunhofer diffraction - Fraunhofer Diffraction due to Single slit, Double slit, N –slits(Qualitative) - Diffraction Grating – Resolving Power of Grating(Qualitative).

Polarizations: Introduction- Types of polarization-polarization by reflection, refraction and Double refraction-Nicol's prism –Half and Quarter wave plates.

UNIT-II: Lasers and Fiber Optics:

Lasers:: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber-Construction- - Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes .

UNIT-III: Magnetic and Dielectric Materials:

Magnetic Materials: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para ferro, anti ferro & ferri – Domain concept of Ferromagnetism(Qualitative) - Hysteresis – soft and hard magnetic materials .

Dielectric Materials: Introduction - Dielectic polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation.

UNIT-IV: Quantum Mechanics,Free Electron Theory:

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of States(3D),Fermi energy.

UNIT-V: Band Theory of Solids and Semiconductors:

Band theory of Solids: Introduction- Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - V vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Semiconductors::Introduction– Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Drift and Diffusion currents – Einstein's equation-Hall effect- Hall coefficient - Applications of Hall effect.

Text Books

1. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G. Kshirsagar - S. Chand Publications, 2019.
2. "Engineering Physics" by D.K. Bhattacharya and Poonam Tandon, Oxford press (2015).

3. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference Books

1. Applied Physics by P.K. Palanisamy, Scitech publications (2014).
2. Engineering Physics by M. Arumugam, Anuradha Publication (2014).
3. Physics for Engineers by M.R. Srinivasan, New Age international publishers (2009).

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20AD2T03 COMPUTER ORGANIZATION

Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It provides an in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

Course Outcomes

By the end of the course the student will be able to

CO1: Demonstrate an understanding of the design of the functional units of a digital computer system. Relate Postulates of Boolean algebra and minimize combinational functions

CO2: Design and analyze combinational and sequential circuits

CO3: Implementation of computer arithmetic operations and to know the basic computer instruction formats

CO4: Obtain how micro programmed control is used to interact with units of components of CPU

CO5: Understanding of organization and architecture of input output and memory

SYLLABUS

UNIT I:

Digital Components and Data Representation:

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation, other Binary codes, Error Detection Codes

Digital Components: Digital Components, logic gates, Boolean Algebra, Map Simplification

UNIT II:

Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Decoders, Multiplexers.

Sequential Circuits: Flip-Flops-SR Flip flop, D Flip flop, JK Flip flop, T Flip flop, Edge Triggered File flop. Sequential Circuits: flip flop input equations, state table, state diagram, Design example and procedure Registers, Shift Registers, Binary Counters

UNIT III:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT IV:

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Text Books:

1. Computer System Architecture, 3rded., M.MorrisMano, PHI

Reference Books:

1. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006
2. Computer Organization, 5thed., Hamacher, Vranesic and Zaky,TMH,2002
3. Computer Organization & Architecture: Designing for Performance, 7thed., William Stallings, PHI,

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20AD2T04 DATA STRUCTURES

Course Objectives:

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

CO1: Understand the properties, interfaces, and behaviors of basic abstract data types.

CO2: Understand and apply linked lists

CO3: Apply Stacks and Queue data structures.

CO4: Demonstrate different methods for traversing trees.

CO5: Demonstrate the application of Graphs

SYLLABUS

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal, Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications- Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees sing Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1. Data Structures Using C. 2ndEdition. Reema Thareja, Oxford.
2. Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1. Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2. Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3. Data Structures with C, Seymour Lipschutz TMH

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20AD2T05 PYTHON PROGRAMMING

Course Objectives:

- Identify/characterize/define a problem
- Design a program to solve the problem
- Create executable code
- Read most Python code

Course Outcomes:

CO1: Understand the fundamentals of Python programming language.

CO2: Understand Data Structures

CO3: Understand the use of functions in Python

CO4: Understand the Object-Oriented Programming concepts of Python

CO5: Apply regular expressions for different situations.

SYLLABUS

UNIT – I:

Introduction: History of Python, Need of Python Programming, Applications of Python Programming Variables, Assignment, Keywords, Input-Output, Indentation.

Types, Operators, and Expressions: Types – Integers, Strings, Booleans; Operators-Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while break, continue, pass

UNIT – II:

Data Structures Lists – Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT – III:

Functions – Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function-Global and Local Variables. Modules: Creating modules, import statements, from. The import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT – IV:

Object-Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error, and Exceptions: Difference between an error and Exception, Handling Exception, try except for block, Raising Exceptions, User Defined Exceptions

UNIT – V:

Regular expressions: Power of pattern matching and searching using regex in python, Meta characters and Sequences used in Patterns, Password, email, URL validation using regular expression, Pattern finding programs using regular expression.

Text Books:

1. Learning Python, Mark Lutz, Orielly
2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19- 948017-3, Oxford University Press, 2017.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. "Python in easy steps In Easy Steps", Mike MC Grath, illustrated edition, In easy steps 2013 publishers.
5. Professional Python Frameworks: Web 2.0 Programming, Dana Moore, Raymond Budd, William Wright, Wrox Publication, ISBN: 978-0-470-13809-0, October 2007.

		L	T	P	C
B.TECH II SEMESTER	**BSC**	**0**	**0**	**3**	**1.5**

20AD2L06 APPLIED PHYSICS LAB

Pre-requisite: Fundamental understanding of usage of an instrument with proper care.

Course Objective: Objective of the course is to impart

- Training Engineering graduates to handle instruments and their usage methods to improve the accuracy of measurements.

At the end of the course, student will be able to

CO1: **Outcomes**: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

CO2: Implement the basic principles of Mechanics to measure different physical parameters.

CO3: Enhance the knowledge of Usage of electronic devices in various applications

SYLLABUS

1. Newton's rings –Determination of radius of curvature of Plano Convex Lens.
2. Determination of wavelength of spectral lines -Diffraction Grating
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of wavelength of laser source using diffraction grating
5. Determination of Numerical Aperture and bending loss of a given Optical Fiber.
6. Determination of dispersive power of prism.
7. Determination of Rigidity modulus of a material- Torsional Pendulum.
8. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
9. Determination of Young's modulus by method of single cantilever oscillations
10. Verification of laws of vibrations in stretched strings – Sonometer.

11. Estimation of Planck's Constant using Photo electric Effect
12. Study of I /V Characteristics of Semiconductor diode.
13. I/V characteristics of Zener diode.
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
15. Energy Band gap of a Semiconductor using p - n junction diode

Reference Books

1. A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers, 2017.

B.TECH II SEMESTER	ESC	L	T	P	C
		0	0	3	1.5

20AD2L07 DATA STRUCTURES LAB

Course Objectives:

The objective of this lab is to

- Demonstrate the different data structures implementation.

Course Outcomes:

- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

List of Experiments:

Exercise -1 (Searching)

a) Write C program that use both recursive and non-recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non-recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order.

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order.

Exercise -3 (Sorting-II)

a) Write C program that implement radix sort, to sort a given list of integers in ascending order

b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4 (Singly Linked List)

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion operation on a singly linked list

c) Write a C program that uses functions to perform deletion operation on a singly linked list

d) Write a C program to reverse elements of a single linked List.

Exercise -5 (Queue)

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists

Exercise -6 (Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write C program for implementing infix to postfix conversion

d) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7 (Binary Tree)

Write a recursive C program for traversing a binary tree in preorder, in-order and post-order.

Exercise -8 (Binary Search Tree)

a) Write a C program to Create a BST

b) Write a C program to insert a node into a BST.

c) Write a C program to delete a node from a BST.

Exercise-9

Write a program for implementing Heap Sort.

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20AD2L08 PYTHON PROGRAMMING LAB

Course Objectives:

The objective of this lab is to

- To elucidate problem solving through python programming language.
- To introduce function-oriented programming paradigm through python.
- To train in development of solutions using modular concepts.
- To teach practical Python solution patterns

Course Outcomes

CO1: Develop fundamental programs in python programming language.

CO2: Develop Python programs for numerical and text-based problems.

CO3: Develop Python programs on object-oriented programming and regular expressions.

CO4: Develop python programs on data structures.

LIST OF EXPERIMENTS

1. Write a program to perform various list of operations (eg: Arithmetic, logical, bitwise etc) in python.
2. Write a program to implement control flow statements.
3. Write a program implementing various predefined function of Lists, Sets, Tuples and Dictionaries.
4. Write a program covering various arguments for a function.
5. Write a program to implement various types of functions.
6. Write a program to implement recursion.
7. Write a program to implement command line arguments.
8. Write a program to create a class and its constructors.
9. Write a program to implement inheritance.
10. Write a program for exception handling.
11. Write a program to perform various linear algebra operations like finding eigen values and vectors, determinant and trace for a matrix.

12. Write a program to perform matrix operations like addition, subtraction, multiplication of matrices using Numpy Module.
13. Write a program to use System, math etc., packages.
14. Write a Python program to find the occurrence and position of the substrings within a string.
15. Write a Python program to replace all occurrences of space, comma, or dot with a colon.
16. Write a Python program to match a string that contains only upper and lowercase letters, numbers, and underscores.

B.TECH III SEMESTER	BSC	L	T	P	C
		3	0	0	3

20AD3T01 NUMERICAL METHODS & VECTOR CALCULUS

Course Objectives:

- Understand the basic numerical methods to solve simultaneous linear equations.
- Knowledge of numerical methods to solve ordinary differential equations.
- The types of integration over the lines, surfaces & volumes.

Course Outcomes:

By the end of the course students shall be able to

CO1: Determine the solution of transcendental equations by different numerical methods

CO2: Provide the interpolation techniques which analyze the data of an unknown function.

CO3: Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries.

CO4: Evaluate areas and volumes using double & triple integrals.

CO5: Apply the concepts of calculus to scalar and vector fields and establish the relation between line, surface and volume integrals.

SYLLABUS

UNIT-I: Numerical Solution of Equations:

Solution of Algebraic and transcendental equations: Bisection method, Method of false position and Newton-Raphson method. Iterative methods of solution of linear simultaneous equations: Jacobi's and Gauss-Seidel iteration methods.

UNIT-II: Interpolation:

Forward and backward, relation between these operators, Differences of a polynomial, Interpolation with unequal intervals: Lagrange's interpolation formula, Newton's forward & backward interpolation formulae & problems

UNIT-III: Numerical Integration & Numerical Solutions of ordinary differential equations with initial conditions:

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rules. Numerical Solution of ODE: Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method of 4^{th} order.

UNIT-IV: Multiple Integrals:

Double integrals in Cartesian & polar coordinates, Change of order of integration, Triple integrals, Change of variables (Cartesian to Polar, Rectangular coordinates to Cylindrical & Rectangular coordinates to Spherical polar coordinate systems).

Applications: Area enclosed by plane curves, Volume of solids.

UNIT-V: Vector Differentiation & Vector Integration:

Introduction, Scalar and Vector point functions, Del applied to scalar point functions- Gradient, directional derivatives, Del applied to vector point functions- Div& Curl, physical interpretation of div & curl, Del applied twice to point functions, Del applied to products of point functions (Identities without proofs).

Line integral, Green's theorem in the plane (without proof), Surface integrals, Stoke's theorem (without proof), Volume integral, Gauss Divergence theorem (without proof)

TEXT BOOKS:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014
2. **B.V.RAMANA,** Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007

REFERENCE:

1. **ERWINKREYSZIG,** Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015
2. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH III SEMESTER

PCC	L	T	P	C
	3	0	0	3

20AD3T02 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- To learn the fundamentals of object-oriented programming.
- To implement object-oriented concepts using Java.
- To understand how to design object-oriented applications using Java.

Course Outcomes:
At the end of the course, student will be able to

CO1: Understand the concepts of Object-Oriented Programming and Java Programming constructs.

CO2: Demonstrate the concepts – Strings, Inheritance and Interfaces.

CO3: Build efficient and error-free codes using exception handling and demonstrate multi-threading

CO4: Design GUI applications using Event Handling and Abstract Window Toolkit.

CO5: Develop real-time applications using Applets and Swings.

SYLLABUS

UNIT - I:

Introduction to OOP, procedural programming language vs. object- oriented language, principles of OOP, applications of OOP, history of java, java features, JVM. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting.

Control Statements: Introduction, if statement, Nested if statement, if–else statements, Ternary Operator, Switch Statement, Iteration Statements: while statement, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

Classes and objects: class declaration, creating objects, methods, method overloading, constructors and constructor overloading, garbage collector.

UNIT - II:

Basic Input-Output Operations. String, String Buffer and String Tokenizer classes.

Inheritance: types of inheritance, super keyword, final keyword, overriding and abstract class.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, importance of static keyword, this keyword, arrays, command line arguments, nested classes

UNIT – III:

Packages and Java Library: creating and using packages, importance of CLASSPATH and java. Lang package.

Exception handling: importance of try, catch, throw, throws and finally block, user- defined exceptions, Assertions.

Multithreading: Introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. File Handling: Reading data from files and writing data to files, random access file.

UNIT - IV:

Event Handling: Events, Event sources, Event classes, Event Listeners, Event Delegation model, handling mouse and key board events, Adapter classes, inner classes.

AWT: Class hierarchy, user- interface components- labels, button, canvas, scrollbars, text components, checkbox, checkbox groups, choices, list panes-scroll pane, dialogs, menu bar, graphics, layout manager- layout manager types- boarder, grid, flow, card and grid bag.

UNIT - V:

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameter stoapplets.

Swings: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing– JApplet, JFrame and J Component, I consand Labels, text fields, buttons-The J Button class, Check boxes, Radio Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees and Tables

TEXTBOOKS:

1. Herbert Schildt —Java The Complete Reference, 11th Edition, McGraw-Hill Education.
2. E Balagurusamy —Programming with Java: A Primer, 4th Ed, Tata McGraw Hill Education Pvt Ltd

REFERENCES:

1. Java Programming, K. Rajkumar. Pearson
2. Core Java, Black Book, R Nageswararao, Wiley, Dream Tech
3. Core Java for Beginners, Rashmi Kanta Das,vikas.
4. Object Oriented Programming Through java, P. Radha Krishna, Universities Press.
5. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

B. TECH III SEMESTER

	L	T	P	C
PCC	3	0	0	3

20AD3T03 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- Understand the basic database concepts, applications, schema and various models
- Familiarize with entity relation model for a data base and write queries using SQL
- Emphasize the importance of normalization, transaction management and concurrency control in databases.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models.

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT - I:

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT - II:

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT – III:

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL

UNIT – IV:

Schema Refinement (Normalization): Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies

UNIT - V:

Transaction Management and Concurrency Control: Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency Control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL” by Shashan k Tiwari, 2011, WROX Press

REFERENCES:

1. Peter Rob & Carlos Coronel, “Data base Systems design, Implementation, and Management”, 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, “Data base System Concepts”, 6th Edition, McGraw Hill, 2010.
3. Elmasri Navathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
4. C.J.Date, “Introduction to Database Systems”, 7th Edition, Pearson Education,2002

B. TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20AD3T04 INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Course Objective:

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

Course Outcomes: At the end of the course, student will be able to

CO1: Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem

CO2: Apply the language/framework of different AI methods for a given problem.

CO3: Implement basic AI algorithms- standard search algorithms or dynamic programming

CO4: Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

SYLLABUS

Unit-I:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

Unit-II:

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games

Unit-III:

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

Unit-IV:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames. Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

Unit-V:

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory. Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
2. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI.
3. Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA.

E-RESOURCES:

1. https://nptel.ac.in
2. http://aima.cs.berkeley.edu/

B. TECH III SEMESTER

	L	T	P	C
PCC	3	0	0	3

20AD3T05 OPERATING SYSTEMS

Course Objectives:

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes:

CO1: Understand the importance, functions and structures of operating systems

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

SYLLABUS

UNIT-I:

Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication

UNIT–II:

Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multi threading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT–III:

Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures

UNIT–IV:

Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock-Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Deadlock

UNIT–V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling.

TEXT BOOKS:

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley,9thedition.(Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6thedition–2005.(Unit-5).

REFERENCES:

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley, Operating Systems: A Design-Oriented Approach, Tata Mc Graw HillEducation, 1996.

B. TECH III SEMESTER

	L	T	P	C
PCC	0	0	3	1.5

20AD3L06 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Objectives:

- Understand fundamentals of Object-Oriented Programming in java including defining classes, invoking methods using class libraries etc.,
- Demonstrate an understanding of graphical user interfaces, multi-threaded programming and event driven programming.

Course Outcomes: At the end of the course, the students will be able to:

CO1: Implement java applications using OOP principles and proper program structuring.

CO2: Develop java programs using packages, inheritance and interfaces

CO3: Implement error and exception handling techniques

CO4: Design event driven GUI and real-time web related applications.

SYLLABUS

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise –2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort

d) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3 (Class, Objects)

Implement java programs using the concept of

a) Class mechanism. Create a class, methods and invoke them inside main method.

b) Constructor. c) Construct or over loading. d) Method overloading

Exercise -4 (Inheritance) Implement java programs using the concept of

a) Single Inheritance b) Multilevel Inheritance c) Abstract class

Exercise - 5 (Inheritance - Continued) Implement java programs using the concept of

a) "super" keyword. b) Interfaces

Exercise – 6 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

Exercise – 7 (Exception)

Implement the programs by using the concepts of

a) Exception handling mechanism b) Multiple catch clauses
c) Finally d) Creating user defined exceptions

Exercise – 8 (Threads)

a) Write a JAVA program that creates threads by extending Thread class. First thread displays "Good Morning" every 1 sec, the second thread displays "Hello" every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)
b) Write a program illustrating is Alive and join()
c) Write a Program illustrating Daemon Threads.

Exercise – 9 (Packages)

a) Create a user defined package and demonstrate different ways of importing packages

Exercise - 10 (Applet)

a) Write a JAVA program to paint like paint brush in applet.
d) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise -11 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

B. TECH III SEMESTER

	L	T	P	C
PCC	0	0	3	1.5

20AD3L07 DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives:

- Populate and query a database using SQL-DDL/DML `commands.
- Understand various advanced query executions such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.
- Develop solutions using PL/SQL for database applications using procedures, cursors and triggers.

Course Outcomes:

CO1: Design database schema for a given application and apply normalization.

CO2: Acquire skills in using SQL commands for data definition and data manipulation.

CO3: Develop solutions for database applications using procedures, cursors and triggers

CO4: Develop solutions using PL/SQL procedures.

LIST OF EXPERIMENTS

1. Introduction to SQL: DDL, DML, DCL,TCL.
2. Queries for Creating Tables with Constraints, Views.
3. Example SQL Queries using select.
4. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN).
5. Queries using Group By, Order By, and Having Clauses and Working with Index, Sequence, Synonym.
6. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.
7. Queries on Joins and Correlated Sub-Queries.
8. Write a PL/SQL Code using Basic Variable, Anchored declarations, and Usage of Assignment Operation.
9. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL.
10. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
11. Write a PL/SQL Code using Cursors, Exceptions and Triggers.
12. Write a PL/SQL Code using Procedures, Functions, and Packages

Text Books:

1. ORACLE PL/SQL by example, Benjamin Rosen Zweig, Elena Silvestrova, Pearson.
2. ORACLE database log PL/SQL programming SCOTT URMAN, TMH.
3. SQL and PL/SQL for ORACLE10g, Black Book, Dr.P.S Deshpande.
4. Data Base Management System, Oracle SQL and PL/SQL, Pranab Kumar Das Gupta, P Radha Krishna, PHI

B.TECH III SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20AD3L08 UNIX AND SHELL PROGRAMMING LAB

Pre-Requisite:

Familiarity with the Unix/Linux command line and running simple commands

Course Objective:

Upon successful completion of this Lab the student will be able to

- Demonstrate how to use the following Bourne Shell commands: cat, grep, ls, more, ps, chmod, finger, ftp, etc.
- Use the following Bourne Shell constructs: test, if then, if then else, if then elif, for, while, until, and case.
- Learn tracing mechanisms (for debugging), user variables, Bourne Shell variables, read-only variables, positional parameters, reading input to a Bourne Shell script, command substitution, comments, and exporting variables. In addition, test on numeric values, test on file type, and test on character strings are covered.
- Copy, move, and delete files and directories
- Write moderately complex Shell scripts.
- Make a Shell script executable.
- Create a ".profile" script to customize the user environment.
- Use advanced features of File Transfer Protocol (FTP)
- Compile source code into object and executable modules.
- Execute programs written in c under UNIX environment.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand and usage of vi editor, file operations commands

CO2: Apply UNIX commands for File handling mechanism and illustrate the changing of File permissions and ownership

CO3: Analyze a given problem and apply requisite facets of Shell programming in order to devise a shell script to solve the problem

CO4: Develop various tasks by using Shell Scripting

CO5: Able to understand the various UNIX Commands

LIST OF EXPERIMENTS

Exercise1:

a) Log in to the system
b) Use Vi editor to create a file called myfile.txt which contains some text.
c) Correct typing errors during creation
d) Save the file
e) Logout of the file.

Exercise2:

a) Log into the system
b) Open the file created in session 1
c) Add some text
d) Change some text
e) Delete some text
f) Save the changes
g) Logout of the system

Exercise 3:

a) log into the system
b) Use the cat command to create a file containing the following data. Call it mutable use tabs to separate the fields

   1425 Ravi 15.65
   4320 Ramu 26.27
   6830 Sita 36.15
   1450 Raju 21.86

c) Use the cat command to display the file, my table
d) Use the vi command to correct any errors in the file, my table
e) Use the sort command to sort the file my table according to the first field. Call the sorted file my table (same name)
f) Print the file my table
g) Use the cut & paste commands to swap fields 2 and 3 my table. Call it my table (same name)
h) Print the new file, my table
i) Logout of the system

Exercise4:

a) Log in the system
b) Use the appropriate commands to determine ur login shell
c) Use the /etc/passwd file to verify the result of step b.
d) Uses the who command redirect the result to a file called myfile1.Use the more command to see the contents of myfile1.
e) Use the date and who commands in sequence ?(in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called my file2.Use the more command to check the contents of myfile2.
f) Write a sed command that deletes the first character in each line in a file
g) Write a sed command that deletes the character before the last character in each line in a file.

h) Write a sed command that swaps the files and second words in each line in a file.

Exercise5:

a) pipe ur /etc/passwd file to awk and print out the home directory of each user.
b) Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word
c) Repeat
d) Part using awk

Exercise6:

a) Write A shell script that takes a command –line argument and reports on whether it is directory, a file, or something else
b) Write a shell script that accepts one or more file name as a arguments and converts all of them to uppercase, provided they exist in the current directory
c) Write a shell script that determines the period for which a specified user is working on the system

Exercise 7:

a) Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers
b) Write a shell script that deletes all lines containing a specified word I one or more files supplied as arguments to it

Exercise8:

a) Write a shell script that computes the gross salary of a employee according to the following rules:
   i) If basic salary is <1500 then HRA=10% of the basic and DA =90% of the basic
   ii) If basic salary is >=1500 then HRA=Rs500 and DA =98% of the basic
   The basic salary is entered interactively through the key board
b) Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number

Exercise9:

a) Write an interactive file handling shell program. Let it offer the user the choice of copying, removing, renaming or linking files. Once the use has made a choice, have the program ask the user for necessary information, such as the file name, new name and so on.
b) Write a shell script that takes a login name as command –line argument and

reports when that person logs in

c) Write a shell script which receives two files names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted

Exercise10:

a) Write a shell script that displays a list of all files in the current directory to which the user has read write and execute permissions

b) Develop an interactive script that asks for a word and file name and then tells how many times that word occurred in the file.

c) Write a shell script to perform the following string operations:

i) To extract a sub string from a given string

ii) To find the length of a given string

Exercise11:

a) Write a C program that takes one or more file or directory names as command line input and reports the following information on the file:

i) file type ii) number of links iii) read, write and execute permissions

iv) time of last access (Note: use /fstat system calls)

Exercise12:

a) Write C program that simulate the following UNIX commands:

i) mv ii) cp

Exercise13:

a) Write a C program that simulates ls command

(Use system calls /directory API)

TEXT BOOKS:

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M. G. Venkateshmurthy, Pearson.

REFERENCE BOOKS:

1. Unix and shell programming by B.M. Harwani, OXFORD university press.

B. TECH III SEMESTER	**SC**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

20AD3S09 DATA ANALYSIS AND VISUALIZATION WITH PYTHON

(Skill Oriented Course)

Pre-Requisite: Python Programming

Course Objectives:

- To acquire programming skills in Python package NumPy and perform mathematical and statistical operations.
- To understand the fundamentals of the Pandas library in Python and how it is used to handle data and also develop basic skills in data analysis and visualization

Course Outcomes:

By the end of this lab the student is able to

CO1: Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems.

CO2: Understand how to apply some linear algebra operations to n-dimensional arrays.

CO3: Use Pandas to create and manipulate data structures like Series and Data Frames

CO4: Work with visualization of data frames

LIST OF EXPERIMENTS

1. NumPy Basics (np.array, np.arrange, np.linespace, np.zeros, np.ones, np.random.random, np.empty)
2. Arrays (array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
3. Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
4. Mathematical Operations(np.add, np.substract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations(np.mean, np.median, np.std, array.corrcoef( ))
5. NumPy Linear Algebra Operations(norm,eigen values and vectors, determinant of a matrix, sum of diagonal elements, inner product, matrix decomposition etc..)

6. Pandas DataFrames: Consider Sample Python dictionary data and list labels: exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'], 'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19], 'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1], 'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']} labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']

   a. Write a Pandas program to create and display a DataFrame from a specified dictionary

   data which has the index labels.

   b. Write a Pandas program to change the name 'James' to 'Suresh' in name column of the

   DataFrame.

   c. Write a Pandas program to insert a new column in existing DataFrame.

   d. Write a Pandas program to get list from DataFrame column headers.

   e. Write a Pandas program to get list from DataFrame column headers.

7. Pandas Index:

   a. Write a Pandas program to display the default index and set a column as an Index in a given dataframe.

   b. Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a given dataframe.

8. Pandas Joining and merging DataFrame:

   a. Write a Pandas program to join the two given dataframes along rows and assign all data.

   b. Write a Pandas program to append a list of dictionaries or series to a existing

   DataFrame and display the combined data.

   c. Write a Pandas program to join the two dataframes with matching records from both

   sides where available.

9. Excel:

   a. Write a Pandas program to import excel data into a Pandas dataframe.

   b. Write a Pandas program to find the sum, mean, max, min value of a column of file.

10. Pandas Library: Visualization: Write a program which use pandas inbuilt visualization to plot following graphs:

    i. Bar plots ii. Histograms iii. Line plots iv. Scatter plots

B.TECH III SEMESTER

	L	T	P	C
MC	2	-	-	-

20AD3M10 CONSTITUTION OF INDIA

COURSE OBJECTIVES:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

COURSE OUTCOMES:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand historical background of the constitution making, importance for building a democratic India, features and principles of Indian Constitution.

CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO3: Understand the roles and powers of State Government and its Administration and value of the fundamental rights and duties for becoming good citizen of India.

CO4: Understand and analyze the decentralization of power between Union, State and Local self-Government and local administration.

CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission, UPSC, Welfare commissions for sustaining democracy.

SYLLABUS

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution -Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

UNIT III

State Government and its Administration Governor, Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV

Local Administration, District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy(Different departments),Village level, Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V

Election Commission: Election Commission, Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government &Politics
4. D.C. Gupta, Indian Government and Politics
5. H. M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. NewDelhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press2012

E-sources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

B. TECH IV SEMESTER

BSC	L	T	P	C
	3	0	0	3

20AD4T01 PROBABILITY AND STATISTICS

Course Objectives:

- Computation of expectation and variance for probability distributions of a random variable
- Description of sampling, distribution of means, proportions &variances
- Knowledge of different distributions to test statistical hypothesis.

Course Outcomes:

By the end of the course students will be able to

CO1: Understand random variables and discrete probability distributions

CO2: Determine probabilities based on practical situations using the normal distributions.

CO3: Apply different distributions to compute confidence intervals.

CO4: Test the hypothesis concerning means and proportions.

CO5: Understand the concept of least square estimation linear regression

SYLLABUS:

UNIT-I: Discrete Random Variables and Distributions:

Introduction-Random variables- Discrete Random Variable-Distribution function-Expectation-Moment Generating Function-Moments and properties. Discrete distributions: Binomial and Poisson distributions.

UNIT-II: Continuous Random Variable and Distributions:

Introduction-Continuous Random Variable-Distribution function- Expectation-Moment Generating Function-Moments and properties. Continuous distribution: Normal distributions, Normal approximation to Binomial distribution.

UNIT-III: Sampling Theory:

Introduction - Population and samples- Sampling distribution of means (s known)-Central limit theorem- t-distribution- Sampling distribution of means (s unknown)-Sampling, distribution of variances, Point estimation- Maximum error of estimate - Interval estimation

UNIT-IV: Tests of Hypothesis:

Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors–Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences- ANOVA for one-way and two-way classified data.

UNIT-V: Regression Analysis:

The method of Lease squares, Curvilinear Regression, Multiple regression, Correlation.

TEXT BOOKS:

1. Richards A Johnson, Irvin Miller and Johnson E Freund. Probability and Statistics for Engineering, 9th Edition, PHI.
2. Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th edition, Cengage.

REFERENCES:

1. Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson2007.
2. William Menden Hall, Robert J. Bever and Barbara Bever, Introduction to probability and statistics, Cengage learning, 2009.

B. TECH IV SEMESTER	ESC	L	T	P	C
		3	0	0	3

20AD4T02 DISCRETE MATHEMATICAL STRUCTURES

Course Objectives:

- The validity or the strength of any particular argument or reasoning
- Knowledge of the theory of relations and functions
- Knowledge of types of graphs to apply in real life problems.

Course Outcomes:

By the end of this course the student will be able to

CO1: Apply mathematical logic to design new programming languages.

CO2: Illustratethepropertiesofsetsandfunctionstodesignamodelingsoftware system.

CO3: Explain a structure of an algebra which is useful to understand the theory of sequential machines, formal languages and coding theory.

CO4: Apply the techniques of recursion for representing the data in the analysis of Algorithms

CO5: Provide the knowledge of graphs such as trees which is useful in maintaining files and directories by Operating Systems

SYLLABUS

UNIT - I: Mathematical Logic:

Introduction, Statements and Notation, Connectives and Truth tables, Normal forms, Theory of inference for Statement Calculus, The Predicate Calculus, Inference theory of Predicate calculus.

UNIT - II: Set Theory & Functions:

Introduction, Basic concepts of set theory, Principle of Inclusion and Exclusion, Properties of Binary relations, Relation matrix and Digraph, operations on relations, Partition and covering, Transitive closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, Bijective functions, Inverse functions, Composition of functions, Recursive functions, Pigeonhole principle and its applications.

UNIT – III: Algebraic Structures & Number Theory:

Algebraic systems and examples, general properties, semigroup, monoid, groups and subgroups. Properties of integers, Division algorithm, Greatest common divisor, Euclidean algorithm (without proof), Least common multiple, testing of prime numbers, The fundamental theorem of Arithmetic, Fermat's theorem and Euler's theorem (without proofs) and its applications.

UNIT - IV: Recurrence Relations:

Recurrence Relations: Recurrence relations, solving recurrence relations by substitution, the method of characteristic roots, Solutions of Inhomogeneous recurrence relations.

UNIT - V: Graph Theory:

Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Coloring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

TEXTBOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Mathematical Foundation for Computer science, S. Santha, E.V. Prasad, Cengage publications

REFERENCES:

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata Mc Graw Hill.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby, Sharon Cutler Ross, PHI.

B. TECH IV SEMESTER

PCC	L	T	P	C
	3	0	0	3

20AD4T03 DESIGN AND ANALYSIS OF ALGORITHMS

Pre-requisite: Data structures, Basic knowledge of programming and mathematics

Course Objectives:

- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
- To introduce the different algorithmic approaches for problem solving through numerous example problems.
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes:

At the end of the course, student will be able to

CO1: Describe asymptotic notation used for denoting performance of algorithms.

CO2: Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms.

CO3: List and describe various algorithmic approaches.

CO4: Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches.

CO5: Apply graph search algorithms to real world problems.

SYLLABUS

UNIT-I:

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Randomized Algorithms.

Sets & Disjoint set union: introduction, union and find operations.

Basic Traversal & Search Techniques: Techniques for Graphs, connected components and Spanning Trees, Bi-connected components and DFS.

UNIT-II:

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.

The Greedy Method: The general Method, container loading, knapsack problem, Job sequencing with deadlines, minimum-cost spanning Trees.

UNIT-III:

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, single-source shortest paths: general weights, optimal Binary search trees, 0/1 knapsack, reliability Design, The traveling salesperson problem.

UNIT-IV:

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

Branch and Bound: FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Traveling salesperson problem.

UNIT-V:

NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem. String Matching: Introduction, String Matching-Meaning and Application, NaÏve String Matching Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Automata, Tries, Suffix Tree.

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press

REFERENCE BOOKS:

1. Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2008**.**
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

B. TECH IV SEMESTER		L	T	P	C
	PCC	3	0	0	3

20AD4T04 FOUNDATIONS OF DATA SCIENCE

Course Objectives:

- This **course** explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists.
- You'll explore data visualization, graph databases, the use of NoSQL, and the data science process.
- You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale

Course Outcomes:

At the end of the course, student will be able to

CO1: Enumerate the Basic Concepts of Web & Markup Languages
CO2: Develop web Applications using Scripting Languages & Frameworks
CO3: Make use of Express JS and Node JS frameworks
CO4: Illustrate the uses of web services concepts like restful, React JS
CO5: Apply Deployment Techniques & Working with cloud platform

SYLLABUS

UNIT-I:

Data Science in a Big Data World: Benefits and uses of data science and big data, Facets of data, The data science process, The big data eco system and data science, An introductory working example of Hadoop.

UNIT-II:

The data science process: Overview of the data science process, Step 1: Defining research goals and creating a project charter, Step 2: Retrieving data, Step 3: Cleansing, integrating, and transforming data, Step 4: Exploratory data analysis, Step 5: Build the models, Step 6: Presenting findings and building applications on top of them.

Machine Learning: What is machine learning and why should you care about it?, The modeling process, Types of machine learning, Semi-supervised learning.

UNIT-III:

Handling large data on a single computer: The problems you face when handling large data, General techniques for handling large volumes of data, General programming tips for dealing with large data sets, Case study 1: Predicting malicious URLs, Case study 2: Building a recommender system inside a database.

UNIT-IV:

First steps in big data: Distributing data storage and processing with frameworks, Case study: Assessing risk when loaning money,

Join the NoSQL movement: Introduction to NoSQL, ACID: the core principle of relational databases, CAP Theorem: the problem with DBs on many nodes, The BASE principles of NoSQL databases, NoSQL database types, Case study: What disease is that?

UNIT-V:

The rise of graph databases: Introducing connected data and graph databases, Introducing Neo4j: a graph database, Connected data example: a recipe recommendation engine,

Text mining and text analytics: Text mining in the real world, Text mining techniques, Case study: Classifying Reddit posts.

TEXT BOOKS:

1. Introducing Data Science by Davy Cielen, Arno D. B. Meysman, and Mohamed Ali.

B. TECH IV SEMESTER

	L	T	P	C
HSMC	3	0	0	3

20AD4T05 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives:

- The Learning objectives of this course are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost- Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product.
CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
CO3: The pupilis also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

SYLLABUS

UNIT–I: Introduction to Managerial Economics and demand Analysis

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT–II: Theories of Production and Cost Analyses:

Theories of Production function- Law of Variable Proportions - Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scaleand Economies of scale- Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –

Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT –III: Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles: Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company–State/Public Enterprises and their forms.

UNIT – IV: Introduction to Accounting & Financing Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis(Problems).

UNIT – V: Capital and Capital Budgeting:

Meaning of Capital- Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index).

TEXT BOOKS:

1. A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:

1. Varshney R. L, K. L Maheswari, Managerial Economics, S. Chand & CompanyLtd.
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. Sakthivel Murugan, Accounting for Management, S. Chand & Company Ltd.
4. Maheswari S. N ,An Introduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I. M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand &Company Ltd.
7.

B. TECH IV SEMESTER

PCC	L	T	P	C
	0	0	3	1.5

20AD4L06 R PROGRAMMING LAB

Course Outcomes:

CO1: Understand the use of operators in R

CO2: Use Data Structures to implement programs in R.

CO3: Implement Mathematical functions in R

CO4: Understand reading and writing files

CO5: Analyze data from various sources

LAB EXPERIMENTS

Exercise 1: Implement programs in R to work with different types of operators

Exercise 2: Implement programs in R with data structures

Exercise 3: Implement programs in R using the concept of functions

Exercise 4: Working with simulation inR

Math

functions

Calculus

Linear algebraic

operations Set operations

Exercise 5: Reading in your own data

Working with files

Accessing the keyboard and monitor

Exercise 6: Data visualization

Charts and plots

Exercise 7:

a) Program to implement simple and multiple linear regression.

b) Program to implement non- linear regression.

Exercise8:

a) Program to implement logistic regression.

Exercise9:

a) Program to perform ANOVA test (one-way, two way)

B. TECH IV SEMESTER

PCC	L	T	P	C
	0	0	3	1.5

20AD4L07 DATA SCIENCE LAB

COURSE OBJECTIVE:

- To understand the basis python libraries (Math and Statistics) used for mathematical calculations
- To understand data preprocessing and analysis using Pandas library
- To understand data visualization in the form of 2D graphs and plots using Matplotlib library
- To understand the concept of simple linear and multiple linear regression on actual data to do prediction

COURSE OUTCOMES:

CO1: Understand modern notions in predictive data analysis
CO2: Select data, model selection, model complexity and identify the trends
CO3: Understand a range of machine learning algorithms along with their strengths and weaknesses
CO4: Build predictive models from data and analyze their performance

LIST OF LAB EXPERIMENTS

1. Write a python program to compute
    a) Central Tendency Measures: Mean, Median, Mode
    b) Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset

B. TECH IV SEMESTER

PCC	L	T	P	C
	0	0	3	1.5

20AD4L08 DESIGN AND ANALYSIS OF ALGORITHMS LAB

Prerequisites: Any Programming Language

Course Outcomes:

This course will enable students to,

- Employ various design strategies for problem solving.
- Measure and compare the performance of different algorithms.

Course Outcomes:

The students should be able to

CO1: Design algorithms using appropriate design techniques (brute-force, greedy, Dynamic programming, etc.).

CO2: Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language.

CO3: Apply and implement learned algorithm design techniques and data structures to solve real world problems

CO4: Analyze and compare the performance of algorithms using language feature

LIST OF LAB EXPERIMENTS

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator
2. Implement a Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted .The elements can be read from a file or can be generated using the random number generator.
3. A) Obtain the Topological ordering of vertices in a given digraph.
   B) Compute the transitive closure of a given directed graph using Warshall's algorithm
4. Implement 0/1 Knapsack problem using Dynamic Programming
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra's algorithm
6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm

7. A) Print all the nodes reachable from a given starting node in a digraph using BFS method.

   B) Check whether a given graph is connected or not using DFS method
8. Find a subset of a given set S = {s1, s2,....., sN} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution
9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation
10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm
11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm
12. Implement N Queen's problem using Back Tracking

B. TECH IV SEMESTER	**SC**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

20AD4S09 BASIC WEB PROGRAMMING
(Skill Oriented Course)

Course Objectives:

- To acquire skills in developing web pages.
- To understand the use of HTML and CSS in designing web pages
- To gain knowledge on Java Script for performing validations.

Course Outcomes:

By the end of this lab the student is able to

CO1: Understand and use various HTML Tags and apply CSS.

CO2: Develop websites that include static pages.

CO3: Design Front end for Web Applications

LIST OF EXPERIMENTS:

1. Exercises to demonstrate the use of Basic HTML tags.
2. Exercises to demonstrate Tables, Lists and Forms
3. Implement forms using HTML Frames and CSS
4. Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, lines and words in the text enter educing an alert message. Words are separated with white space and lines are separated with new line character.
5. Write an HTML page that contains a selection box with a list of 5 countries In the above page when the user selects a country, its capital should be printed next to the list, and add CSS to customize the properties of the font of the capital.
6. Create a website using the HTML and CSS to create your personal portfolio.
7. Create a website using HTML and CSS for a Book Store.
8. Write a JavaScript to design a simple calculator to perform the operations: sum, product, difference and quotient
9. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in HTML table format.

10. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.
11. Demonstrate the Login page with user id and password validations.
12. Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:
    a) Parameter: A string Output: The position in the string of the left-most vowel
    b) Parameter: A number Output: The number with its digits in the reverse order
13. Write an HTML page with Java script that takes a number from one text field in the range 0-999 and display it in other text field in words. If the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box.

B.TECH MINOR

MN	L	T	P	C
	3	1	0	4

20ADMN01 INTRODUCTION TO DATA SCIENCE
(Minor Engineering Course)

Course Objectives:

The objective of this course is to explain the relevant parts of statistics, computer science, and machine learning that are crucial to data science. Data science draws on tools from the empirical sciences, statistics, reporting, analytics, visualization, business intelligence, expert systems, machine learning, databases, data warehousing, data mining, and big data. The goal is to present data science from a pragmatic, practice-oriented viewpoint.

Course Outcomes: By the end of the course the student will be able to

CO1: Understand roles and stages of data science project

CO2: Loading different data sets into R environment.

CO3: Visualize the data using graphs

CO4: Learn data preprocessing using R

CO5: Mapping various business problems to machine learning tasks

SYLLABUS

UNIT-I: Introduction to Data Science:

The data science process, the roles in a data science project, Stages of a data science project, setting expectations, Summary.

UNIT-II: Loading data into R:

Working with data from files, working with well-structured data from files or URLs, Using R on less-structured data, Working with relational databases, A production-size example, Loading data from a database into R, Working with the PUMS data

UNIT-III: Exploring Data:

Using summary statistics to spot problems, Typical problems revealed by data summaries, Spotting problems using graphics and visualization, Visually checking distributions for a single variable, Visually checking relationships between two variables.

UNIT-IV: Managing data:

Cleaning data, Treating missing values (nas), Data transformations, Sampling for modeling and validation, Test and training splits, Creating a sample group column, Record grouping, Data provenance.

UNIT-V: Modeling methods:

Choosing and evaluating models, Mapping problems to machine learning tasks, Solving classification problems, Solving scoring problems, Working without known targets, Problem-to-method mapping, Evaluating models, Evaluating classification models, Evaluating scoring models, Evaluating probability models, Evaluating ranking models, Evaluating clustering models

Validating models, Identifying common model problems, Quantifying model soundness, Ensuring model quality.

TEXT BOOKS:

1. Practical Data Science with R by NINA ZUMEL JOHN MOUNT

REFERENCE:

1. Data Science from Scratch: First Principles with Python by Joel Grus
2. Data Science for Dummies is a book by Lillian Pierson

B.TECH MINOR

MN	L	T	P	C
	3	1	0	4

20ADMN02 INTRODUCTION TO MACHINE LEARNING
(Minor Engineering Course)

Course Objective:

- To understand the need for machine learning for various problem solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To understand the latest trends in machine learning
- To design appropriate machine learning algorithms for problem solving

Course Outcomes: At the end of the course, student will be able to:

CO1: Differentiate between supervised, unsupervised, semi-supervised machine learning approaches

CO2: Discuss the decision tree algorithm and indentity and overcome the problem of over fitting**.**

CO3: Discuss and apply the back propagation algorithm and genetic algorithms to various problems

CO4: Apply the Bayesian concepts to machine learning

CO5: Analyze and suggest appropriate machine learning approaches for various types of problems

SYLLABUS

Unit-I: **INTRODUCTION:**

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

Unit-II: **NEURAL NETWORKS AND GENETIC ALGORITHMS**:

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms –Advanced Topics in ANN, Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

Unit-III: **BAYESIAN AND COMPUTATIONAL LEARNING**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes

Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model

Unit-IV: INSTANT BASED LEARNING:

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

Unit-V: ADVANCED LEARNING

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning.

TEXT BOOKS:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES:

1. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and
   Machine Learning), The MIT Press 2004.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
COURSE STRUCTURE
B. TECH I SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AM1T01	BSC	Linear Algebra and Differential Equations	3	-	-	3	3
2	20AM1T02	BSC	Applied Chemistry	3	-	-	3	3
3	20AM1T03	HSMC	English	3	-	-	3	3
4	20AM1L04	ESC	Computer Engineering Workshop	1	-	4	3	3
5	20AM1T05	ESC	Problem Solving through C	3	-	-	3	3
6	20AM1L06	HSMC	English Communication Skills Lab	-	-	3	3	1.5
7	20AM1L07	BSC	Applied Chemistry Lab	-	-	3	3	1.5
8	20AM1L08	ESC	Problem Solving through C Lab	-	-	3	3	1.
9	20AM1M09	MC	Environmental Science	2	-	-	2	-
Total number of credits								19.5

B. TECH II SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AM2T01	BSC	Transform Techniques	3	_	_	3	3
2	20AM2T02	BSC	Applied Physics	3	_	_	3	3
3	20AM2T03	ESC	Computer organization	3	_	_	3	3
4	20AM2T04	ESC	Data Structures	3	_	_	3	3
5	20AM2T05	ESC	Python Programming	3	_	_	3	3
6	20AM2L06	BSC	Applied Physics Lab	_	_	3	3	1.5
7	20AM2L07	ESC	Data Structures Lab	_	_	3	3	1.5
8	20AM2L08	ESC	Python Programming Lab	_	_	3	3	1.5
Total number of credits								**19.5**

B. TECH III SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AM3T01	BSC	Numerical Methods & Vector Calculus	3	-	-	3	3
2	20AM3T02	PCC	Introduction to Artificial Intelligence	3	-	-	3	3
3	20AM3T03	PCC	Object Oriented Programming through Java	3	-	-	3	3
4	20AM3T04	PCC	Data Base Management Systems	3	-	-	3	3
5	20AM3T05	PCC	Operating Systems	3	-	-	3	3
6	20AM3L06	PCC	Object Oriented Programming through Java Lab	-	-	3	3	1.5
7	20AM3L07	PCC	Data Base Management Systems Lab	-	-	3	3	1.5
8	20AM3L08	PCC	UNIX and Shell programming Lab	-	-	3	3	1.5
9	20AM3S09	SC	Data analysis and visualization with python	-	-	4	4	2
10	20AM3M10	MC	Constitution of India	2	-	-	2	-
Total number of credits								**21.5**

B. TECH IV SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AM4T01	BSC	Probability and Statistics	3	-	-		3
2	20AM4T02	ESC	Discrete Mathematical Structures	3	-	-		3
3	20AM4T03	PCC	Design and Analysis of Algorithms	3	-	-		3
4	20AM4T04	PCC	Machine Learning	3	-	-		3
5	20AM4T05	HSMC	Managerial Economics and Financial Analysis	3	-	-		3
6	20AM4L06	ESC	R Programming Lab	-	-	3		1.5
7	20AM4L07	PCC	Machine Learning Using Python Lab	-	-	3		1.5
8	20AM4L08	PCC	Design and analysis of Algorithms Lab	-	-	3		1.5
9	20AM4S09	SC	Basic Web programming	-	-	4		2
Total number of credits								**21.5**
Internship 2 Months (Mandatory) during summer vacation								
Honors/Minor courses				4	0	0	-	4

B.TECH V SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AM5T01	PCC	Theory of Automata	3	0	0	3	3
2	20AM5T02	PCC	Data Warehousing & Mining	3	0	0	3	3
3	20AM5T03	PCC	Software Engineering	3	0	0	3	3
Program Elective-I				3	0	0	3	3
4	20AM5T04	PE-I	Computer Graphics					
5	20AM5T05		E-Commerce					
6	20AM5T06		Data Science and Visualization					
7	**Open Elective-I**			3	0	0	3	3
8	20AM5L08	PCC	CASE Tools Lab	0	0	3	3	1.5
9	20AM5L09	PCC	Data Warehousing and Mining Lab	0	0	3	3	1.5
10	20AM5S10	SC	Testing Tools Lab/Text Analytics Lab	0	0	4	4	2
11	20AM5M11	MC	Disaster Management	2	0	0	2	-
12	20AM5I12	I	Summer Internship	0	0	0	1.5	1.5
Total number of credits								**21.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VI SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20AM6T01	PCC	Deep Learning	3	0	0	3	3
2	20AM6T02	PCC	Computer Networks	3	0	0	3	3
3	20AM6T03	PCC	Big Data Analytics	3	0	0	3	3
Program Elective-II				3	0	0	3	3
4	20AM6T04	PE-II	MEAN Stack Technologies					
5	20AM6T05		Compiler Design					
6	20AM6T06		Software Architecture and Design patterns					
7	**Open Elective-II**			3	0	0	3	3
8	20AM6L08	PCC	Deep Learning Lab	0	0	3	3	1.5
9	20AM6L09	PCC	Computer Networks Lab	0	0	3	3	1.5
10	20AM6L10	PCC	BDA Lab	0	0	3	3	1.5
11	20AM6S11	SC	Soft Skills	0	0	4	4	2
12	20AM6M12	MC	Essence of Indian traditional knowledge	2	0	0	2	-
13	20AM6P13	P	Community Service Project	-	-	-	-	4
Total number of credits								**25.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
Program Elective-III				3	0	0	3	3
1	20AM7T01	PE-III	Cloud Computing					
2	20AM7T02		Natural Language Processing					
3	20AM7T03		Software Project Management					
Program Elective-IV				3	0	0	3	3
4	20AM7T04	PE-IV	Software Testing Methodologies					
5	20AM7T05		Information Security					
6	20AM7T06		Business Intelligence					
Program Elective-V				3	0	0	3	3
7	20AM7T07	PE-V	Soft Computing					
8	20AM7T08		Robotics and its Applications					
9	20AM7T09		Internet of Things					
10	**Open Elective-III**			3	0	0	3	3
11	**Open Elective-IV**			3	0	0	3	3
12	20AM5L12	HSMC	Universal Human Values Understanding Harmony	0	0	3	3	3
13	20AM5S13	SC	Data Visualization using Tableau	0	0	4	4	2
14	20AM5I14	I	Industrial Internship	-	-	-	-	3
Total number of credits								**23**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VIII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
2	20AM8P01	P	Project	0	0	0	-	8
Total number of credits								**8**

OPEN ELECTIVE –I:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE5T04	Architecture and Town Planning	3	0	0	3	CE
2	20CE5T05	Elements of Civil Engineering	3	0	0	3	CE
3	20EE5T04	Basics of Control Systems	3	0	0	3	EEE
4	20EE5T05	Special Electrical Machines	3	0	0	3	EEE
5	20ME5T04	Design Thinking & Product Innovation	3	0	0	3	ME
6	20ME5T05	Nanotechnology	3	0	0	3	ME
7	20EC5T04	Linear System Analysis	3	0	0	3	ECE
8	20EC5T05	Digital Logic Design	3	0	0	3	ECE
9	20EC5T06	Solid State Devices	3	0	0	3	ECE
10	20CS5T07	Introduction to Artificial Intelligence	3	0	0	3	CSE
11	20CS5T08	Operating Systems	3	0	0	3	CSE
12	20CS5T09	Software Engineering	3	0	0	3	CSE
13	20IT5T07	Computer Networks	3	0	0	3	IT
14	20IT5T08	Computer Graphics	3	0	0	3	IT
15	20HS5T02	Operations Research	3	0	0	3	BED
16	20MB5T01	Principles of Management	3	0	0	3	DMS
17	20MB5T02	Technology Management	3	0	0	3	DMS
18	20AD5T07	Foundations of Data Science	3	0	0	3	AIDS
19	20AM5T07	Introduction to Machine Learning	3	0	0	3	AIML

OPEN ELECTIVE –II:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE6T08	Remote Sensing and GIS	3	0	0	3	CE
2	20CE6T09	Environmental Impact Assessment	3	0	0	3	CE
3	20EE6T08	Renewable Energy Sources	3	0	0	3	EEE
4	20EE6T09	Energy Audit, Conservation and Management	3	0	0	3	EEE
5	20ME6T07	Industrial Robotics	3	0	0	3	ME
6	20ME6T08	Additive manufacturing	3	0	0	3	ME
7	20EC6T07	Electronic Circuits and Networks	3	0	0	3	ECE
8	20EC6T08	Principles of Communications	3	0	0	3	ECE

9	20EC6T09	Microcontrollers & its Applications	3	0	0	3	ECE
10	20CS6T07	Introduction to Machine Learning	3	0	0	3	CSE
11	20CS6T08	Information Security	3	0	0	3	CSE
12	20CS6T09	Agile Technologies	3	0	0	3	CSE
13	20IT6T07	Fundamentals of Machine Learning	3	0	0	3	IT
14	20IT6T08	Database Management Systems	3	0	0	3	IT
15	20HS6T02	Quantitative Aptitude and Reasoning	3	0	0	3	BED
16	20MB6T01	Organizational Behaviour	3	0	0	3	DMS
17	20MB6T02	Project Management	3	0	0	3	DMS
18	20AD6T07	Visual Analytics	3	0	0	3	AIDS
19	20AM6T07	Big data Analytics	3	0	0	3	AIML

OPEN ELECTIVE –III:

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CE7T13	Construction Technology and Management	3	0	0	3	CE
2	20CE7T14	Green Buildings	3	0	0	3	CE
3	20EE7T13	Concept of Power System Engineering	3	0	0	3	EEE
4	20EE7T14	Instrumentation	3	0	0	3	EEE
5	20ME7T10	Green Engineering Systems	3	0	0	3	ME
6	20ME7T11	Hybrid Electric Vehicles	3	0	0	3	ME
7	20EC7T10	Data Communications	3	0	0	3	ECE
8	20EC7T11	Mechatronics	3	0	0	3	ECE
9	20EC7T12	Bio Medical Instrumentation	3	0	0	3	ECE
10	20CS7T10	Artificial Neural Networks	3	0	0	3	CSE
11	20CS7T11	Cyber Security	3	0	0	3	CSE
12	20CS7T12	Software Testing Methodologies	3	0	0	3	CSE
13	20IT7T10	Internet of Things	3	0	0	3	IT
14	20IT7T11	Computer Vision	3	0	0	3	IT
15	20HS7T01	Fuzzy sets	3	0	0	3	BED
16	20MB7T01	Digital Media management	3	0	0	3	DMS
17	20MB7T02	Entrepreneurship Development	3	0	0	3	DMS
18	20AD7T10	Data Analysis and Visualization with Python	3	0	0	3	AIDS

19	20AM7T10	NoSQL Databases	3	0	0	3	AIML

OPEN ELECTIVE –IV:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE7T15	Waste water treatment	3	0	0	3	CE
2	20CE7T16	Repair and Rehabilitation of Concrete Structures	3	0	0	3	CE
3	20EE7T15	Power Quality	3	0	0	3	EEE
4	20EE7T16	Electric Vehicles	3	0	0	3	EEE
5	20ME7T12	Micro-Electro- Mechanical Systems	3	0	0	3	ME
6	20ME7T13	Solar Energy Systems	3	0	0	3	ME
7	20EC7T13	Introduction to Embedded Systems	3	0	0	3	ECE
8	20EC7T14	Internet of Things	3	0	0	3	ECE
9	20EC7T15	Analog and Digital IC applications	3	0	0	3	ECE
10	20CS7T13	Data Analytics	3	0	0	3	CSE
11	20CS7T14	Block Chain Technology	3	0	0	3	CSE
12	20CS7T15	Software Project Management	3	0	0	3	CSE
13	20IT7T13	Cloud Computing	3	0	0	3	IT
14	20IT7T14	Business Intelligence	3	0	0	3	IT
15	20HS7T02	Polymer Chemistry	3	0	0	3	BED
16	20MB7T03	Total Engineering Quality Management	3	0	0	3	DMS
17	20MB7T04	Stress Management	3	0	0	3	DMS
18	20AD7T11	Natural Language Processing	3	0	0	3	AIDS
19	20AM7T11	Deep Learning	3	0	0	3	AIML

HONORS/MINOR COURSES OFFERED BY THE DEPARTMENT

Honors/ Minor Course Fulfillments:

- The 20 additional credits need to be acquired, 16 credits can be earned by undergoing specified courses, with each carrying 4 credits.
- The remaining 4 credits must be acquired through two online MOOCs (SWAYAM /NPTEL), which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of Studies.
- Minor Engineering subjects are offered to other branches by AIML Department (except for AIML Students).
- Honors engineering subjects are offered to AIML Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (SWAYAM/NPTEL).

HONORS COURSES

S.No.	Course code	Course Name	L	T	P	C
		Pool-1				
1	20AMHN01	Introduction to cyber Security	3	1	0	4
2	20AMHN02	Computer Networks	3	1	0	4
3	20AMHN03	Distributed Systems	3	0	2	4
		Pool-2				
4	20AMHN05	Software Engineering	3	1	0	4
5	20AMHN06	Systems programming	3	1	0	4
6	20AMHN07	Social Network Analysis	3	1	0	4
		Pool-3				
7	20AMHN09	Case Tools	3	1	0	4
8	20AMHN10	Adhoc and Sensor Networks	3	1	0	4
9	20AMHN11	Parallel Computing	3	1	0	4
		Pool-4				
10	20AMHN13	Pattern Recognition	3	1	0	4
11	20AMHN14	Fault Tolerant Computing	3	1	0	4
12	20AMHN15	Data Centre Design and Management	3	1	0	4

MINOR COURSES

S.No.	Course code	Course Name	L	T	P	C	Offered by
1	20AMMN01	Foundation of Data Science	3	1	0	4	AIML
2	20AMMN02	Introduction to AI	3	1	0	4	AIML
3	20AMMN03	NOSQL Databases	3	1	0	4	AIML
4	20AMMN04	Social Network Analysis	3	1	0	4	AIML
5	20AMMN05	Natural Language Processing	3	1	0	4	AIML
6	20AMMN06	Robotic Process Automation	3	1	0	4	AIML
7	20AMMN07	MOOC1	-	-	-	2	AIML
8	20AMMN08	MOOC2	-	-	-	2	AIML

B.TECH I SEMESTER	BSC	L	T	P	C
		3	0	0	3

20AM1T01 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

Pre-requisite: Basic knowledge about matrices, differentiation and integration

Course Objective: Objective of the course is to impart

- Basic understanding of mathematical methods to solve simultaneous linear systems
- Understanding of formation and solutions of ordinary differential equations
- Knowing the mathematical methods to solve applications of differential equations

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the knowledge to solve a system of homogeneous and non homogeneous linear equations

CO2: Illustrate the methods of computing eigen values and eigen vectors

CO3: Able to analyze the real life situations, formulate the differential equations and then applying the methods

CO4: Determine the solutions of linear differential equations

CO5: Optimize functions of several variables and able to find extreme values of constrained functions

SYLLABUS

UNIT-I: Linear systems of equations:

Rank of a matrix, Echelon form, Normal form, PAQ is in normal form, linear dependence and independence of vectors, Consistency of linear system of equations, System of linear homogeneous equations, Gauss-elimination and Gauss -Jordan methods.

UNIT-II: Eigen values & Eigen vectors:

Eigen values, Eigen vectors, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), finding inverse and powers of a matrix using C-H theorem, Reduction to diagonal form, reduction of quadratic form to canonical form using orthogonal reduction, nature of quadratic forms.

UNIT-III: Ordinary Differential Equations of first order:

Linear equations, Bernoulli's equation, Exact differential equations. Equations reducible

to exact equations, **Applications:** Orthogonal Trajectories, Newton's Law of cooling, Rate of decay & growth, R-L series circuits.

UNIT-IV: Linear Differential Equations higher order:

Definitions, Complete solution (without proof), Operator D, Rules to find complementary function, Inverse operator, Rules to find the particular integral(nonhomogeneous term of the form e^{ax} , sin(ax+b), cos(ax+b), polynomials in x^m, e^{ax} V(x), any other function), Method of variation of parameters.

UNIT-V: Partial Differentiation:

Functions of two variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Jacobian and functional dependence, Taylor's theorem for functions of two variables. **Applications:** Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL**,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH I SEMESTER	BSC	L	T	P	C
		3	0	0	3

20AM1T02 APPLIED CHEMISTRY

Pre-requisite: Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the availableresources

Course Objective: Objective of the course is to impart

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of green chemistry and molecular switches

Course Outcomes: At the end of the course, student will be able to

CO1: Analyze the different types of composite plastic materials and interpret the mechanism ofconduction in conducting polymers.

CO2: Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning newengineering products and categorize the reasons for corrosion and study methods to control corrosion.

CO3: Synthesize nanomaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystalsand superconductors.

CO4: Design models for energy by different natural sources.
Analyze the principles of different analytical instruments and their applications.

CO5: Obtain the knowledge of green chemistry and molecular machines

SYLLABUS

UNIT-I: Polymer Technology

Polymerisation: Introduction, methods of polymerization (addition and Condensation), Physical and mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers: Natural rubber-Drawbacks-vulcanization, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics – GFRP and Aramid FRP

Conducting polymers: Intrinsic and extrinsic conducting polymers

Biodegradable polymers: preparation and applications

UNIT-II: Electrochemical Cells And Corrosion

Part I: ELECTROCHEMICAL CELLS: Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Part II: Corrosion: Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings (cathodic coatings, anodic coatings, electroplating and electroless plating)

UNIT-III: Material Chemistry

Part I: Non-elemental semiconducting materials: Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling technique) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Super conductors:-Type –I, Type II-characteristics and applications

Part II: Nano materials: Introduction, sol-gel method, characterization by (Brunauer Emmet Teller[BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals: Introduction-types-applications.

UNIT-IV: Non-Conventional Energy Sources & Spectroscopy

Part I: NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Part II: **SPECTROSCOPY**

UV spectroscopy- Basic principle-Instrumentation-Applications

IR spectroscopy- Basic principle-Instrumentation-Applications

NMR spectroscopy- Basic principle-Instrumentation-Applications

UNIT-V: Advanced Concepts/Topics In Chemistry

Part-I: Green chemistry: Introduction, Principles of green chemistry, Green synthesis-Aquaeous Phase method-Microwave method-Phase transfer catalysis method, R4M4 principles (Econoburette).

PART-II: Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid- base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor.

Text Books:

1. P.C. Jain and M. Jain “Engineering Chemistry”, 15/e, Dhanpat Rai & Sons, Delhi,(Latest edition).
2. Shikha Agarwal, “Engineering Chemistry”, Cambridge University Press, New Delhi,(2019).
3. S.S. Dara, “A Textbook of Engineering Chemistry”, S.Chand & Co, (2010).
4. Shashi Chawla, “Engineering Chemistry”, Dhanpat Rai Publicating Co. (Latest edition).

References:

1. K. Sesha Maheshwaramma and Mridula Chugh, “Engineering Chemistry”, Pearson India
2. O.G. Palana, “Engineering Chemistry”, Tata McGraw Hill Education Private Limited,(2009).
3. CNR Rao and JM Honig (Eds) “Preparation and characterization of materials” Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, “Textbook of Nanoscience and Nanotechnology”,University press (latest edition)

B.TECH I SEMESTER	**HSMC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20AM1T03 ENGLISH

Pre-requisite:

Course Objective:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: At the end of the course, student will be able to

CO1 understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information

CO2 ask and answer general questions on familiar topics

CO3 employ suitable strategies to master the art of letter writing and email writing

CO4 recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs

CO5 form sentences using proper grammatical structures and correct word forms

SYLLABUS

UNIT-I	A Drawer full of happiness (Detailed Study) Deliverance (Non-detailed Study)
UNIT-II	Nehru's letter to his daughter Indira on her birthday(Detailed Study) Bosom Friend (Non-detailed Study)
UNIT-III	Stephen Hawking-Positivity 'Benchmark' (Detailed Study) Shakespeare's Sister(Non-detailed Study)
UNIT-IV	Liking a Tree, Unbowed: Wangari Maathai-biography (Detailed Study)

Telephone Conversation(Non-detailed Study)

UNIT-V Stay Hungry-Stay foolish (Detailed Study)
Still I Rise(Non-detailed Study)

Text Books

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The Individual Society", Pearson Publications.(Non-detailed)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

		L	T	P	C
B.TECH I SEMESTER	**ESC**	**1**	**0**	**4**	**3**

20AM1L04 COMPUTER ENGIENERING WORKSHOP

Course Objectives:

Skills and knowledge provided by this subject are the following:

- **PC Hardware:** Identification of basic peripherals, Assembling a PC, Installation of system software like MS Windows, device drivers, etc. Troubleshooting of PC Hardware and Software issues.
- **Internet & World Wide Web:** Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber attacks.
- **Productivity Tools:** Understanding and practical approach of professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite office tools.

Course Outcomes:

CO1: Identify, assemble and update the components of a computer

CO2: Configure, evaluate and select hardware platforms for the implementation and execution of computer applications, services and systems

CO3: Make use of tools for converting pdf to word and vice versa

CO4: Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, HTML, LaTex

LIST OF EXERCISES

Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.

Task 2: Practicing disassembling and assembling components of a PC

Task 3: Installation of Device Drivers, MS Windows, Linux Operating systems and Disk Partitioning, dual boating with Windows and Linux.

Task 4: Introduction to Memory and Storage Devices, I/O Port, Assemblers, Compilers, Interpreters, Linkers and Loaders.

Task 5: Demonstration of Hardware and Software Troubleshooting

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DSL, and Dialup Connection.

Task 7: Surfing the Web using Web Browsers, Awareness of various threats on the Internet and its solutions, Search engines and usage of various search engines, Need of anti-virus, Installation of anti-virus, configuring personal firewall and windows update.

(Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and popup blockers)

Productivity Tools:

Task 8: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Task 9: Demonstration and Practice of various features of Microsoft Word

Assignment:

1. Create a project certificate.

2. Creating a news letter

Features to be covered:-Formatting Fonts, Paragraphs, Text effects, Spacing, Borders and Colors, Header and Footer, Date and Time option, tables, Images, Bullets and Numbering, Table of Content, Newspaper columns, Drawing toolbar and Word Art and Mail Merge in word etc.,

Task 10: Demonstration and Practice of various features Microsoft Excel

Assignment: 1. Creating a scheduler

2. Calculating GPA

3. Calculating Total, average of marks in various subjects and ranks of students

based on marks

Features to be covered:Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel, Charts, Renaming and Inserting worksheets, etc.,

Task 11: Demonstration and Practice of various features Microsoft Power Point

Features to be covered:Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks Tables and Charts, Master Layouts, Types of views, Inserting – Background, textures, Design Templates, etc.,

Task 12: Demonstration and Practice of various features LaTeX – document preparation, presentation (Features covered in Task 9 and Task 11 need to be explored in LaTex)

Task 13: Tools for converting word to pdf and pdf to word

Task 14: Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Reference Books:

1. Computer Fundamentals, Anita Goel, Pearson India Education, 2017

2. PC Hardware Trouble Shooting Made Easy, TMH

3. Introduction to Information Technology, ITL Education Solutions Limited, 2nd Edition, Pearson, 2020

4. Upgrading and Repairing PCs, 18th Edition, Scott Mueller, QUE, Pearson, 2008

5. LaTeX Companion – Leslie Lamport, PHI/Pearson

6. Introducing HTML5, Bruce Lawson, Remy Sharp, 2nd Edition, Pearson, 2012

7. Teach yourself HTML in 24 hours, By Techmedia

8. HTML 5 and CSS 3.0 to the Real World by Alexis Goldstein, Sitepoint publication.

9. Internet of Things, Technologies, Applications, Challenges and Solutions, B K Tripathy, J Anuradha, CRC Press

10. Comdex Information Technology Course Tool Kit, Vikas Gupta, Wiley Dreamtech.

11. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme, CISCO Press, Pearson Education.

12. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N. B. Venkateswarlu, S. Chand Publishers

B.TECH I SEMESTER	ESC	L	T	P	C
		3	0	0	3

20AM1T05 PROBLEM SOLVING THROUGH C

Pre-requisite:

Course Objective:

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor. To assimilate about File I/O and significance of functions

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of programming

CO2: Understand and Apply loop construct for a given problem

CO3: Demonstrate the use pointers

CO4: Understand the use of functions and develop modular reusable code

CO5: Understand File I/O operations

SYLLABUS

UNIT-I:

INTRODUCTION TO COMPUTERS: Functional Components of computer, computer software, categories of memory, types of programming languages, Development of algorithms, flow charts, software development process, Computer Numbering system

BASICS OF C PROGRAMMING: Introduction to programming paradigms, Structure of C program, Data Types, C Tokens, Operators: Precedence and Associativity, Expressions Input/output statements, Assignment statements

UNIT-II:

Decision making statements: if, if else, nester if. Multi way decision making statements: else if, Switch statement. **Loop statements**: while, do while, for, Compilation process.

UNIT-III:

Introduction to Arrays: Declaration, Initialization, One dimensional array, Example Programs on one dimensional array, Selection sort, linear and binary search, two

dimensional arrays, Matrix Operations, Multi-dimensional Arrays

Strings: Declaration, String operations: length, compare, concatenate, copy, String handling functions.

UNIT-IV:

FUNCTIONS: Introduction to functions: Function prototype, function definition, function call, Built-in functions, Recursion, Storage classes, Passing Arrays & Strings to the functions, Preprocessor directives

POINTERS: Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers, Parameter passing: Pass by value, Pass by reference, Dynamic Memory Allocation

UNIT-V:

STRUCTURES AND UNIONS: Structure, Nested structures, Pointer and Structures, Array of structures, Example Program using structures and pointers, Self-referential structures, Unions.

FILE PROCESSING: Files, Types of file processing: Sequential access, Random access, Sequential access file, Random access file, Command line arguments

Text Books:

1. Krnighan. B.W and Ritche, D.M, “The C Programming Language”, Second Edition, Pearson Education, 2006

2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.

References:

1. Pradepdey, Manas Ghosh, “Fundamentals of Computing and programming in C”, First Edition, Oxford University Press, 2009.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh Edition, Pearson Publication.
3. E Balagursamy, “Programming in C, Sixth Edition, Tata McGraw Hill.
4. Ajay Mittal, “Programming in C A practical Approach”, Pearson education

		L	T	P	C
B.TECH I SEMESTER	**HSMC**	**0**	**0**	**3**	**1.5**

20AM1L06 ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

- Facilitate effective usage of functional English through role plays
- Focus on vocabulary enhancement
- Foster various nuances of phonetics and accent neutralization

Course Outcomes: At the end of the course, student will be able to

CO1: Acquire basic proficiency in English by learning functional aspects of English language

CO2: Learn the methods of enhancing vocabulary

CO3: Acquaint himself/herself with nuances of Phonetics

LIST OF EXPERIMENTS

1 Greetings and Introductions
2 Requesting Permission & Giving Directions
3 Inviting/Complaining/Congratulating
4 Root Words
5 Phonetics-Sounds and Symbols
6 Pronunciation Rules

References:

1. Strengthen Your Steps, Maruti Publications
2. Interact, Orient Blackswan
3. Word Power Made Easy, Pocket Books

B.TECH I SEMESTER	BSC	L	T	P	C
		0	0	3	1.5

20AM1L07 APPLIED CHEMISTRY LAB

Pre-requisite: Acquire some experimental skills.

Course Objective: Objective of the course is to impart

- The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations.
- A few instrumental methods of chemical analysis.

Course Outcomes:

At the end of the course, student will be able to

CO1: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

LIST OF EXPERIMENTS

1. Determination of HCl using standard Na2CO3 solution.
2. Determination of alkalinity of a sample containing Na2CO3 and NaOH.
3. Determination of Mn+2 using standard oxalic acid solution.
4. Determination of ferrous iron using standard K2Cr2O7 solution.
5. Determination of Cu+2 using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe+3 by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).

12 Determination of Mg^{+2} present in an antacid.

13 Determination of $CaCO_3$ present in an egg shell.

14 Estimation of Vitamin C.

15 Determination of phosphoric content in soft drinks.

16 Adsorption of acetic acid by charcoal.

17 Preparation of nylon-6, 6 and Bakelite (demonstration only).

B.TECH I SEMESTER	ESC	L	T	P	C
		0	0	3	1.5

20AM1L08 PROBLEM SOLVING THROUGH C LAB

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers &functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

- Demonstrate Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.

2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( )function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name
3. Write a program in C to remove a file from the disk.

B.TECH I SEMESTER

	L	T	P	C
MC	2	0	0	--

20AM1M09 ENVIRONMENTAL SCIENCE

Course objective:

To understand the importance of Environment and the importance of biodiversity

Course outcomes:

- The importance of environment, Natural resources and current global environmental challenges for the sustenance of the life on planet earth.
- The concepts of the ecosystem and its function in the environment.
- 3.The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- The various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices.
- The environmental legislations of India and Social issues and the possible means
- Environmental assessment and the stages involved in EIA.

SYLLABUS

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Introduction- Scope of Environmental Studies- Importance of Environmental Studies- Need for public awareness, Environmental ethics- Contemporary Environmentalists- Environmental Global moves: Stockholm conference, Earth summit

Concept of an ecosystem - Structure of an ecosystem- function of an ecosystem- Food chains, food webs- ecological pyramids- Energy flow in the ecosystem- Ecological succession- Nutrient cycling- 1^oproduction& 2^oproduction- Major ecosystems: Forest ecosystem- Grassland ecosystem, Desert ecosystem- Aquatic ecosystem: pond, Lake Ecosystem- Streams, river ecosystem, Oceans

UNIT-II: NATURAL RESOURCES AND CONSERVATION

Introduction and classification of natural resources-Forest resources**:** Use and over-exploitation- Deforestation-Timber extraction-Mining- Conservation-Water resources**:** Use and over utilization of surface and ground water,- Floods, drought, Dams and associated problems- Water conservation, rain water harvesting, water shed management-Energy resources**:** renewable energy sources –solar-wind-hydro-

tidal- Ocean thermal-geo thermal-bio mass-bio gas-bio fuels- Hydrogen.- Non-renewable energy sources-coal-petroleum-natural gas-Nuclear energy

UNIT-III: **BIODIVERSITY AND ITS CONSERVATION**

Definition, classification- Value of biodiversity-Threats to biodiversity: habitat loss, man-wildlife conflicts- Endangered and endemic species of India-Conservation of biodiversity- Biodiversity at national and local levels, Hot-sports of biodiversity

UNIT-IV: ENVIRONMENTAL PROBLEMS

Global warming, Climate change- Acid rain, Ozone depletion- Air pollution- Water pollution- Soil pollution- Noise pollution, Nuclear hazards- Solid Waste Management: Causes, Consequences and Control methods- Solid Waste Management- Population growth and explosion, effects, control measures- Pollution case studies- Role of an individual in prevention of pollution

UNIT-V: ENVIRONMENTALLEGISLATION & MANAGEMENT

Sustainable development- Air (Prevention and Control of Pollution) Act-Drawbacks- Water (Prevention and control of Pollution) Act- Drawbacks- Wildlife Protection Act- Drawbacks- Forest Conservation Act- Drawbacks- Environmental Protection Act- Drawbacks- Environmental Impact Assessment and its significance- Preparation of Environmental Management Plan and Environmental Impact Statement- Ecotourism

TEXT BOOKS:

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age Publications, New Delhi

2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada

3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCES:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Delhi

B.TECH II SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20AM2T01 TRANSFORM TECHNIQUES

Pre-requisite: Linear Algebra and Differential Equations

Course Objective: Objective of the course is to impart

- Learning the techniques of Laplace transforms to solve ordinary differential equations
- knowledge of Fourier series & Fourier transforms for piecewise continuous functions
- knowledge of solving boundary valued problems

Course Outcomes: At the end of the course, student will be able to

CO1: Able to analyze a class of integrals in terms of beta and gamma functions

CO2: Provide the techniques of Laplace transformations and able to solve problems related to digital signal processing

CO3: Analyze the general periodic functions in the form of an infinite convergent sine and cosine series

CO4: Illustrate the methods to solve the boundary value problems

CO5: Determine a solution of a discrete system using Z- transforms

SYLLABUS

UNIT-I: Special functions:

Beta function, Properties & problems, Gamma function, properties & problems, Relation between Beta and Gamma functions, Evaluation of improper integrals.

UNIT-II: Laplace Transforms (all properties without proofs):

Definition, Transforms of elementary functions, properties of Laplace transforms, Transforms of periodic functions, Transforms of derivatives and integrals, Multiplication by t^n, Division by t, Evaluation of improper integrals.
Inverse Laplace transforms–Method of partial fractions, other methods of finding inverse transforms, Convolution theorem (without proof). **Application:** Application to differential equations.

UNIT-III: Fourier Series & Fourier Transforms:

Euler's formulae (without proof), Conditions of Fourier expansion, Functions having points of discontinuity, Change of inerval, Even and odd functions, Half-range series. Fourier Integral theorem (without proof), Fourier cosine & sine integral, complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, properties of Fourier transforms (without proof), Convolution theorem(without proof), finite & infinite Fourier sine & cosine transforms.

UNIT-IV: Partial Differential Equations:

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of Variables, Applications: One-dimensional wave and heat equations, two-dimensional heat equation.

UNIT-V: Z-Transforms: (all properties without proofs)

Introduction, definition, some standard z-transforms, linearity property, damping rule, some standard results, shifting U_n to the right, multiplication by n, initial and final value theorems, Inverse z-transforms, convolution theorem, evaluation of inverse z-transforms by partial fractions, applications to difference equations.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH II SEMESTER	BSC	L	T	P	C
		3	0	0	3

20AM2T02 APPLIED PHYSICS

Pre-requisite: Knowledge of basic concepts of waves, Optics, Electricity and Magnetism

Course Objective: Objective of the course is to impart

- ***Knowledge*** of fundamentals of Physics which helps them in the study of advanced topics of Engineering.
- ***Develop*** analytical capability and understand various Engineering concepts.

Course Outcomes:

At the end of the course, student will be able to

CO1: ***Impart*** knowledge of Physical Optics phenomenon Polarization and identify these phenomenon in natural processes

CO2: ***Gain*** knowledge of applications of lasers and optical fibers in various fields .

CO3: ***Classify*** magnetic and dielectric materials and their Engineering applications.

CO4: ***Understand*** basic quantum mechanics and free electron theories.

CO5: ***Obtain*** the concept of concept of holes and electrons in semiconductors.

SYLLABUS

UNIT-I: Wave Optics:

Interference*:* Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Colors in thin films-Newton's rings-Determination of wave length nd refractive index.

Diffraction: C Introduction- Fresnel and Fraunhofer diffraction - Fraunhofer Diffraction due to Single slit, Double slit, N –slits(Qualitative) - Diffraction Grating – Resolving Power of Grating(Qualitative).

Polarizations: Introduction- Types of polarization-polarization by reflection, refraction and Double refraction-Nicol's prism –Half and Quarter wave plates.

UNIT-II: Lasers and Fiber Optics:

Lasers:: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber-Construction- - Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes .

UNIT-III: Magnetic and Dielectric Materials:

Magnetic Materials: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para ferro, anti ferro & ferri – Domain concept of Ferromagnetism(Qualitative) - Hysteresis – soft and hard magnetic materials .

Dielectric Materials: Introduction - Dielectic polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation.

UNIT-IV: Quantum Mechanics,Free Electron Theory:

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of States(3D),Fermi energy.

UNIT-V: Band Theory of Solids and Semiconductors:

Band theory of Solids: Introduction- Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - V vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Semiconductors::Introduction– Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Drift and Diffusion currents – Einstein's equation-Hall effect- Hall coefficient - Applications of Hall effect.

Text Books

1. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G. Kshirsagar - S. Chand Publications, 2019.
2. "Engineering Physics" by D.K. Bhattacharya and Poonam Tandon, Oxford press (2015).

3. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference Books

1. Applied Physics by P.K. Palanisamy, Scitech publications (2014).
2. Engineering Physics by M. Arumugam, Anuradha Publication (2014).
3. Physics for Engineers by M.R. Srinivasan, New Age international publishers (2009).

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20AD2T03 COMPUTER ORGANIZATION

Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It provides an in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

Course Outcomes

By the end of the course the student will be able to

CO1: Demonstrate an understanding of the design of the functional units **of** a digital computer system. Relate Postulates of Boolean algebra and minimize combinational functions

CO2: Design and analyze combinational and sequential circuits

CO3: Implementation of computer arithmetic operations and to know the basic computer instruction formats

CO4: Obtain how micro programmed control is used to interact with units of components of CPU

CO5: Understanding of **o**rganization and architecture of input output and memory

SYLLABUS

UNIT I:

Digital Components and Data Representation:

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation, other Binary codes, Error Detection Codes

Digital Components: Digital Components, logic gates, Boolean Algebra, Map Simplification

UNIT II:

Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Decoders, Multiplexers.

Sequential Circuits: Flip-Flops-SR Flip flop, D Flip flop, JK Flip flop, T Flip flop, Edge Triggered File flop. Sequential Circuits: flip flop input equations, state table, state diagram, Design example and procedure Registers, Shift Registers, Binary Counters

UNIT III:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT IV:

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access

Text Books:

1. Computer System Architecture, 3rded., M.MorrisMano, PHI

Reference Books:

1. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006
2. Computer Organization, 5thed., Hamacher, Vranesic and Zaky,TMH,2002
3. Computer Organization & Architecture: Designing for Performance, 7thed., William Stallings, PHI,

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20AM2T04 DATA STRUCTURES

Course Objectives:

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

CO1: Understand the properties, interfaces, and behaviors of basic abstract data types.
CO2: Understand and apply linked lists
CO3: Apply Stacks and Queue data structures.
CO4: Demonstrate different methods for traversing trees.
CO5: Demonstrate the application of Graphs

SYLLABUS

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.
Searching - Linear search, Binary search, Fibonacci search.
Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal, Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications- Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees sing Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1. Data Structures Using C. 2ndEdition. Reema Thareja, Oxford.
2. Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1. Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2. Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3. Data Structures with C, Seymour Lipschutz TMH

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20AM2T05 PYTHON PROGRAMMING

Course Objectives:

- Identify/characterize/define a problem
- Design a program to solve the problem
- Create executable code
- Read most Python code

Course Outcomes:

CO1: Understand the fundamentals of Python programming language.

CO2: Understand Data Structures

CO3: Understand the use of functions in Python

CO4: Understand the Object-Oriented Programming concepts of Python

CO5: Apply regular expressions for different situations.

SYLLABUS

UNIT – I:

Introduction: History of Python, Need of Python Programming, Applications of Python Programming Variables, Assignment, Keywords, Input-Output, Indentation.

Types, Operators, and Expressions: Types – Integers, Strings, Booleans; Operators-Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while break, continue, pass

UNIT – II:

Data Structures Lists – Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT – III:

Functions – Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function-Global and Local Variables. Modules: Creating modules, import statements, from. The import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT – IV:

Object-Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error, and Exceptions: Difference between an error and Exception, Handling Exception, try except for block, Raising Exceptions, User Defined Exceptions

UNIT – V:

Regular expressions: Power of pattern matching and searching using regex in python, Meta characters and Sequences used in Patterns, Password, email, URL validation using regular expression, Pattern finding programs using regular expression.

Text Books:

1. Learning Python, Mark Lutz, Orielly
2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19- 948017-3, Oxford University Press, 2017.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. "Python in easy steps In Easy Steps", Mike MC Grath, illustrated edition, In easy steps 2013 publishers.
5. Professional Python Frameworks: Web 2.0 Programming, Dana Moore, Raymond Budd, William Wright, Wrox Publication, ISBN: 978-0-470-13809-0, October 2007.

B.TECH II SEMESTER	BSC	L	T	P	C
		0	0	3	1.5

20AM2L06 APPLIED PHYSICS LAB

Pre-requisite: Fundamental understanding of usage of an instrument with proper care.

Course Objective: Objective of the course is to impart

- Training Engineering graduates to handle instruments and their usage methods to improve the accuracy of measurements.

At the end of the course, student will be able to

CO1: **Outcomes**: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

CO2: Implement the basic principles of Mechanics to measure different physical parameters.

CO3: Enhance the knowledge of Usage of electronic devices in various applications

SYLLABUS

1. Newton's rings –Determination of radius of curvature of Plano Convex Lens.
2. Determination of wavelength of spectral lines -Diffraction Grating
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of wavelength of laser source using diffraction grating
5. Determination of Numerical Aperture and bending loss of a given Optical Fiber.
6. Determination of dispersive power of prism.
7. Determination of Rigidity modulus of a material- Torsional Pendulum.
8. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
9. Determination of Young's modulus by method of single cantilever oscillations
10. Verification of laws of vibrations in stretched strings – Sonometer.

11. Estimation of Planck's Constant using Photo electric Effect
12. Study of I /V Characteristics of Semiconductor diode.
13. I/V characteristics of Zener diode.
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
15. Energy Band gap of a Semiconductor using p - n junction diode

Reference Books

1. A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers, 2017.

		L	T	P	C
B.TECH II SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20AM2L07 DATA STRUCTURES LAB

Course Objectives:

The objective of this lab is to

- Demonstrate the different data structures implementation.

Course Outcomes:

- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

List of Experiments:

Exercise -1 (Searching)

a) Write C program that use both recursive and non-recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non-recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order.

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order.

Exercise -3 (Sorting-II)

a) Write C program that implement radix sort, to sort a given list of integers in ascending order

b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4 (Singly Linked List)

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion operation on a singly linked list

c) Write a C program that uses functions to perform deletion operation on a singly linked list

d) Write a C program to reverse elements of a single linked List.

Exercise -5 (Queue)

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists

Exercise -6 (Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write C program for implementing infix to postfix conversion

d) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7 (Binary Tree)

Write a recursive C program for traversing a binary tree in preorder, in-order and post-order.

Exercise -8 (Binary Search Tree)

a) Write a C program to Create a BST

b) Write a C program to insert a node into a BST.

c) Write a C program to delete a node from a BST.

Exercise-9

Write a program for implementing Heap Sort.

		L	T	P	C
B.TECH II SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20AM2L08 PYTHON PROGRAMMING LAB

Course Objectives:

The objective of this lab is to

- To elucidate problem solving through python programming language.
- To introduce function-oriented programming paradigm through python.
- To train in development of solutions using modular concepts.
- To teach practical Python solution patterns

Course Outcomes

CO1: Develop fundamental programs in python programming language.

CO2: Develop Python programs for numerical and text-based problems.

CO3: Develop Python programs on object-oriented programming and regular expressions.

CO4: Develop python programs on data structures.

LIST OF EXPERIMENTS

1. Write a program to perform various list of operations (eg: Arithmetic, logical, bitwise etc) in python.
2. Write a program to implement control flow statements.
3. Write a program implementing various predefined function of Lists, Sets, Tuples and Dictionaries.
4. Write a program covering various arguments for a function.
5. Write a program to implement various types of functions.
6. Write a program to implement recursion.
7. Write a program to implement command line arguments.
8. Write a program to create a class and its constructors.
9. Write a program to implement inheritance.
10. Write a program for exception handling.
11. Write a program to perform various linear algebra operations like finding eigen values and vectors, determinant and trace for a matrix.

12. Write a program to perform matrix operations like addition, subtraction, multiplication of matrices using Numpy Module.
13. Write a program to use System, math etc., packages.
14. Write a Python program to find the occurrence and position of the substrings within a string.
15. Write a Python program to replace all occurrences of space, comma, or dot with a colon.
16. Write a Python program to match a string that contains only upper and lowercase letters, numbers, and underscores.

B.TECH III SEMESTER

BSC	L	T	P	C
	3	0	0	3

20AM3T01 NUMERICAL METHODS & VECTOR CALCULUS

Course Objectives:

- Understand the basic numerical methods to solve simultaneous linear equations.
- Knowledge of numerical methods to solve ordinary differential equations.
- The types of integration over the lines, surfaces & volumes.

Course Outcomes:

By the end of the course students shall be able to

CO1: Determine the solution of transcendental equations by different numerical methods

CO2: Provide the interpolation techniques which analyze the data of an unknown function.

CO3: Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries.

CO4: Evaluate areas and volumes using double & triple integrals.

CO5: Apply the concepts of calculus to scalar and vector fields and establish the relation between line, surface and volume integrals.

SYLLABUS

UNIT-I: Numerical Solution of Equations:

Solution of Algebraic and transcendental equations: Bisection method, Method of false position and Newton-Raphson method. Iterative methods of solution of linear simultaneous equations: Jacobi's and Gauss-Seidel iteration methods.

UNIT-II: Interpolation:

Forward and backward, relation between these operators, Differences of a polynomial, Interpolation with unequal intervals: Lagrange's interpolation formula, Newton's forward & backward interpolation formulae & problems

UNIT-III: Numerical Integration & Numerical Solutions of ordinary differential equations with initial conditions:

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rules. Numerical Solution of ODE: Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method of 4^{th} order.

UNIT-IV: Multiple Integrals:

Double integrals in Cartesian & polar coordinates, Change of order of integration, Triple integrals, Change of variables (Cartesian to Polar, Rectangular coordinates to Cylindrical & Rectangular coordinates to Spherical polar coordinate systems).

Applications: Area enclosed by plane curves, Volume of solids.

UNIT-V: Vector Differentiation & Vector Integration:

Introduction, Scalar and Vector point functions, Del applied to scalar point functions- Gradient, directional derivatives, Del applied to vector point functions- Div& Curl, physical interpretation of div & curl, Del applied twice to point functions, Del applied to products of point functions (Identities without proofs).

Line integral, Green's theorem in the plane (without proof), Surface integrals, Stoke's theorem (without proof), Volume integral, Gauss Divergence theorem (without proof)

TEXT BOOKS:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014
2. **B.V.RAMANA,** Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007

REFERENCE:

1. **ERWINKREYSZIG,** Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015
2. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH III SEMESTER

PCC	L	T	P	C
	3	0	0	3

20AM3T02 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- To learn the fundamentals of object-oriented programming.
- To implement object-oriented concepts using Java.
- To understand how to design object-oriented applications using Java.

Course Outcomes:
At the end of the course, student will be able to

CO1: Understand the concepts of Object-Oriented Programming and Java Programming constructs.
CO2: Demonstrate the concepts – Strings, Inheritance and Interfaces.
CO3: Build efficient and error-free codes using exception handling and demonstrate multi-threading
CO4: Design GUI applications using Event Handling and Abstract Window Toolkit.
CO5: Develop real-time applications using Applets and Swings.

SYLLABUS

UNIT - I:

Introduction to OOP, procedural programming language vs. object- oriented language, principles of OOP, applications of OOP, history of java, java features, JVM. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting.

Control Statements: Introduction, if statement, Nested if statement, if–else statements, Ternary Operator, Switch Statement, Iteration Statements: while statement, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

Classes and objects: class declaration, creating objects, methods, method overloading, constructors and constructor overloading, garbage collector.

UNIT - II:

Basic Input-Output Operations. String, String Buffer and String Tokenizer classes.

Inheritance: types of inheritance, super keyword, final keyword, overriding and abstract class.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, importance of static keyword, this keyword, arrays, command line arguments, nested classes

UNIT – III:

Packages and Java Library: creating and using packages, importance of CLASSPATH and java. Lang package.

Exception handling: importance of try, catch, throw, throws and finally block, user- defined exceptions, Assertions.

Multithreading: Introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. File Handling: Reading data from files and writing data to files, random access file.

UNIT - IV:

Event Handling: Events, Event sources, Event classes, Event Listeners, Event Delegation model, handling mouse and key board events, Adapter classes, inner classes.

AWT: Class hierarchy, user- interface components- labels, button, canvas, scrollbars, text components, checkbox, checkbox groups, choices, list panes-scroll pane, dialogs, menu bar, graphics, layout manager- layout manager types- boarder, grid, flow, card and grid bag.

UNIT - V:

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameter stoapplets.

Swings: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing– JApplet, JFrame and J Component, I consand Labels, text fields, buttons-The J Button class, Check boxes, Radio Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees and Tables

TEXTBOOKS:

1. Herbert Schildt ―Java The Complete Reference, 11th Edition, McGraw-Hill Education.
2. E Balagurusamy ―Programming with Java: A Primer, 4th Ed, Tata McGraw Hill Education Pvt Ltd

REFERENCES:

1. Java Programming, K. Rajkumar. Pearson
2. Core Java, Black Book, R Nageswararao, Wiley, Dream Tech
3. Core Java for Beginners, Rashmi Kanta Das,vikas.
4. Object Oriented Programming Through java, P. Radha Krishna, Universities Press.
5. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

B. TECH III SEMESTER

	L	T	P	C
PCC	3	0	0	3

20AM3T03 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- Understand the basic database concepts, applications, schema and various models
- Familiarize with entity relation model for a data base and write queries using SQL
- Emphasize the importance of normalization, transaction management and concurrency control in databases.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models.

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT - I:

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT - II:

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT – III:

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL

UNIT – IV:

Schema Refinement (Normalization): Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies

UNIT - V:

Transaction Management and Concurrency Control: Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency Control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, "Data base Management Systems", 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL" by Shashan k Tiwari, 2011, WROX Press

REFERENCES:

1. Peter Rob & Carlos Coronel, "Data base Systems design, Implementation, and Management", 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, "Data base System Concepts", 6th Edition, McGraw Hill, 2010.
3. Elmasri Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2007.
4. C.J.Date, "Introduction to Database Systems", 7th Edition, Pearson Education,2002

	PCC	L	T	P	C
B. TECH III SEMESTER		3	0	0	3

20AM3T04 INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Course Objective:

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

Course Outcomes: At the end of the course, student will be able to

CO1: Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem

CO2: Apply the language/framework of different AI methods for a given problem.

CO3: Implement basic AI algorithms- standard search algorithms or dynamic programming

CO4: Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

SYLLABUS

Unit-I:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

Unit-II:

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games

Unit-III:

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

Unit-IV:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames. Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

Unit-V:

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory .Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
2. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI.
3. Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA.

E-RESOURCES:

1. https://nptel.ac.in
2. http://aima.cs.berkeley.edu/

B. TECH III SEMESTER

		L	T	P	C
	PCC	3	0	0	3

20AM3T05 OPERATING SYSTEMS

Course Objectives:

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes:

CO1: Understand the importance, functions and structures of operating systems

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

SYLLABUS

UNIT-I:

Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication

UNIT–II:

Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multi threading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT–III:

Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures

UNIT–IV:

Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock-Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Deadlock

UNIT–V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling.

TEXT BOOKS:

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley, 9th edition. (Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition –2005. (Unit-5).

REFERENCES:

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley, Operating Systems: A Design-Oriented Approach, Tata Mc Graw HillEducation, 1996.

B. TECH III SEMESTER

		L	T	P	C
	PCC	0	0	3	1.5

20AM3L06 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Objectives:

- Understand fundamentals of Object-Oriented Programming in java including defining classes, invoking methods using class libraries etc.,
- Demonstrate an understanding of graphical user interfaces, multi-threaded programming and event driven programming.

Course Outcomes: At the end of the course, the students will be able to:

CO1: Implement java applications using OOP principles and proper program structuring.

CO2: Develop java programs using packages, inheritance and interfaces

CO3: Implement error and exception handling techniques

CO4: Design event driven GUI and real-time web related applications.

SYLLABUS

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise –2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort

d) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3 (Class, Objects)

Implement java programs using the concept of

a) Class mechanism. Create a class, methods and invoke them inside main method.

b) Constructor. c) Construct or over loading. d) Method overloading

Exercise -4 (Inheritance) Implement java programs using the concept of

a) Single Inheritance b) Multilevel Inheritance c) Abstract class

Exercise - 5 (Inheritance - Continued) Implement java programs using the concept of

a) "super" keyword. b) Interfaces

Exercise – 6 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

Exercise – 7 (Exception)

Implement the programs by using the concepts of

a) Exception handling mechanism b) Multiple catch clauses
c) Finally d) Creating user defined exceptions

Exercise – 8 (Threads)

a) Write a JAVA program that creates threads by extending Thread class. First thread displays "Good Morning" every 1 sec, the second thread displays "Hello" every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)
b) Write a program illustrating is Alive and join()
c) Write a Program illustrating Daemon Threads.

Exercise – 9 (Packages)

a) Create a user defined package and demonstrate different ways of importing packages

Exercise - 10 (Applet)

a) Write a JAVA program to paint like paint brush in applet.
d) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise -11 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

B. TECH III SEMESTER

	L	T	P	C
PCC	0	0	3	1.5

20AM3L07 DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives:

- Populate and query a database using SQL-DDL/DML `commands.
- Understand various advanced query executions such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.
- Develop solutions using PL/SQL for database applications using procedures, cursors and triggers.

Course Outcomes:

CO1: Design database schema for a given application and apply normalization.

CO2: Acquire skills in using SQL commands for data definition and data manipulation.

CO3: Develop solutions for database applications using procedures, cursors and triggers

CO4: Develop solutions using PL/SQL procedures.

LIST OF EXPERIMENTS

1. Introduction to SQL: DDL, DML, DCL,TCL.
2. Queries for Creating Tables with Constraints, Views.
3. Example SQL Queries using select.
4. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN).
5. Queries using Group By, Order By, and Having Clauses and Working with Index, Sequence, Synonym.
6. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.
7. Queries on Joins and Correlated Sub-Queries.
8. Write a PL/SQL Code using Basic Variable, Anchored declarations, and Usage of Assignment Operation.
9. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL.
10. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
11. Write a PL/SQL Code using Cursors, Exceptions and Triggers.
12. Write a PL/SQL Code using Procedures, Functions, and Packages

Text Books:

1. ORACLE PL/SQL by example, Benjamin Rosen Zweig, Elena Silvestrova, Pearson.
2. ORACLE database log PL/SQL programming SCOTT URMAN, TMH.

3. SQL and PL/SQL for ORACLE10g, Black Book, Dr.P.S Deshpande.
4. Data Base Management System, Oracle SQL and PL/SQL, Pranab Kumar Das Gupta, P Radha Krishna, PHI

B.TECH III SEMESTER	PCC	L	T	P	C
		-	-	3	1.5

20AM3L08 UNIX AND SHELL PROGRAMMING LAB

Pre-Requisite:

Familiarity with the Unix/Linux command line and running simple commands

Course Objective:

Upon successful completion of this Lab the student will be able to

- Demonstrate how to use the following Bourne Shell commands: cat, grep, ls, more, ps, chmod, finger, ftp, etc.
- Use the following Bourne Shell constructs: test, if then, if then else, if then elif, for, while, until, and case.
- Learn tracing mechanisms (for debugging), user variables, Bourne Shell variables, read-only variables, positional parameters, reading input to a Bourne Shell script, command substitution, comments, and exporting variables. In addition, test on numeric values, test on file type, and test on character strings are covered.
- Copy, move, and delete files and directories
- Write moderately complex Shell scripts.
- Make a Shell script executable.
- Create a ".profile" script to customize the user environment.
- Use advanced features of File Transfer Protocol (FTP)
- Compile source code into object and executable modules.
- Execute programs written in c under UNIX environment.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand and usage of vi editor, file operations commands

CO2: Apply UNIX commands for File handling mechanism and illustrate the changing of File permissions and ownership

CO3: Analyze a given problem and apply requisite facets of Shell programming in order to devise a shell script to solve the problem

CO4: Develop various tasks by using Shell Scripting

CO5: Able to understand the various UNIX Commands

LIST OF EXPERIMENTS

Exercise1:

a) Log in to the system
b) Use Vi editor to create a file called myfile.txt which contains some text.
c) Correct typing errors during creation
d) Save the file
e) Logout of the file.

Exercise2:

a) Log into the system
b) Open the file created in session 1
c) Add some text
d) Change some text
e) Delete some text
f) Save the changes
g) Logout of the system

Exercise 3:

a) log into the system
b) Use the cat command to create a file containing the following data. Call it mutable use tabs to separate the fields

   1425 Ravi 15.65
   4320 Ramu 26.27
   6830 Sita 36.15
   1450 Raju 21.86

c) Use the cat command to display the file, my table
d) Use the vi command to correct any errors in the file, my table
e) Use the sort command to sort the file my table according to the first field. Call the sorted file my table (same name)
f) Print the file my table
g) Use the cut & paste commands to swap fields 2 and 3 my table. Call it my table (same name)
h) Print the new file, my table
i) Logout of the system

Exercise4:

a) Log in the system
b) Use the appropriate commands to determine ur login shell
c) Use the /etc/passwd file to verify the result of step b.
d) Uses the who command redirect the result to a file called myfile1.Use the more command to see the contents of myfile1.
e) Use the date and who commands in sequence ?(in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called my file2.Use the more command to check the contents of myfile2.
f) Write a sed command that deletes the first character in each line in a file
g) Write a sed command that deletes the character before the last character in each line in a file.

h) Write a sed command that swaps the files and second words in each line in a file.

Exercise5:

a) pipe ur /etc/passwd file to awk and print out the home directory of each user.
b) Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word
c) Repeat
d) Part using awk

Exercise6:

a) Write A shell script that takes a command –line argument and reports on whether it is directory, a file, or something else
b) Write a shell script that accepts one or more file name as a arguments and converts all of them to uppercase, provided they exist in the current directory
c) Write a shell script that determines the period for which a specified user is working on the system

Exercise 7:

a) Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers
b) Write a shell script that deletes all lines containing a specified word I one or more files supplied as arguments to it

Exercise8:

a) Write a shell script that computes the gross salary of a employee according to the following rules:

    i) If basic salary is <1500 then HRA=10% of the basic and DA =90% of the basic

    ii) If basic salary is >=1500 then HRA=Rs500 and DA =98% of the basic

   The basic salary is entered interactively through the key board
b) Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number

Exercise9:

a) Write an interactive file handling shell program. Let it offer the user the choice of copying, removing, renaming or linking files. Once the use has made a choice, have the program ask the user for necessary information, such as the file name, new name and so on.
b) Write a shell script that takes a login name as command –line argument and

reports when that person logs in

c) Write a shell script which receives two files names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted

Exercise10:

a) Write a shell script that displays a list of all files in the current directory to which the user has read write and execute permissions

b) Develop an interactive script that asks for a word and file name and then tells how many times that word occurred in the file.

c) Write a shell script to perform the following string operations:

i) To extract a sub string from a given string

ii) To find the length of a given string

Exercise11:

a) Write a C program that takes one or more file or directory names as command line input and reports the following information on the file:

i) file type ii) number of links iii) read, write and execute permissions

iv) time of last access (Note: use /fstat system calls)

Exercise12:

a) Write C program that simulate the following UNIX commands:

i) mv ii) cp

Exercise13:

a) Write a C program that simulates ls command

(Use system calls /directory API)

TEXT BOOKS:

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M. G. Venkateshmurthy, Pearson.

REFERENCE BOOKS:

1. Unix and shell programming by B.M. Harwani, OXFORD university press.

B. TECH III SEMESTER

SC	L	T	P	C
	0	0	4	2

20AM3S09 DATA ANALYSIS AND VISUALIZATION WITH PYTHON
(Skill Oriented Course)

Pre-Requisite: Python Programming

Course Objectives:

- To acquire programming skills in Python package NumPy and perform mathematical and statistical operations.
- To understand the fundamentals of the Pandas library in Python and how it is used to handle data and also develop basic skills in data analysis and visualization

Course Outcomes:

By the end of this lab the student is able to

CO1: Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems.

CO2: Understand how to apply some linear algebra operations to n-dimensional arrays.

CO3: Use Pandas to create and manipulate data structures like Series and Data Frames

CO4: Work with visualization of data frames

LIST OF EXPERIMENTS

1. NumPy Basics (np.array, np.arrange, np.linespace, np.zeros, np.ones, np.random.random, np.empty)
2. Arrays (array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
3. Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
4. Mathematical Operations(np.add, np.substract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations(np.mean, np.median, np.std, array.corrcoef( ))
5. NumPy Linear Algebra Operations(norm,eigen values and vectors, determinant of a matrix, sum of diagonal elements, inner product, matrix

decomposition etc..)

6. Pandas DataFrames: Consider Sample Python dictionary data and list labels: exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'], 'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19], 'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1], 'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']} labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']

   a. Write a Pandas program to create and display a DataFrame from a specified dictionary

   data which has the index labels.

   b. Write a Pandas program to change the name 'James' to 'Suresh' in name column of the

   DataFrame.

   c. Write a Pandas program to insert a new column in existing DataFrame.

   d. Write a Pandas program to get list from DataFrame column headers.

   e. Write a Pandas program to get list from DataFrame column headers.

7. Pandas Index:

   a. Write a Pandas program to display the default index and set a column as an Index in a given dataframe.

   b. Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a given dataframe.

8. Pandas Joining and merging DataFrame:

   a. Write a Pandas program to join the two given dataframes along rows and assign all data.

   b. Write a Pandas program to append a list of dictionaries or series to a existing

   DataFrame and display the combined data.

   c. Write a Pandas program to join the two dataframes with matching records from both

   sides where available.

9. Excel:

   a. Write a Pandas program to import excel data into a Pandas dataframe.

   b. Write a Pandas program to find the sum, mean, max, min value of a column of file.

10. Pandas Library: Visualization: Write a program which use pandas inbuilt visualization to plot following graphs:

    i. Bar plots ii. Histograms iii. Line plots iv. Scatter plots

B.TECH III SEMESTER

	L	T	P	C
MC	2	-	-	-

20AD3M10 CONSTITUTION OF INDIA

COURSE OBJECTIVES:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

COURSE OUTCOMES:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand historical background of the constitution making, importance for building a democratic India, features and principles of Indian Constitution.

CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO3: Understand the roles and powers of State Government and its Administration and value of the fundamental rights and duties for becoming good citizen of India.

CO4: Understand and analyze the decentralization of power between Union, State and Local self-Government and local administration.

CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission, UPSC, Welfare commissions for sustaining democracy.

SYLLABUS

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution -Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

UNIT III

State Government and its Administration Governor, Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV

Local Administration, District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy(Different departments),Village level, Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V

Election Commission: Election Commission, Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government &Politics
4. D.C. Gupta, Indian Government and Politics
5. H. M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. NewDelhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press2012

E-sources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

B. TECH IV SEMESTER

BSC	L	T	P	C
	3	0	0	3

20AM4T01 PROBABILITY AND STATISTICS

Course Objectives:

- Computation of expectation and variance for probability distributions of a random variable
- Description of sampling, distribution of means, proportions &variances
- Knowledge of different distributions to test statistical hypothesis.

Course Outcomes:

By the end of the course students will be able to

CO1: Understand random variables and discrete probability distributions

CO2: Determine probabilities based on practical situations using the normal distributions.

CO3: Apply different distributions to compute confidence intervals.

CO4: Test the hypothesis concerning means and proportions.

CO5: Understand the concept of least square estimation linear regression

SYLLABUS:

UNIT-I: Discrete Random Variables and Distributions:

Introduction-Random variables- Discrete Random Variable-Distribution function-Expectation-Moment Generating Function-Moments and properties. Discrete distributions: Binomial and Poisson distributions.

UNIT-II: Continuous Random Variable and Distributions:

Introduction-Continuous Random Variable-Distribution function- Expectation-Moment Generating Function-Moments and properties. Continuous distribution: Normal distributions, Normal approximation to Binomial distribution.

UNIT-III: Sampling Theory:

Introduction - Population and samples- Sampling distribution of means (s known)-Central limit theorem- t-distribution- Sampling distribution of means (s unknown)-Sampling, distribution of variances, Point estimation- Maximum error of estimate - Interval estimation

UNIT-IV: Tests of Hypothesis:

Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors–Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences- ANOVA for one-way and two-way classified data.

UNIT-V: Regression Analysis:

The method of Lease squares, Curvilinear Regression, Multiple regression, Correlation.

TEXT BOOKS:

1. Richards A Johnson, Irvin Miller and Johnson E Freund. Probability and Statistics for Engineering, 9th Edition, PHI.
2. Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th edition, Cengage.

REFERENCES:

1. Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson2007.
2. William Menden Hall, Robert J. Bever and Barbara Bever, Introduction to probability and statistics, Cengage learning, 2009.

B. TECH IV SEMESTER	ESC	L	T	P	C
		3	0	0	3

20AM4T02 DISCRETE MATHEMATICAL STRUCTURES

Course Objectives:

- The validity or the strength of any particular argument or reasoning
- Knowledge of the theory of relations and functions
- Knowledge of types of graphs to apply in real life problems.

Course Outcomes:

By the end of this course the student will be able to

CO1: Apply mathematical logic to design new programming languages.

CO2: Illustratethepropertiesofsetsandfunctionstodesignamodelingsoftware system.

CO3: Explain a structure of an algebra which is useful to understand the theory of sequential machines, formal languages and coding theory.

CO4: Apply the techniques of recursion for representing the data in the analysis of Algorithms

CO5: Provide the knowledge of graphs such as trees which is useful in maintaining files and directories by Operating Systems

SYLLABUS

UNIT - I: **Mathematical Logic**:

Introduction, Statements and Notation, Connectives and Truth tables, Normal forms, Theory of inference for Statement Calculus, The Predicate Calculus, Inference theory of Predicate calculus.

UNIT - II: **Set Theory & Functions**:

Introduction, Basic concepts of set theory, Principle of Inclusion and Exclusion, Properties of Binary relations, Relation matrix and Digraph, operations on relations, Partition and covering, Transitive closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, Bijective functions, Inverse functions, Composition of functions, Recursive functions, Pigeonhole principle and its applications.

UNIT – III: **Algebraic Structures & Number Theory**:

Algebraic systems and examples, general properties, semigroup, monoid, groups and subgroups. Properties of integers, Division algorithm, Greatest common divisor, Euclidean algorithm (without proof), Least common multiple, testing of prime numbers, The fundamental theorem of Arithmetic, Fermat's theorem and Euler's

theorem (without proofs) and its applications.

UNIT - IV: Recurrence Relations:

Recurrence Relations: Recurrence relations, solving recurrence relations by substitution, the method of characteristic roots, Solutions of Inhomogeneous recurrence relations.

UNIT - V: Graph Theory:

Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Coloring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

TEXTBOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Mathematical Foundation for Computer science, S. Santha, E.V. Prasad, Cengage publications

REFERENCES:

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata Mc Graw Hill.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby, Sharon Cutler Ross, PHI.

B. TECH IV SEMESTER

PCC	L	T	P	C
	3	0	0	3

20AM4T03 DESIGN AND ANALYSIS OF ALGORITHMS

Pre-requisite: Data structures, Basic knowledge of programming and mathematics

Course Objectives:

- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
- To introduce the different algorithmic approaches for problem solving through numerous example problems.
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes:

At the end of the course, student will be able to

CO1: Describe asymptotic notation used for denoting performance of algorithms.

CO2: Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms.

CO3: List and describe various algorithmic approaches.

CO4: Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches.

CO5: Apply graph search algorithms to real world problems.

SYLLABUS

UNIT-I:

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Randomized Algorithms.

Sets & Disjoint set union: introduction, union and find operations.

Basic Traversal & Search Techniques: Techniques for Graphs, connected components and Spanning Trees, Bi-connected components and DFS.

UNIT-II:

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.

The Greedy Method: The general Method, container loading, knapsack problem, Job sequencing with deadlines, minimum-cost spanning Trees.

UNIT-III:

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, single-source shortest paths: general weights, optimal Binary search trees, 0/1 knapsack, reliability Design, The traveling salesperson problem.

UNIT-IV:

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

Branch and Bound: FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Traveling salesperson problem.

UNIT-V:

NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem. String Matching: Introduction, String Matching-Meaning and Application, NaÏve String Matching Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Automata, Tries, Suffix Tree.

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press

REFERENCE BOOKS:

1. Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2008**.**
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

B. TECH IV SEMESTER		**L**	**T**	**P**	**C**
	PCC	**3**	**0**	**0**	**3**

20AM4T04 MACHINE LEARNING

Pre-requisite: Probability and Statistics, Linear Algebra

Course Objectives:

- To understand the need for machine learning for various problem solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To understand the latest trends in machine learning
- To design appropriate machine learning algorithms for problem solving

Course Outcomes:

At the end of the course, student will be able to

CO1: Differentiate between supervised, unsupervised, semi-supervised machine learning approaches

CO2: Discuss the decision tree algorithm and indentity and overcome the problem of over fitting

CO3: Discuss and apply the back propagation algorithm and genetic algorithms to various problems

CO4: Apply the Bayesian concepts to machine learning

CO5: Analyze and suggest appropriate machine learning approaches for various types of problems

SYLLABUS

UNIT-I: Introduction:

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT-II: Neural Networks and Genetic Algorithms:

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms –Advanced Topics in ANN, Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT-III: Bayesian and Computational Learning

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes

Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT-IV: Instant Based Learning

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning

UNIT-V: Advanced Learning

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning.

TEXT BOOKS:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

References:

1. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and
Machine Learning), The MIT Press 2004.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009

B. TECH IV SEMESTER		L	T	P	C
	HSMC	3	0	0	3

20AM4T05 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives:

- The Learning objectives of this course are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost- Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product.
CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
CO3: The pupils also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

SYLLABUS

UNIT–I: Introduction to Managerial Economics and demand Analysis

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT–II: Theories of Production and Cost Analyses:

Theories of Production function- Law of Variable Proportions - Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale- Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT –III: Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles: Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company–State/Public Enterprises and their forms.

UNIT – IV: Introduction to Accounting & Financing Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis(Problems).

UNIT – V: Capital and Capital Budgeting:

Meaning of Capital- Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index).

TEXT BOOKS:

1. A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:

1. Varshney R. L, K. L Maheswari, Managerial Economics, S. Chand & CompanyLtd.
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. Sakthivel Murugan, Accounting for Management, S. Chand & Company Ltd.
4. Maheswari S. N ,An Introduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I. M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand &Company Ltd.

B. TECH IV SEMESTER

	L	T	P	C
ESC	0	0	3	1.5

20AM4L06 R PROGRAMMING LAB

Course Outcomes:

CO1: Understand the use of operators in R

CO2: Use Data Structures to implement programs in R.

CO3: Implement Mathematical functions in R

CO4: Understand reading and writing files

CO5: Analyze data from various sources

LAB EXPERIMENTS

Exercise 1: Implement programs in R to work with different types of operators

Exercise 2: Implement programs in R with data structures

Exercise 3: Implement programs in R using the concept of functions

Exercise 4: Working with simulation inR

Math

functions

Calculus

Linear algebraic

operations Set operations

Exercise 5: Reading in your own data

Working with files

Accessing the keyboard and monitor

Exercise 6: Data visualization

Charts and plots

Exercise 7:

a) Program to implement simple and multiple linear regression.
b) Program to implement non- linear regression.

Exercise8:

a) Program to implement logistic regression.

Exercise9:

a) Program to perform ANOVA test (one-way, two way)

B. TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20AM4L07: MACHINE LEARNING USING PYTHON LAB

COURSE DESCRIPTION

Machine Learning is concerned with computer programs that automatically improve their performance through experience. This course covers the theory and practical algorithms for machine learning from a variety of perspectives. We cover topics such as FIND-S, Candidate Elimination Algorithm, Decision tree (ID3 Algorithm), Back propagation Algorithm, Naïve Bayesian classifier, Bayesian Network, k-Means Algorithm, k-Nearest Neighbour Algorithm, Locally Weighted Regression Algorithm

COURSE OBJECTIVE: This course will enable students to

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice

COURSE OUTCOMES: After studying this course, the students will be able to

CO1: Understand the implementation procedures for the machine learning algorithms

CO2: Design Java/Python programs for various Learning algorithms

CO3: Apply appropriate data sets to the Machine Learning algorithms

CO4: Identify and apply Machine Learning algorithms to solve real world problems

LIST OF LAB EXPERIMENTS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

B. TECH IV SEMESTER

PCC	L	T	P	C
	0	0	3	1.5

20AM4L08: DESIGN AND ANALYSIS OF ALGORITHMS LAB

Prerequisites: Any Programming Language

Course Outcomes:

This course will enable students to,

- Employ various design strategies for problem solving.
- Measure and compare the performance of different algorithms.

Course Outcomes:

The students should be able to

CO1: Design algorithms using appropriate design techniques (brute-force, greedy, Dynamic programming, etc.).

CO2: Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language.

CO3: Apply and implement learned algorithm design techniques and data structures to solve real world problems

CO4: Analyze and compare the performance of algorithms using language feature

LIST OF LAB EXPERIMENTS

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator
2. Implement a Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted .The elements can be read from a file or can be generated using the random number generator.
3. A) Obtain the Topological ordering of vertices in a given digraph.

   B) Compute the transitive closure of a given directed graph using Warshall's algorithm
4. Implement 0/1 Knapsack problem using Dynamic Programming
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra's algorithm
6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm

7. A) Print all the nodes reachable from a given starting node in a digraph using BFS method.
   B) Check whether a given graph is connected or not using DFS method
8. Find a subset of a given set S = {s1, s2,....., sN} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution
9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation
10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm
11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm
12. Implement N Queen's problem using Back Tracking

B. TECH IV SEMESTER	SC	L	T	P	C
		0	0	4	2

20AM4S09 BASIC WEB PROGRAMMING

(Skill Oriented Course)

Course Objectives:

- To acquire skills in developing web pages.
- To understand the use of HTML and CSS in designing web pages
- To gain knowledge on Java Script for performing validations.

Course Outcomes:

By the end of this lab the student is able to

CO1: Understand and use various HTML Tags and apply CSS.

CO2: Develop websites that include static pages.

CO3: Design Front end for Web Applications

LIST OF EXPERIMENTS:

1. Exercises to demonstrate the use of Basic HTML tags.
2. Exercises to demonstrate Tables, Lists and Forms
3. Implement forms using HTML Frames and CSS
4. Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, lines and words in the text enter educing an alert message. Words are separated with white space and lines are separated with new line character.
5. Write an HTML page that contains a selection box with a list of 5 countries In the above page when the user selects a country, its capital should be printed next to the list, and add CSS to customize the properties of the font of the capital.
6. Create a website using the HTML and CSS to create your personal portfolio.
7. Create a website using HTML and CSS for a Book Store.
8. Write a JavaScript to design a simple calculator to perform the operations: sum, product, difference and quotient
9. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in HTML table format.
10. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches

50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.

11. Demonstrate the Login page with user id and password validations.
12. Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:
    a) Parameter: A string Output: The position in the string of the left-most vowel
    b) Parameter: A number Output: The number with its digits in the reverse order
13. Write an HTML page with Java script that takes a number from one text field in the range 0-999 and display it in other text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.

		L	T	P	C
B.TECH MINOR	**MN**	3	1	0	4

20IAMMN01 INTRODUCTION TO DATA SCIENCE
(Minor Engineering Course)

Course Objectives:

The objective of this course is to explain the relevant parts of statistics, computer science, and machine learning that are crucial to data science. Data science draws on tools from the empirical sciences, statistics, reporting, analytics, visualization, business intelligence, expert systems, machine learning, databases, data warehousing, data mining, and big data. The goal is to present data science from a pragmatic, practice-oriented viewpoint.

Course Outcomes: By the end of the course the student will be able to

- **CO1: Understand** roles and stages of data science project
- **CO2: Loading** different data sets into R environment.
- **CO3: Visualize** the data using graphs
- **CO4: Learn** data preprocessing using R
- **CO5: Mapping** various business problems to machine learning tasks

SYLLABUS

UNIT-I: Introduction to Data Science:

The data science process, the roles in a data science project, Stages of a data science project, setting expectations, Summary.

UNIT-II: Loading data into R:

Working with data from files, working with well-structured data from files or URLs, Using R on less-structured data, Working with relational databases, A production-size example, Loading data from a database into R, Working with the PUMS data

UNIT-III: Exploring Data:

Using summary statistics to spot problems, Typical problems revealed by data summaries, Spotting problems using graphics and visualization, Visually checking distributions for a single variable, Visually checking relationships between two variables.

UNIT-IV: Managing data:

Cleaning data, Treating missing values (nas), Data transformations, Sampling for modeling and validation, Test and training splits, Creating a sample group column, Record grouping, Data provenance.

UNIT-V: Modeling methods:

Choosing and evaluating models, Mapping problems to machine learning tasks, Solving classification problems, Solving scoring problems, Working without known targets, Problem-to-method mapping, Evaluating models, Evaluating classification models, Evaluating scoring models, Evaluating probability models, Evaluating ranking models, Evaluating clustering models

Validating models, Identifying common model problems, Quantifying model soundness, Ensuring model quality.

TEXT BOOKS:

1. Practical Data Science with R by NINA ZUMEL JOHN MOUNT

REFERENCE:

1. Data Science from Scratch: First Principles with Python by Joel Grus
2. Data Science for Dummies is a book by Lillian Pierson

B.TECH MINOR	MN	L	T	P	C
		3	1	0	4

20AMMN02 INTRODUCTION TO ARTIFICIAL INTELLIGENCE
(Minor Engineering Course)

Course Objective:

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

Course Outcomes: At the end of the course, student will be able to:

CO1: Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem

CO2: Apply the language/framework of different AI methods for a given problem.

CO3: Implement basic AI algorithms- standard search algorithms or dynamic programming

CO4: Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

SYLLABUS

Unit-I:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

Unit-II:

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

Unit-III: Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

Unit-IV:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames. Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

Unit-V:

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory .Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning.
2. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013.
2. Introduction to Artificial Intelligence, Patterson, PHI.
3. Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA

E-RESOURCES:

1. **https://nptel.ac.in**

CIVIL ENGINEERING

COURSE STRUCTURE

B. TECH I SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE1T01	BSC	Linear Algebra and Differential Equations	3	-	-	3	3
2	20CE1T02	BSC	Engineering Physics	3	-	-	3	3
3	20CE1T03	HSMC	English	3	-	-	3	3
4	20CE1T04	ESC	Building Materials & Construction	3	-	-	3	3
5	20CE1T05	ESC	Engineering Graphics	1	-	4	5	3
6	20CE1L06	HSMC LAB	English Communication Skills Lab	-	-	3	3	1.5
7	20CE1L07	BSC LAB	Engineering Physics Lab	-	-	3	3	1.5
8	20CE1L08	ESC LAB	Civil Engineering Workshop	-	-	3	3	1.5
Total number of credits								**19.5**

B. TECH II SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE2T01	BSC	Transform Techniques	3	-	-	3	3
2	20CE2T02	BSC	Engineering Chemistry	3	-	-	3	3
3	20CE2T03	ESC	Engineering Mechanics	3	-	-	3	3
4	20CE2T04	ESC	Building Planning and Drawing	3	-	-	3	3
5	20CE2T05	ESC	Problem Solving Through C	3	-	-	3	3
6	20CE2L06	BSC LAB	Engineering Chemistry Lab	-	-	3	3	1.5
7	20CE2L07	ESC LAB	Computer Aided Building Drawing Lab	-	-	3	3	1.5
8	20CE2L08	ESC LAB	Problem Solving Through C Lab	-	-	3	3	1.5
9	20CE2M09	MC	Environmental Science	2	-	-	2	-
Total number of credits								**19.5**

B. TECH III SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE3T01	BSC	Numerical Methods and Vector calculus	3	-	-	3	3
2	20CE3T02	PCC	Strength of Materials	3	-	-	3	3
3	20CE3T03	PCC	Fluid Mechanics	3	-	-	3	3
4	20CE3T04	PCC	Concrete Technology	3	-	-	3	3
5	20CE3T05	PCC	Surveying	3	-	-	3	3
6	20CE3L06	PCC LAB	Strength of Materials Lab	-	-	3	3	1.5
7	20CE3L07	PCC LAB	Surveying Field Work	-	-	3	3	1.5
8	20CE3L08	PCC LAB	Concrete Technology Lab	-	-	3	3	1.5
9	20CE3S09	SC	AUTO CAD 2D&3D	-	-	4	4	2
Total number of credits								**21.5**

B. TECH IV SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE4T01	BSC	Complex Variables and Statistical Methods	3	-	-	3	3
2	20CE4T02	ESC	Engineering Geology	3	-	-	3	3
3	20CE4T03	PCC	Hydraulics and Hydraulic Machinery	3	-	-	3	3
4	20CE4T04	PCC	Structural Analysis-1	3	-	-	3	3
5	20CE4T05	HSMC	Managerial Economics and Financial Analysis	3	-	-	3	3
6	20CE4L06	PCC LAB	Engineering Geology Lab	-	-	3	3	1.5
7	20CE4L07	PCC LAB	Fluid Mechanics and Hydraulic Machinery Lab	-	-	3	3	1.5
8	20CE4L08	PCC LAB	Advanced Surveying Lab	-	-	3	3	1.5
9	20CE4S09	SC	Revit Architecture	-	-	4	4	2
10	20CE4M10	MC	Constitution of India	2	-	-	-	-
Total number of credits								**21.5**
Internship 2 Months (Mandatory) during summer vacation								
Honors/ Minor Course				**4**	**0**	**0**	**4**	**4**

B. TECH V SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE5T01	PCC	Geotechnical Engineering-1	3	-	-	3	3
2	20CE5T02	PCC	Transportation Engineering -1	3	-	-	3	3
3	20CE5T03	PCC	Design and Drawing of Reinforced Concrete Structures	3	-	-	3	3
4	Open Elective–I			3	-	-	3	3
5	Professional Elective–I			3	-	-	3	3
	20CE5T06	PEC	Structural Analysis – 2					
	20CE5T07		Rural Water Supply and Environmental Sanitation					
	20CE5T08		Geo synthetics					
	20CE5T09		Interior Designs and Decorations					
6	20CE5L10	PCC LAB	Geotechnical Engineering Lab	-	-	3	3	1.5
7	20CE5L11	PCC LAB	Transportation Engineering Lab	-	-	3	3	1.5
8	20CE5L12	SC	STAAD PRO LAB	-	-	4	4	2
9	20CE5M13	MC	Essence of Indian Traditional Knowledge	2	-	-	2	-
10	20CE5I14	I	Summer Internship	-	-	-	-	1.5
Total number of credits								**21.5**
Honors/ Minor Course				**4**	**0**	**0**	**4**	**4**

B. TECH VI SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE6T01	PCC	Design and Drawing of Steel Structures	3	-	-	3	3
2	20CE6T02	PCC	Water Resources Engineering-1	3	-	-	3	3
3	20CE6T03	PCC	Environmental Engineering	3	-	-	3	3
4	Professional Elective-II			3	-	-	3	3
	20CE6T04	PEC	Geotechnical Engineering -2					
	20CE6T05		Air pollution and Control					
	20CE6T06		Urban Transportation Planning					
	20CE6T07		Ground water development and Management.					
5	Open Elective–II			3	-	-	3	3
6	20CE6L10	PCC LAB	Environmental Engineering Lab	-	-	3	3	1.5
7	20CE6L11	PCC LAB	Design and Drawing of Irrigation Structures	-	-	3	3	1.5
8	20CE6L12	PCC LAB	Geographical Information Systems Lab	-	-	3	3	1.5
9	20CE6S13	SC	Soft Skills	-	-	4	4	2
10	20CE6M14	MC	Disaster Management	2	-	-	-	-
11	20CE6P15	P	Community Service Project	-	-	-	-	4
Total number of credits								**25.5**
Internship 2 Months (Mandatory) during summer vacation								
Honors/ Minor Course				**4**	**0**	**0**	**4**	**4**

B. TECH VII SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	**Professional Elective-III**			3	-	-	3	3
	20CE7T01	PEC	Transportation Engineering-2					
	20CE7T02		Solid and Hazardous Management					
	20CE7T03		Bridge Engineering					
	20CE7T04		Ground Improvement Techniques.					
2	**Professional Elective-IV**			3	-	-	3	3
	20CE7T05	PEC	Water Resources Engineering-2					
	20CE7T06		Finite Element Methods					
	20CE7T07		Pavement Design					
	20CE7T08		Port and Harbour Structures					
3	**Professional Elective-V**			3	-	-	3	3
	20CE7T09	PEC	Estimation, Specification and Contracts					
	20CE7T10		Pre stressed Concrete					
	20CE7T11		Geo environmental Engineering					
	20CE7T12		Water Harvesting and Conservation.					
4	**Open Elective–III**			3	-	-	3	3
5	**Open Elective–IV**			3	-	-	3	3
6	20CE7T17	HSMC	Universal Human Values 2 Understanding Harmony	-	-	3	3	3
7	20CE7S18	SC	ETABS	1	-	2	3	2
8	20CE7I19	I	Industrial Internship					3
Total number of credits								**23**
Honors/ Minor Course				4	0	0	4	4

B. TECH VIII SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE8P01	PROJ	Project	-	-	-		8
Total number of credits								**8**

OPEN ELECTIVE –I:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE5T04	Architecture and Town Planning	3	0	0	3	CE
2	20CE5T05	Elements of Civil Engineering	3	0	0	3	CE
3	20EE5T04	Basics of Control Systems	3	0	0	3	EEE
4	20EE5T05	Special Electrical Machines	3	0	0	3	EEE
5	20ME5T04	Design Thinking & Product Innovation	3	0	0	3	ME
6	20ME5T05	Nanotechnology	3	0	0	3	ME
7	20EC5T04	Linear System Analysis	3	0	0	3	ECE
8	20EC5T05	Digital Logic Design	3	0	0	3	ECE
9	20EC5T06	Solid State Devices	3	0	0	3	ECE
10	20CS5T07	Introduction to Artificial Intelligence	3	0	0	3	CSE
11	20CS5T08	Operating System	3	0	0	3	CSE
12	20CS5T09	Software Engineering	3	0	0	3	CSE
13	20IT5T07	Computer Networks	3	0	0	3	IT
14	20IT5T08	Computer Graphics	3	0	0	3	IT
15	20HS5T01	Quantitative Aptitude and Reasoning	3	0	0	3	BED
16	20MB5T01	Principles of Management	3	0	0	3	DMS
17	20MB5T02	Technology Management	3	0	0	3	DMS
18	20AD5T07	Foundations of Data Science	3	0	0	3	AIDS
19	20AM5T07	Introduction to Machine Learning	3	0	0	3	AIML

OPEN ELECTIVE –II:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE6T08	Remote Sensing and GIS	3	0	0	3	CE
2	20CE6T09	Environmental Impact Assessment	3	0	0	3	CE
3	20EE6T08	Renewable Energy Sources	3	0	0	3	EEE
4	20EE6T09	Energy Audit, Conservation and Management	3	0	0	3	EEE
5	20ME6T07	Industrial Robotics	3	0	0	3	ME
6	20ME6T08	Additive manufacturing	3	0	0	3	ME
7	20EC6T07	Electronic Circuits and Networks	3	0	0	3	ECE

8	20EC6T08	Principles of Communications	3	0	0	3	ECE
9	20EC6T09	Microcontrollers & its Applications	3	0	0	3	ECE
10	20CS6T07	Introduction to Machine Learning	3	0	0	3	CSE
11	20CS6T08	Information Security	3	0	0	3	CSE
12	20CS6T09	Agile Technologies	3	0	0	3	CSE
13	20IT6T07	Fundamentals of Machine Learning	3	0	0	3	IT
14	20IT6T08	Database Management Systems	3	0	0	3	IT
15	20HS6T01	Operations Research	3	0	0	3	BED
16	20MB6T01	Organizational Behaviour	3	0	0	3	DMS
17	20MB6T02	Project Management	3	0	0	3	DMS
18	20AD6T07	Visual Analytics	3	0	0	3	AIDS
19	20AM6T07	Big data Analytics	3	0	0	3	AIML

OPEN ELECTIVE –III:

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CE7T13	Construction Technology and Management	3	0	0	3	CE
2	20CE7T14	Green Buildings	3	0	0	3	CE
3	20EE7T13	Concept of Power System Engineering	3	0	0	3	EEE
4	20EE7T14	Instrumentation	3	0	0	3	EEE
5	20ME7T10	Green Engineering Systems	3	0	0	3	ME
6	20ME7T11	Hybrid Electric Vehicles	3	0	0	3	ME
7	20EC7T10	Data Communications	3	0	0	3	ECE
8	20EC7T11	Mechatronics	3	0	0	3	ECE
9	20EC7T12	Bio Medical Instrumentation	3	0	0	3	ECE
10	20CS7T10	Artificial Neural Networks	3	0	0	3	CSE
11	20CS7T11	Cyber Security	3	0	0	3	CSE
12	20CS7T12	Software Testing Methodologies	3	0	0	3	CSE
13	20IT7T10	Internet of Things	3	0	0	3	IT
14	20IT7T11	Computer Vision	3	0	0	3	IT
15	20HS7T01	Fuzzy sets	3	0	0	3	BED
16	20MB7T01	Digital Media management	3	0	0	3	DMS
17	20MB7T02	Entrepreneurship Development	3	0	0	3	DMS
18	20AD7T10	Data Analysis and Visualization with Python	3	0	0	3	AIDS

19	20AM7T10	NoSQL Databases	3	0	0	3	AIML

OPEN ELECTIVE –IV:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE7T15	Waste water treatment	3	0	0	3	CE
2	20CE7T16	Repair and Rehabilitation of Concrete Structures	3	0	0	3	CE
3	20EE7T15	Power Quality	3	0	0	3	EEE
4	20EE7T16	Electric Vehicles	3	0	0	3	EEE
5	20ME7T12	Micro-Electro- Mechanical Systems	3	0	0	3	ME
6	20ME7T13	Solar Energy Systems	3	0	0	3	ME
7	20EC7T13	Introduction to Embedded Systems	3	0	0	3	ECE
8	20EC7T14	Internet of Things	3	0	0	3	ECE
9	20EC7T15	Analog and Digital IC applications	3	0	0	3	ECE
10	20CS7T13	Data Analytics	3	0	0	3	CSE
11	20CS7T14	Block Chain Technology	3	0	0	3	CSE
12	20CS7T15	Software Project Management	3	0	0	3	CSE
13	20IT7T13	Cloud Computing	3	0	0	3	IT
14	20IT7T14	Business Intelligence	3	0	0	3	IT
15	20HS7T02	Polymer Chemistry	3	0	0	3	BED
16	20MB7T03	Total Engineering Quality Management	3	0	0	3	DMS
17	20MB7T04	Stress Management	3	0	0	3	DMS
18	20AD7T11	Natural Language Processing	3	0	0	3	AIDS
19	20AM7T11	Deep Learning	3	0	0	3	AIML

HONORS/MINOR COURSES OFFERED BY THE DEPARTMENT

Honors/ Minor Course Fulfillments:

- The 20 additional credits need to be acquired, 16 credits can be earned by undergoing specified courses, with each carrying 4 credits.
- The remaining 4 credits must be acquired through two online MOOCs (SWAYAM /NPTEL), which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of Studies.
- Minor Engineering subjects are offered to other branches by CE Department (except for CE Students).
- Honors engineering subjects are offered to CE Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (SWAYAM/NPTEL).

HONORS COURSES

S. No.	Course code	Course Name	L	T	P	C
		Pool-1 (Structural Engineering)				
1	20CEHN01	Pre- Stressed Concrete	4	0	0	4
2	20CEHN02	Theory of Elasticity	4	0	0	4
3	20CEHN03	Earthquake Resistant Design of Structures	4	0	0	4
4	20CEHN04	Precast and Prefabricated Structures	4	0	0	4
		Pool-2 (Geo-technical Engineering)				
5	20CEHN05	Rock Mechanics	4	0	0	4
6	20CEHN06	Earth and Rock fill Dams	4	0	0	4
7	20CEHN07	Reinforced Soil Structures	4	0	0	4
8	20CEHN08	Advanced Foundation Engineering	4	0	0	4
		Pool-3 (Transportation Engineering)				
9	20CEHN09	Pavement Construction and Evaluation	4	0	0	4
10	20CEHN10	Urban Transportation Planning	4	0	0	4
11	20CEHN11	Traffic Analysis	4	0	0	4
12	20CEHN12	Intelligent Transportation System	4	0	0	4
		Pool-4 (Hydraulics and Water Resources Engineering)				
13	20CEHN13	River Management	4	0	0	4
14	20CEHN14	Hydraulic Structures	4	0	0	4
15	20CEHN15	Advanced Hydrology	4	0	0	4
16	20CEHN16	Environmental Impact Assessment for Water Resource Projects	4	0	0	4

MINOR COURSES

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CEMN01	Building Materials & Construction	3	1	0	4	CE
2	20CEMN02	Concrete Technology	3	1	0	4	CE
3	20CEMN03	Surveying	3	1	0	4	CE
4	20CEMN04	Traffic Engineering	3	1	0	4	CE

B.TECH I SEMESTER	BSC	L	T	P	C
		3	0	0	3

20CE1T01 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

Pre-requisite: Basic knowledge about matrices, differentiation and integration

Course Objective: Objective of the course is to impart

- Basic understanding of mathematical methods to solve simultaneous linear systems
- Understanding of formation and solutions of ordinary differential equations
- Knowing the mathematical methods to solve applications of differential equations

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the knowledge to solve a system of homogeneous and non-homogeneous linear equations

CO2: Illustrate the methods of computing eigen values and eigen vectors

CO3: Able to analyze the real life situations, formulate the differential equations and then applying the methods

CO4: Determine the solutions of linear differential equations

CO5: Optimize functions of several variables and able to find extreme values of constrained functions

SYLLABUS

UNIT-I: Linear systems of equations:

Rank of a matrix, Echelon form, Normal form, PAQ is in normal form, linear dependence and independence of vectors, Consistency of linear system of equations, System of linear homogeneous equations, Gauss-elimination and Gauss -Jordan methods.

UNIT-II: Eigen values & Eigen vectors:

Eigen values, Eigen vectors, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), finding inverse and powers of a matrix using C-H theorem, Reduction to diagonal form, reduction of quadratic form to canonical form using orthogonal reduction, nature of quadratic forms.

UNIT-III: Ordinary Differential Equations of first order:

Linear equations, Bernoulli's equation, Exact differential equations. Equations reducible to exact equations, **Applications:** Orthogonal Trajectories, Newton's Law of cooling, Rate of decay & growth., R-L series circuits.

UNIT-IV: Linear Differential Equations higher order:

Definitions, Complete solution (without proof), Operator D, Rules to find complementary function, Inverse operator, Rules to find the particular integral(nonhomogeneous term of the form e^{ax} , sin(ax+b), cos(ax+b), polynomials in x^m, e^{ax} V(x), any other function), Method of variation of parameters.

UNIT-V: Partial Differentiation:

Functions of two variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Jacobian and functional dependence, Taylor's theorem for functions of two variables. **Applications:** Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH I SEMESTER **BSC**

L	T	P	C
3	0	0	3

20CE1T02 ENGINEERING PHYSICS

Pre-requisite: Knowledge of basic concepts of waves, Optics, Electricity and Magnetism

Course Objective: Objective of the course is to impart

- *Knowledge* of fundamentals of Physics which helps them in the study of advanced topics of Engineering.
- *Develop* analytical capability and understand various Engineering concepts.

Course Outcomes:

At the end of the course, student will be able to

CO1: *Impart* knowledge of Physical Optics phenomenon Polarization and identify these phenomenon in natural processes

CO2: *Gain* knowledge of applications of lasers and optical fibers in various fields .

CO3: *Classify* magnetic and dielectric materials and their Engineering applications.

CO4: *Impart* knowledge of architectural acoustics and Study of Ultrasonics.

CO5: *Classify* crystal systems and analyze the crystalline structure using various X-ray diffraction techniques .

SYLLABUS

UNIT-I: Wave Optics:

Interference: Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Colors in thin films-Newton's rings-Determination of wave length nd refractive index.

Diffraction: C Introduction- Fresnel and Fraunhofer diffraction - Fraunhofer Diffraction due to Single slit, Double slit, N –slits(Qualitative) - Diffraction Grating – Resolving Power of Grating(Qualitative).

Polarizations: Introduction- Types of polarization-polarization by reflection, refraction and Double refraction-Nicol's prism –Half and Quarter wave plates.

UNIT-II: Lasers and Fiber Optics:

Lasers:: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber-Construction- - Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes .

UNIT-III: Magnetic and Dielectric Materials:

Magnetic Materials: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para ferro, anti ferro & ferri – Domain concept of Ferromagnetism(Qualitative) - Hysteresis – soft and hard magnetic materials .

Dielectric Materials: Introduction - Dielectic polarization – Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation.

UNIT-IV: Acoustics and Ultrasonics:

Acoustics: Introduction – requirements of acoustically good auditorium– Reverberation – Reverberation time– Sabine's formula - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

Ultrasonics: Introduction - Properties - Production by magnetostriction and piezoelectric methods – Detection - Non Destructive Testing – pulse echo system through transmission and reflection modes - Applications.

UNIT-V: Crystallography and X-ray diffraction:

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC.

X-ray diffraction: Miller indices – separation between successive (hkl) planes- Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods – powder pattern of bulk, nano materials of ZnO and calculation of lattice cell by Scherrer's formula.

Text books:

1. Engineering Physics – Dr. M.N. Avadhanulu& Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford University press.
3. Engineering Physics by P.K.Palanisamy SciTech publications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics – M.R.Srinivasan, New Age Publications
3. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
4. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press

B.TECH I SEMESTER	**HSMC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE1T03 ENGLISH

Course Objective:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: At the end of the course, student will be able to

CO1 understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information

CO2 ask and answer general questions on familiar topics

CO3 employ suitable strategies to master the art of letter writing and email writing

CO4 recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs

CO5 form sentences using proper grammatical structures and correct word forms

SYLLABUS

UNIT-I	A Drawer full of happiness (Detailed Study) Deliverance (Non-detailed Study)
UNIT-II	Nehru's letter to his daughter Indira on her birthday(Detailed Study) Bosom Friend (Non-detailed Study)

UNIT-III Stephen Hawking-Positivity 'Benchmark' (Detailed Study)
Shakespeare's Sister(Non-detailed Study)

UNIT-IV Liking a Tree, Unbowed: Wangari Maathai-biography (Detailed Study)
Telephone Conversation(Non-detailed Study)

UNIT-V Stay Hungry-Stay foolish (Detailed Study)
Still I Rise(Non-detailed Study)

Text Books

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The Individual Society", Pearson Publications.(Non-detailed)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

B.TECH I SEMESTER

ESC	L	T	P	C
	3	0	3	3

20CE1T04 BUILDING MATERIALS AND CONSTRUCTION

Course Objectives:

- To learn about the nature, properties, classification and manufacturing process of building materials and familiarize with various methods of masonry construction.
- To understand the knowledge of building components, finishings.

SYLLABUS

UNIT - I: Stones, Bricks and Masonry Stones and Bricks

Properties of building stones, Relation to their structural requirements; Classification of stones, Stone quarrying, Precautions in blasting; Dressing of stone; Composition of good brick earth, various methods of manufacture of bricks; Comparison between clamp burning and kiln burning; Qualities of a good brick.

Masonry: Types of Masonry, Rubble and Ashlar masonry; English Bond, Flemish Bond and Rat Trap Bond; Cavity walls and Partition walls.

UNIT - II: Wood, Lime and Cement

Wood: Classification of various types of wood used in buildings, Structure of wood, Properties - Seasoning and Defects in timber.

Lime and Cement: Various ingredients of lime, Constituents of lime, Classification of lime.

Cement: composition, cement manufacturing process, various types of cements, their properties and uses; Various field and laboratory tests for Cement.

UNIT - III: Aggregates

Classification of aggregate, Coarse and Fine aggregates; Particle shape and Texture, Bond and Strength of Aggregate; Specific gravity; Bulk density

; Porosity and Absorption, Moisture content of Aggregate– Bulking of sand.

UNIT - IV: Building Components

Lintels, Arches, Vaults, Types of Stair cases; Different types of floors - Concrete, Mosaic and Terrazzo floors. Pitched, Flat and curved Roofs, Lean-to-Roof ; Coupled roofs, Trussed roofs- King and Queen Post Trusses, RCC flat and Shell roofs.

UNIT - V: Finishings

Damp proofing and Water proofing- materials used; Plastering, Pointing, Whitewashing and Distempering; Painting – Constituents of paints – Types of paints; Painting of new/old Wood Surface – Varnish – Form work and scaffolding.

Text books

1. Building materials,S K Duggal,third Edition – New Age International Publishers.
2. Building Construction,B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, third Edition - Laxmi Publications (P) ltd., New Delhi.

Reference Books

1. Construction Technology,R.Chudly– Volumes I and II 2nd Edition, Longman,UK, 1987.
2. Engineering Materials, S.C.Rangwala, Fourth Edition, Charotar Publications.
3. Building Construction,P.C.Varghese,SecondEdition, Prentice-Hall of India private Ltd,New Delhi.
4. The Text Book of Building Construction,S.P.Arora and S.P.Bindra, Dhanapati Rai, second Edition Publishers.
5. SP-7:2016 National Building Code of India 2016 (NBC 2016).

B.TECH - I SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		1	**0**	**4**	**3**

20CE1T05 : ENGINEERING GRAPHICS

Objective:

- To introduce the students to use orthographic projections, projections of points & simple lines.
- To make the students draw the projections of the lines inclined to both the planes.
- To make the students draw the projections of the plane inclined to both the planes.
- To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
- To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Course Outcomes:

At the end of the course, the student will be able to

CO1: Understand the concepts of projections and draw projections for simple entities such as points and lines.

CO2: Draw orthographic projections of planes and simple solids.

CO3: Understand the concept of sections and sectional views.

CO4: Develop the surfaces for various simple solids and understand the concept of intersection of two solids.

CO5: Analyze the 2D drawings and convert to 3D isometric views.

CO6: Learn computer aided drafting with AutoCAD and draw simple 2D part drawings and orthographic views using the software.

SYLLABUS

UNIT I

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

UNIT II

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders-Simple positions

UNIT III

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one plane.

Sections of Solids: Sections and sectional views of Right regular solids-Prisms, Pyramids, Cones and Cylinder.

UNIT IV

Interpenetration of right regular solids: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

Development of Surfaces: Development of Surfaces of right regular solids-Prisms, Pyramids, Cones and Cylinder

UNIT V

Conversion of orthographic views to isometric view for Simple Solids such as prism, pyramid, cylinder and cone; Conversion of isometric view to orthographic views.

Computer Aided Drafting: Introduction to AutoCAD, Geometric commands, Modify commands, Annotation, Layers, display control and Properties tool bars. Creation of simple 2D part drawings and orthographic views.

Text books:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers

Reference books:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers
2. Engineering Graphics by PI Varghese, McGrawHill Publishers

3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age
4. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

B.TECH I SEMESTER	**HSMC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20CE1L06 ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

- Facilitate effective usage of functional English through role plays
- Focus on vocabulary enhancement
- Foster various nuances of phonetics and accent neutralization

Course Outcomes: At the end of the course, student will be able to

CO1: Acquire basic proficiency in English by learning functional aspects of English language

CO2: Learn the methods of enhancing vocabulary

CO3: Acquaint himself/herself with nuances of Phonetics

LIST OF EXPERIMENTS

1 Greetings and Introductions
2 Requesting Permission & Giving Directions
3 Inviting/Complaining/Congratulating
4 Root Words
5 Phonetics-Sounds and Symbols
6 Pronunciation Rules

References:

1. Strengthen Your Steps, Maruti Publications
2. Interact, Orient Blackswan
3. Word Power Made Easy, Pocket Books

		L	T	P	C
B.TECH I SEMESTER	**BSC**	**0**	**0**	**3**	**1.5**

20CE1L07 ENGINEERING PHYSICS LAB

Pre-requisite: Fundamental understanding of usage of an instrument with proper care.

Course Objective: Objective of the course is to impart

- Training Engineering graduates to handle instruments and their usage methods to improve the accuracy of measurements.

At the end of the course, student will be able to

CO1: **Outcomes**: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

CO2: Implement the basic principles of Mechanics to measure different physical parameters.

CO3: Enhance the knowledge of Usage of electronic devices in various applications

LIST OF EXPERIMENTS

1. Newton's rings –Determination of radius of curvature of Plano Convex Lens.
2. Determination of wavelength of spectral lines -Diffraction Grating
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of wavelength of laser source using diffraction grating
5. Determination of Numerical Aperture and bending loss of a given Optical Fiber.
6. Determination of dispersive power of prism.
7. Determination of Rigidity modulus of a material- Torsional Pendulum.
8. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
9. Determination of Young's modulus by method of single cantilever oscillations
10. Verification of laws of vibrations in stretched strings – Sonometer.

11. Estimation of Planck's Constant using Photo electric Effect
12. Study of I /V Characteristics of Semiconductor diode.
13. I/V characteristics of Zener diode.
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
15. Energy Band gap of a Semiconductor using p - n junction diode

Reference Books

1. A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers, 2017.

		L	T	P	C
B.TECH I SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20CE1L08 CIVIL ENGINEERING WORKSHOP

Course objectives:

- To outline the process of identification of various building components and their estimation
- To provide knowledge on operation of the various survey instruments used for linear and angular measurements.
- To explain the concept of measurement of discharge and velocity in a pipe and density of water
- To demonstrate automatic weather station

LIST OF EXPERIMENTS

1. Demonstration on usage of chain
2. Ranging – offsets – chain-age
3. To find the area of an irregular polygon using chain by using horizontal measurements
4. Determination of bearings and included angles with prismatic compass.
5. Demonstration on various Building materials used in construction
6. Estimation of quantity of bricks, concrete, wood, paint for the given single room building
7. Masonry work hands – on practice work deferent types of bonds in brick masonry
8. Identification of quality of brick through physical tests
9. Identification of soil based on their physical properties

10. Setting out of building: The student is required to set out a building (Single room only) as per the given building plan using tape and cross staff.

11. Demonstration on Installation of simple sanitary fittings and fixtures like Tap, T-joint, Elbow, bend, threading etc.

12. Finding the discharge velocity in a water pipe line also find density of water

13. Computation of Centre of gravity and moment of inertial of (i) I-section and (ii) Channel section.

14. Welding (arc welding and gas welding)

15. Carpentry (Demonstration)

16. Identify deferent types of roads in the campus and write the physical characteristics of layers

17. Demonstration on making of cement mortar/concrete for the given nominal mix

18. Study of given Topo -sheet

REFERENCE BOOKS:

1. Laboratory Manual for Basic Civil Engineering workshops

B.TECH II SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE2T01 TRANSFORM TECHNIQUES

Pre-requisite: Linear Algebra and Differential Equations

Course Objective: Objective of the course is to impart

- Learning the techniques of Laplace transforms to solve ordinary differential equations
- knowledge of Fourier series & Fourier transforms for piecewise continuous functions
- knowledge of solving boundary valued problems

Course Outcomes: At the end of the course, student will be able to

CO1: Able to analyze a class of integrals in terms of beta and gamma functions

CO2: Provide the techniques of Laplace transformations and able to solve problems related to digital signal processing

CO3: Analyze the general periodic functions in the form of an infinite convergent sine and cosine series

CO4: Illustrate the methods to solve the boundary value problems

CO5: Determine a solution of a discrete system using Z- transforms

SYLLABUS

UNIT-I: Special functions:

Beta function, Properties & problems, Gamma function, properties & problems, Relation between Beta and Gamma functions, Evaluation of improper integrals.

UNIT-II: Laplace Transforms (all properties without proofs):

Definition, Transforms of elementary functions, properties of Laplace transforms, Transforms of periodic functions, Transforms of derivatives and integrals, Multiplication by t^n, Division by t, Evaluation of improper integrals.

Inverse Laplace transforms–Method of partial fractions, other methods of finding inverse transforms, Convolution theorem (without proof). Application: Application to differential equations

UNIT-III: Fourier Series & Fourier Transforms:

Euler's formulae (without proof), Conditions of Fourier expansion, Functions having points of discontinuity, Change of inerval, Even and odd functions, Half-range series.

Fourier Integral theorem (without proof), Fourier cosine & sine integral, complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, properties of Fourier transforms (without proof), Convolution theorem(without proof), finite & infinite Fourier sine & cosine transforms.

UNIT-IV: Partial Differential Equations:

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of Variables, Applications: One-dimensional wave and heat equations, two-dimensional heat equation.

UNIT-V: Z-Transforms: (all properties without proofs)

Introduction, definition, some standard z-transforms, linearity property, damping rule, some standard results, shifting U_n to the right, multiplication by n, initial and final value theorems, Inverse z-transforms, convolution theorem, evaluation of inverse z-transforms by partial fractions, applications to difference equations.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

3. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
4. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH II SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE2T02 ENGINEERING CHEMISTRY

Pre-requisite: Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objective: Objective of the course is to impart

- ***Importance*** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- ***Express*** the increases in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
- ***Classify and discuss*** the materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries. Lubrication is also ***summarized***.
- ***Relate*** the need of fuels as a source of energy to any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence introduced.
- ***Explain*** the importance and usage of water as basic material in almost all the industries;
- ***Interpret*** drawbacks of steam boilers and also how portable water is supplied for drinking purposes.

Course Outcomes:

At the end of the course, student will be able to

CO1: ***Analyze*** the different types of composite plastic materials and ***interpret*** the mechanism of conduction in conducting polymers.

CO2: ***Utilize*** the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and c***ategorize*** the reasons for corrosion and study methods to control corrosion.

CO3: ***ynthesize*** nanomaterials for modern advances of engineering technology.

ımmarize the techniques that detect and measure changes of state of reaction.

!ustrate the commonly used industrial materials.

CO4: ***ifferentiate*** petroleum, petrol, synthetic petrol and have knowledge how they are produced.

Study alternate fuels and a***nalyse*** flue gases.

CO5: ***Analyze*** the suitable methods for purification and treatment of hard water and brackish water.

SYLLABUS

UNIT-I: Polymer Technology:

Polymerisation: Introduction, methods of polymerization (addition and Condensation), Physical and mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers: Natural rubber-Drawbacks-vulcanization, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics – GFRP and Aramid FRP

Conducting polymers: Intrinsic and extrinsic conducting polymers

Biodegradable polymers: preparation and applications

UNIT-II: Electrochemical Cells And Corrosion:

Part I*: ELECTROCHEMICAL CELLS:* Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Part II: *Corrosion:* Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress

corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings (cathodic coatings, anodic coatings, electroplating and electroless plating)

UNIT-III: Chemistry Of Materials:

Part- A: ***Nano materials:-*** Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]) with example (TiO_2), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Part-B: ***Refractories:*** **- Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.**

Lubricants: **-** Definition, mechanism of lubricants, properties (definition and importance).

Cement: **-** Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR), deterioration of cement.

UNIT-IV: Fuels:

Introduction, calorific value, higher calorific value, lower calorific values, problems using Dulong's formula, proximate and ultimate analysis of coal sample and their significance, numerical problems, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch and Bergius), petrol knocking, diesel knocking, octane and cetane ratings, anti-knocking agents, Introduction to alternative fuels (Bio-diesel, ethanol, methanol, natural gas, liquefied petroleum gas, compressed natural gas).

UNIT-V: Water Technology:

Hardness of water, determination of hardness by complexometric method, boiler troubles (priming and foaming, scale formation, boiler corrosion,

caustic embrittlement), internal treatments, softening of hard water (zeolite process and related sums, ion exchange process), potable water and its specifications, break point chlorination-desalination (reverse osmosis and electro dialysis).

Standard Books:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", 15/e, Dhanpat Rai & Sons, Delhi,(Latest edition).
2. Shikha Agarwal, "**Engineering Chemistry**", Cambridge University Press, New Delhi,(2019).
3. S.S. Dara, "**A Textbook of Engineering Chemistry**", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

Reference:

1. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry**", Pearson India Edn.
2. O.G. Palana, "**Engineering Chemistry**", Tata McGraw Hill Education Private Limited, 2009). CNR Rao and JM Honig (Eds)
3. "**Preparation and characterization of materials**" Academic press, New York (latest edition) B. S. Murthy, P. Shankar and others,
4. "**Textbook of Nanoscience and Nanotechnology**", University press (latest edition)

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20CE2T03 ENGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

Course outcomes:

1. The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters.
2. The student should be able to determine centroid for lines, areas and center of gravity for volumes and their composites.
3. The student should be able to determine area and mass movement of inertia for composite sections
4. The student should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum.

SYLLABUS

UNIT – I

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces.

Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

UNIT II

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction, Wedges.

Analysis of plane trusses-Method of Joints, Method of Sections.

UNIT – III

Objectives : The students are to be exposed to concepts of centre of gravity.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT – IV

Objectives: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives: The students are to be exposed to rigid motion kinematics and kinetics

Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration

– Motion of Rigid Body – Types and their Analysis in Planar Motion

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation– Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TEXT BOOKS :

1. Engineering Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.
2. Engineering Mechanics- S S Bhavikati –New Age International Publishers

REFERENCES :

3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Engineering Mechanics, Fedinand . L. Singer, Harper – Collins.
5. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications
6. Engineering Mechanics- A K Tayal
7. Engieering Mechanics , R.K.Bansal, Laxmi Publications
8. Engg. Mechanics- KL Kumar-Tata McGraw Hill publications

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE2T04 BUILDING PLANNING AND DRAWING

Course Objectives:

- Initiating the student to different building bye-laws and regulations.
- Imparting the planning aspects of residential buildings and public buildings.
- Giving training exercises on various signs and bonds and different building units.
- Imparting the skills and methods of planning of various buildings.

SYLLABUS

UNIT I: Building Byelaws and Regulations

Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations height of buildings- wall thickness – lightening and ventilation requirements.

Sign Conventions and Bonds

Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond - odd and even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

UNIT II: Residential Buildings

Minimum standards for various parts of buildings requirements of different rooms and their grouping.

Characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions

UNIT III: Public Buildings

Planning of educational institutions, hospitals, dispensaries, office

buildings, banks.
Industrial buildings, hotels and motels, buildings for recreation, Landscaping requirements.

UNIT IV: Doors, Windows, Ventilators And Roofs

Panelled door, panelled and glazed door, glazed windows, panelled windows, swing ventilators, fixed ventilators.

Coupled roof, collar roof, King Post truss, Queen Post truss Sloped and flat roof .

UNIT V: Planning and Designing Of Buildings.

Draw the Plan, Elevation and Sections of a Residential Buildings from the given line diagram.
Draw the Plan, Elevation and Sections of a Public Buildings from the given line diagram.

Text Books:

1. Planning, designing and Scheduling, Gurucharan Singh and Jagadish Singh
2. Building planning and drawing by M. Chakravarthi.
3. 3. ‘A’ Series & ‘B’ Series of JNTU Engineering College, Anantapur,

References:

1. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, New Delhi.
4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai.
5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, Mcgraw Hill Education (P) India Ltd. New Delhi.

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20CE2T05 PROBLEM SOLVING THROUGH C

Pre-requisite:

Course Objective:

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor. To assimilate about File I/O and significance of functions

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of programming

CO2: Understand and Apply loop construct for a given problem

CO3: Demonstrate the use pointers

CO4: Understand the use of functions and develop modular reusable code

CO5: Understand File I/O operations

SYLLABUS

UNIT-I:

INTRODUCTION TO COMPUTERS: Functional Components of computer, computer software, categories of memory, types of programming languages, Development of algorithms, flow charts, software development process, Computer Numbering system

BASICS OF C PROGRAMMING: Introduction to programming paradigms, Structure of C program, Data Types, C Tokens, Operators: Precedence and Associativity, Expressions Input/output statements, Assignment statements

UNIT-II:

Decision making statements: if, if else, nester if. Multi way decision making statements: else if, Switch statement. **Loop statements**: while, do while, for, Compilation process.

UNIT-III:

Introduction to Arrays: Declaration, Initialization, One dimensional array, Example Programs on one dimensional array, Selection sort, linear and binary search, two dimensional arrays, Matrix Operations, Multi-dimensional Arrays

Strings: Declaration, String operations: length, compare, concatenate, copy, String handling functions.

UNIT-IV:

FUNCTIONS: Introduction to functions: Function prototype, function definition, function call, Built-in functions, Recursion, Storage classes, Passing Arrays & Strings to the functions, Preprocessor directives

POINTERS: Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers, Parameter passing: Pass by value, Pass by reference, Dynamic Memory Allocation

UNIT-V:

STRUCTURES AND UNIONS: Structure, Nested structures, Pointer and Structures, Array of structures, Example Program using structures and pointers, Self-referential structures, Unions.

FILE PROCESSING: Files, Types of file processing: Sequential access, Random access, Sequential access file, Random access file, Command line arguments

Text Books:

1. Krnighan. B.W and Ritche, D.M, “The C Programming Language”, Second Edition, Pearson Education, 2006

2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.

References:

1. Pradepdey, Manas Ghosh, “Fundamentals of Computing and programming in C”, First Edition, Oxford University Press, 2009.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh Edition,

Pearson Publication.
3. E Balagursamy, "Programming in C, Sixth Edition, Tata McGraw Hill.
4. Ajay Mittal, "Programming in C A practical Approach", Pearson education

B.TECH II SEMESTER	BSC	L	T	P	C
		0	0	3	1.5

20CE2L06 ENGINEERING CHEMISTRY LAB

Pre-requisite: Acquire some experimental skills.

Course Objective: Objective of the course is to impart

- The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations.
- A few instrumental methods of chemical analysis.

Course Outcomes:

At the end of the course, student will be able to

CO1: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

LIST OF EXPERIMENTS

1. Determination of HCl using standard Na2CO3 solution.
2. Determination of alkalinity of a sample containing Na2CO3 and NaOH.
3. Determination of Mn+2 using standard oxalic acid solution.
4. Determination of ferrous iron using standard K2Cr2O7 solution.
5. Determination of Cu+2 using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe+3 by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method

10 Determination of the concentration of strong acid vs strong base (by conductometric method).

11 Determination of strong acid vs strong base (by potentiometric method).

12 Determination of Mg+2 present in an antacid.

13 Determination of CaCO3 present in an egg shell.

14 Estimation of Vitamin C.

15 Determination of phosphoric content in soft drinks.

16 Adsorption of acetic acid by charcoal.

17 Preparation of nylon-6, 6 and Bakelite (demonstration only).

B.TECH II SEMESTER	ESC	L	T	P	C
		0	0	3	1.5

20CE2L07: COMPUTER AIDED BUILDING DRAWING LAB

Course Objectives:

- The objective of this lab is to teach the student basic drawing fundamentals in various civil engineering applications, specially in building drawing.

Course Outcomes:

At the end of the course, the student will be able to:

- Master the usage of Auto cad commands for drawing 2D & 3D building drawings required for different civil engineering applications.

LIST OF EXPERIMRNTS

1. Introduction to computer aided drafting .
2. Software for CAD – Introduction to different softwares.
3. Practice exercises on CAD software .
4. Drawing of plans of buildings using software a) Single storied buildings b) Multi storied buildings .
5. Developing sections and elevations for a) Single storied buildings b) Multi storied buildings.
6. Detailing of building components like Doors, Windows, Roof Trusses etc. using CAD softwares .
7. 7. Exercises on Development of working drawings of buildings (Residential ,Industrial ,Public buildings).

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh – Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.

B.TECH II SEMESTER	ESC	L	T	P	C
		0	0	3	1.5

20CE2L08 PROBLEM SOLVING THROUGH C LAB

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers &functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

- Demonstrate Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute

the area of the various geometrical shape.

3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and

*(value at address) operator.

2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( )function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name
3. Write a program in C to remove a file from the disk.

B.TECH II SEMESTER	**MC**	**L**	**T**	**P**	**C**
		2	**0**	**-**	**-**

20CE2M09 ENVIRONMENTAL SCIENCE

Course objective:

To understand the importance of Environment and the importance of biodiversity

Course outcomes:

- The importance of environment, Natural resources and current global environmental challenges for the sustenance of the life on planet earth.
- The concepts of the ecosystem and its function in the environment.
- 3.The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- The various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices.
- The environmental legislations of India and Social issues and the possible means
- Environmental assessment and the stages involved in EIA.

SYLLABUS

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Introduction- Scope of Environmental Studies- Importance of Environmental Studies- Need for public awareness, Environmental ethics- Contemporary Environmentalists- Environmental Global moves: Stockholm conference, Earth summit

Concept of an ecosystem - Structure of an ecosystem- function of an ecosystem- Food chains, food webs- ecological pyramids- Energy flow in the ecosystem- Ecological succession- Nutrient cycling- 1°production& 2°production- Major ecosystems: Forest ecosystem- Grassland ecosystem, Desert ecosystem- Aquatic ecosystem: pond, Lake Ecosystem- Streams, river ecosystem, Oceans

UNIT-II: NATURAL RESOURCES AND CONSERVATION

Introduction and classification of natural resources-Forest resources**:** Use and over-exploitation- Deforestation-Timber extraction-Mining- Conservation- Water resources**:** Use and over utilization of surface and ground water,- Floods, drought, Dams and associated problems- Water conservation, rain water harvesting, water shed management-Energy resources**:** renewable energy sources –solar-wind-hydro-tidal- Ocean thermal-geo thermal-bio mass-bio gas-bio fuels- Hydrogen.- Non-renewable energy sources-coal-petroleum-natural gas-Nuclear energy

UNIT-III: **BIODIVERSITY AND ITS CONSERVATION**

Definition, classification- Value of biodiversity-Threats to biodiversity: habitat loss, man-wildlife conflicts- Endangered and endemic species of India-Conservation of biodiversity- Biodiversity at national and local levels, Hot-sports of biodiversity

UNIT-IV: ENVIRONMENTAL PROBLEMS

Global warming, Climate change- Acid rain, Ozone depletion- Air pollution- Water pollution- Soil pollution- Noise pollution, Nuclear hazards- Solid Waste Management: Causes, Consequences and Control methods- Solid Waste Management- Population growth and explosion, effects, control measures- Pollution case studies- Role of an individual in prevention of pollution

UNIT-V: ENVIRONMENTALLEGISLATION & MANAGEMENT

Sustainable development- Air (Prevention and Control of Pollution) Act- Drawbacks- Water (Prevention and control of Pollution) Act- Drawbacks- Wildlife Protection Act- Drawbacks- Forest Conservation Act- Drawbacks- Environmental Protection Act- Drawbacks- Environmental Impact Assessment and its significance- Preparation of Environmental Management Plan and Environmental Impact Statement- Ecotourism

TEXT BOOKS:

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age Publications, New Delhi

2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada

3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCES:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Delhi

			L T P C
B.TECH III SEMESTER		**BSC**	**3 0 0 3**
20CE3T01	**NUMERICAL METHODS AND VECTOR CALCULUS**		

Course objectives:

Pre Requisites: Mathematics

Objectives: Understand the basic numerical methods to solve simultaneous linear equations. To quantify the knowledge of numerical methods to solve ordinary differential equations

Course Outcomes: after the completion of the course student should be able to

CO1: Determine the solution of transcendental equations by different numerical methods. Provide the interpolation techniques which analyze the data of an unknown function.

CO2: Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries

CO3: Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries.

CO4: Evaluate areas and volumes using double & triple integrals.

CO5: Apply the concepts of calculus to scalar and vector fields and establish the relation between line, surface and volume integrals.

Syllabus:

UNIT I: Numerical Solution of Equations:

Solution of Algebraic and transcendental equations: Bisection method, Method of false position and Newton-Raphson method. Iterative methods of solution of linear simultaneous equations: Jacobi's and Gauss-Seidel iteration methods.

UNIT II: Interpolation: Forward and backward, relation between these operators, Differences of a polynomial, Interpolation with unequal intervals: Lagrange's interpolation formula, Newton's forward & backward interpolation formulae & problems.

UNIT III: Numerical Integration & Numerical Solutions of ordinary differential equations with initial conditions:

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rules. Numerical Solution of ODE: Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method of 4th order.

UNIT IV: Multiple Integrals:

Double integrals in Cartesian & polar coordinates, Change of order of integration, Triple integrals, Change of variables (Cartesian to Polar, Rectangular coordinates to Cylindrical & Rectangular coordinates to Spherical polar coordinate systems). **Applications:** Area enclosed by plane curves, Volume of solids.

Unit-V: Vector Differentiation & Vector Integration:

Introduction, Scalar and Vector point functions, Del applied to scalar point functions-Gradient, directional derivatives, Del applied to vector point functions-Div& Curl, physical interpretation of div & curl, Del applied twice to point functions, Del applied to products of point functions (Identities without proofs).

Line integral, Green's theorem in the plane (without proof), Surface integrals, Stoke's theorem (without proof), Volume integral, Gauss Divergence theorem (without proof)

Text Books:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014.
2. **B. V. RAMANA,** Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

3. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
4. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE3T02 STRENGTH OF MATERIALS

Pre Requisites: Engineering Mechanics

Objectives: The subject provide the knowledge of simple stress strains flexural stresses in members, shear stresses and deflection in beams so that the concepts can be applied to the Engineering problems.

Course Outcomes: after the completion of the course student should be able to

CO1: Gain a broad understanding of behavior of materials
CO2: Identify forces to be resisted by member
CO3: Analyze stresses in member
CO4: Determine deformations of simple members

SYLLABUS

UNIT – I

SIMPLE STRESSES AND STRAINS:

Simple Stresses and strains – Elastic constants – Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member – Composite Bars – Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress – Mohr's circle method.

UNIT – II

SHEAR FORCE AND BENDING MOMENT:

Types of loads, supports, beams – concept of shearing force and bending moment – Relationship between intensity of load, Shear Force and Bending moment – Shear Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment.

UNIT – III

FLEXURAL STRESSES:

Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

SHEAR STRESSES:

Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT – IV

DEFLECTION OF BEAMS:

Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, Uniformly varying load-Mohr's theorems – Moment area method – application to simple cases.

UNIT – V

Torsion, Shafts & Springs, Theories of Failures: Torsion of circular and hollow shafts, Elastic Theory of torsion, Stresses and Deflection in circular solid and hollow shafts. Combined bending moment and torsion of shafts – Strain energy due to torsion- Modulus of Rupture – Power transmitted to shaft- shaft in series and parallel- Closed and open coiled helical springs- Leaf springs.

Text Books:

1) Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd.

2) Strength of Materials by R.K Rajput, S.Chand & Company Ltd.

References:

1) Strength of Materials by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

2) Mechanics of Structures Vol –I by H.J.Shah and S.B.Junnarkar, Charotar Publishing

House Pvt. Ltd.

3) Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.

4) Strength of Materials by S.S.Rattan, Tata McGraw Hill Education Pvt. Ltd.

5) Fundamentals of Solid Mechancis by M.L.Gambhir, PHI Learning Pvt. Ltd

6) Strength of Materials and Structures by John Case *et al.*, Butterworth-Heinemann.

B.TECH III SEMESTER	PCC	L	T	P	C
		3	0	0	3

20CE3T03 FLUID MECHANICS

Pre Requisites: Engineering Mechanics

Objectives: This subject introduces the basic concepts of fluids, their behavioural properties, analyzing the fluid flows using primary equations. This subject further deals with various flow measuring devices and concepts of boundary layer flows.

Course Outcomes: after the completion of the course student should be able to

CO1: Understanding the behavior of fluids and its properties.
CO2: Able to identify and understand the static fluid systems.
CO3: Able to identify and understand the dynamic fluid systems.
CO4: Able to analyze the flow parameters and design different fluid flow systems

SYLLABUS

UNIT I

INTRODUCTION : Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers. Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems.

UNTI – II

FLUID KINEMATICS: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows : Steady, unsteady, uniform, non uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis.

UNIT – III

FLUID DYNAMICS and Measurement of Flow: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, (Navier – stokes equations (Explanationary) Momentum equation and its application – forces on pipe bend. Pitot tube, Venturi meter and orifice meter – classification of orifices, flow over rectangular, triangular and trapezoidal and stepped notches - –Broad crested weirs

UNIT - IV

CLOSED CONDUIT FLOW: Reynold's experiment – Characteristics of Laminar & Turbulent flows. Laws of Fluid friction – Darcy's equation, ,variation of friction factor with Reynold's number – Moody's Chart, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Pipe network problems Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

UNIT – V

BOUNDARY LAYER THEORY: Approximate Solutions of Navier Stoke's Equations – Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers (no derivations) BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K.Som & G.Biswas (Tata Mc.Grawhill publishers Pvt. Ltd.)
3. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer, Oxford University Press, New Delhi

REFERENCES:

1. Fluid Mechanics by J.F.Douglas, J.M. Gaserek and J.A.Swaffirld (Longman)
2. Fluid Mechanics by Frank.M. White (Tata Mc.Grawhill Pvt. Ltd.)
3. Fluid Mechanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi
4. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) ltd., New Delhi

			L	T	P	C
B.TECH III SEMESTER		**PCC**	**3**	**0**	**0**	**3**
20CE3T04	**CONCRETE TECHNOLOGY**					

Course Objectives: Lot of advantages are taking place in the concrete technology as par with development taking place in the engineering. The present day industry needs the knowledge of concrete technology thoroughly. The subject is designed to give the basic knowledge as well as latest developments in concrete technology.

Course Outcomes: After the completion of the course student should be able to

CO1: Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.

CO2: Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties

CO3: Use advanced laboratory techniques to characterize cement-based materials.

CO4: Perform mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete

UNIT I

CEMENT: Portland cement – chemical composition – Types of Cements– Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

UNIT - II

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT – III

FRESH CONCRETE: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT - IV

HARDENED CONCRETE : Water / Cement ratio – Abram's Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT

ELASTICITY, CREEP &SHRINKAGE: Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT – V

MIX DESIGN: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

SPECIAL CONCRETES: Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

Text books:

1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition

2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004

References:

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

2. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi

3. Concrete: Micro structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers

B.TECH III SEMESTER **PCC**

L	T	P	C
3	0	0	3

20CE3T05 SURVEYING

Pre Requisites: Engineering Mechanics

Objectives: The first step in engineering practice is surveying and the soundness of the any civil engineering work is dependent on the reliability and accuracy of the surveying.

There ore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

Course Outcomes: after the completion of the course student should be able to

CO1: Gain a broad understanding of Land Survey

CO2: Get accustoms with the angular and linear measurements.

CO3: Trained with recording the field information and necessary plot.

CO4: Contemporary issues and developments.

Unit-I:

Introduction and Basic Concepts

Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip.

Unit-II

Leveling and Contouring

Leveling- Basics definitions, types of levels and leveling staves, temporary adjustments, methods of leveling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Plan Table Surveying: Introduction of Plane table surveying- Area by the method of radiation and intersection – Two point problem

Computation of Areas and Volumes

Areas- Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes- Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

Unit-III

Theodolite Surveying

Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.

Traversing

Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

Unit-IV

Tacheometric Surveying

Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves

Types of curves and their necessity, elements of simple curve, setting out of simple Curves, Introduction to compound curves.

Unit-V

Modern Surveying Methods

Total Station and Global Positioning System. : Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working, E.D.M. method and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

TEXT BOOKS:

1. Chandra A M, “Plane Surveying”, New age International Pvt. Ltd., Publishers, New Delhi, 2002.
2. Chandra A M, “Higher Surveying”, New age International Pvt. Ltd., Publishers, New Delhi, 2002.
3. Duggal S K, “Surveying (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. New Delhi, 2004.
4. Hoffman.B, H.Lichtenegga and J.Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers, 2001.

REFERENCES:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill – 2000
2. Arora K R “Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004

3. Surveying (Vol – 1, 2 & 3), by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi

4. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi

5. Surveying by BHAVIKATTI; Vikas publishing house ltd.

B.TECH III SEMESTER		**PCC**	**L**	**T**	**P**	**C**
			0	**0**	**3**	**1.5**
20CE3L06	**STRENGTH OF MATERIALS LAB**					

Experiments

1. Tension test on Mild steel bar
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood orconcrete
8. Impact test (Charpy and Izod impact test)
9. Shear test (on UTM)
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of Electrical resistance strain gauges
12. Continuous beam – deflection test.

List of Major Equipment:

1. Universal Testing Machine
2. Torsion testing machine
3. Brinnell's / Rock well's hardness testing machine
4. Setup for spring tests
5. Compression testing machine
6. Izod Impact machine
7. Shear testing machine
8. Beam setup for Maxwell's theorem verification.

Note: Any10 Experiments must be completed**.**

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20CE3L07 SURVEYING FIELD WORK

List of Field Works:

1. Survey by chain survey of road profile with offsets in case of road widening.
2. Survey in an area by chain survey (Closed circuit)
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse)
5. Plane table survey; finding the area of a given boundary by the method of Radiation
6. Plane table survey; finding the area of a given boundary by the method of intersection.
7. Two Point Problem by the plane table survey.
8. Fly levelling: Height of the instrument method (differential levelling)
9. Fly levelling: rise and fall method.
10. Fly levelling: closed circuit/ open circuit.
11. Fly levelling; Longitudinal Section and Cross sections of a given road profile.
12. Fly levelling and Fly chaining (complete field work).

Note: Any 10 field work assignments must be completed.

B.TECH III SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20CE3L08 CONCRETE TECHNOLOGY LAB

Pre-Requisites: Concrete Technology Theory

Course Objectives

To develop the skill of testing the building materials like cement & aggregates.

To impart the knowledge on properties of fresh concrete.

To familiarize with the strength properties of hardened Concrete.

To introduce the concepts of non-destructive testing.

List of Experiments

I. Tests on Cement

Normal Consistency and Fineness of Cement. (IS: 4031-PART 4&1)

Initial and Final Setting Times of Cement. (IS: 4031-PART5)

Specific Gravity and Soundness of Cement. (IS: 4031-PART 11&3).

Compressive Strength of Cement. (IS: 4031-PART6)

II. Tests on Fine Aggregate

Specific Gravity and Bulking of Sand (IS: 2386-PART3)

Fineness Modulus and Grading of Fine aggregate (IS:383)

III. Tests on Coarse Aggregate

Specific Gravity of Coarse aggregate. (IS: 2386-PART3)

Fineness Modulus of Coarse aggregate. (IS: 2386-PART1)

Flakiness index of coarse aggregate. (IS: 2386-PART1)

Elongation index of coarse aggregate. (IS: 2386-PART1)

IV. Tests on Fresh and Hardened Concrete

Workability test on concrete by compaction factor, slump and Vee-bee. (IS:1199)

Compressive strength, split tensile strength and flexural strength of concrete (IS:516)

Non-Destructive testing on concrete by Rebound hammer. (IS: 13311-PART1)

B.TECH III SEMESTER		**SC**	**L**	**T**	**P**	**C**
			0	**0**	**4**	**2**
20CE3S09	**AUTOCAD 2D&3D (Skill Oriented Course-I)**					

Course Objectives: The objective of this lab is to teach the student usage of Auto cad and basic drawing fundamentals in various civil engineering applications, specially in building drawing.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Use the Autocad commands for drawing 2D & 3D building drawings required for different civil Engg applications ,

CO2: Plan and draw Civil Engineering Buildings as per aspect and orientation.

CO3: Presenting drawings as per user requirements and preparation of technical report

LIST OF EXPERIMENTS

1. Introduction to computer aided drafting and different coordinate system
2. Drawing of Regular shapes using Editor Mode
3. Introduction GUI and drawing of regular shapes using GUI
4. Exercise on Draw tools
5. Exercise on Modify tools
6. Exercise on other tools (Layers, dimensions, texting etc.)
7. Drawing of building components like walls, lintels, Doors, and Windows. Using CAD software
8. Drawing a plan of Building and dimensioning
9. Drawing a plan of a residential building using layers
10. Developing a 3-D plan from a given 2-D plan

11. Developing sections and elevations for given a) Single storied buildings b) multi storied buildings

12. Auto CAD applications in surveying, mechanics etc.

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh –Laxmi Publications.

2. Engineering Graphics by P. J. Sha – S. Chand & Co.

B.TECH IV SEMESTER	HSMC	L	T	P	C
		3	0	0	3

20CE4T01: COMPLEX VARIABLES AND STATISTICAL METHODS

Pre-requisite: Basic knowledge about Calculus and Probability

Course Objective: Objective of the course is to impart

- basic understanding of complex variable theory
- description of sampling distribution of means, proportions & variances
- testing the hypothesis concerning means, proportions & variances

Course Outcomes:

At the end of the course, student will be able to

CO 1: Determine analytic and non-analytic functions

CO 2: Analyze the analytic function into a power series which is useful in the study of communication systems.

CO 3: Understand random variables and probability distributions

CO 4: Apply different distributions to compute confidence intervals

CO 5: Test the hypothesis concerning means and proportions

SYLLABUS

UNIT-I: Analytic Functions:

Introduction, Complex function, Limit and continuity of a complex function, Derivative of f(z), Analytic functions, Harmonic functions & orthogonal system, finding analytic functions by Milne-Thomson method. Applications to flow problems.

UNIT-II: Complex Integration and Residues: (all theorems without proofs)

Complex integration, Cauchy's theorem and Cauchy's integral formula, Series of complex terms, Taylor's series and Laurent's series. Zeros and singularities of an analytic function, Residues and Cauchy-Residue theorem. Evaluation of real definite integrals using contour integration about unit circle.

UNIT-III: Random variables and distributions:

Introduction-Discrete & Continuous Random variable - Distribution functions.

Binomial, Poisson distributions. Continuous distribution: Normal distributions, Normal approximation to Binomial distribution.

UNIT-IV: Sampling Theory:

Introduction - Population and samples- Sampling distribution of means (s known)-Central limit theorem- t-distribution- Sampling distribution of means (s unknown)- Sampling distribution of variances - Point estimation- Maximum error of estimate - Interval estimation.

UNIT-V: Tests of Hypothesis:

Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors – Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences.

Text Books:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014.
2. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition, PHI.

Reference Books:

3. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.
4. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8thedition, Cengage Publshers.

		L	T	P	C
B.TECH IV SEMESTER	**ESC**	**3**	**0**	**0**	**3**

20CE4T02 ENGINEERING GEOLOGY

Course Objectives:

The objective of this course is:

- To introduce the Engineering Geology as a subject in Civil Engineering
- To enable the student to use subject in civil engineering applications.
- To know the Geological history of India.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Identify and classify the geological minerals

CO2: Measure the rock strengths of various rocks

CO3: Classify and measure the earthquake prone areas to practice the hazard zonation

CO4: Classify, monitor and measure the Landslides and subsidence

CO5: Prepares, analyses and interpret the Engineering Geologic maps

CO6: Analyses the ground conditions through geophysical surveys.

CO7: Test the geological material and ground to check the suitability of civil engineering project construction.

CO8: Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc...

SYLLABUS

UNIT-I: Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies

Weathering: Weathering of rocks, Geological agents, weathering process of Rock, River process and their development.

UNIT-II

Mineralogy And Petrology: Definitions of mineral, Structures of silicates and rock, Different methods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks, Common rock forming minerals are Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and other ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite And Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate and their importance in Civil Engineering.

UNIT-III

Structural Geology: Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering–Indian stratigraphy. Aims of statigrtaphy, Principles, Geological time scour, Geological division in India, Major stratigraphic units in India.

UNIT-IV

Earthquakes And Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides Case studies.

UNIT-V

Geophysics: Importance of Geophysical methods, Classification, Principles ofGeophysicalstudybyGravitymethod,Magneticmethod,Electricalmethods,S eismicmethods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

Geology of Dams, Reservoirs And Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunneling, effects, Lining of Tunnels. Influence of Geology for successful Tunneling.

Text Books:

1. Engineering Geology, N. Chenn Kesavulu, Laxmi Publications, 2nd

Edition, 2014.

2. Engineering Geology, Subinoy Gangopadhay, Oxford University press

References:

1. Engineering Geology, D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
2. Engineering Geology, Vasudev Kanithi, University Press.
3. Engineering Geology for Civil Engineers P. C. Varghese, PHI learning pvt. Ltd.
4. G Fundamentals of Engineering Geology' P.G. Bell, B. S. P. Publications, 2012
5. Geology for Engineers and Environmental Society, Alan E Kehew, person publications, 3rd edition.
6. Engineer's Geology by S. K. Duggal, H.K. Pandey, N. Rawd, McGraw Hill education.
7. Engineering Geology, K. S. Valdiya, McGraw Hill.
8. Environmental Geology, K. S Valdiya, Mcgraw Hill Publications, 2nd Edition.

		L	T	P	C
B.TECH IV SEMESTER	**PCC**	3	0	0	3

20CE4T03 HYDRAULICS AND HYDRAULIC MACHINERY

Course Objectives:

- To study about uniform and non-uniform flows in open channel and also to learn about the characteristics of hydraulic jump
- To introduce dimensional analysis for fluid flow problems
- Tounderstandtheworkingprinciplesofvarioustypesofhydraulicmachinesandpumps.

Course Outcomes:

Upon successful completion of this course the students will be able to:

CO1: Solve uniform and non-uniform open channel flow problems.

CO2: Apply the principals of dimensional analysis and similitude in hydraulic model testing.

CO3: Understand the working principles of various hydraulic machineries and pumps.

SYLLABUS

UNIT– I UNIFORMFLOW IN OPEN CHANNELS:

Types of channels–Types of flows-Velocity distribution–Energy and momentum correction factors–Chezy's, and Manning's formulae for uniform flow–Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth

UNIT II NON-UNIFORM FLOW IN OPEN CHANNELS:

Steady Gradually Varied flow-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes – surface profiles – direct step method-Rapidly varied flow, hydraulic jump, energy dissipation.

UNIT – III HYDRAULIC SIMILITUDE:

Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimension less numbers– model and proto type relations.

UNIT–IV

BASICS OF TURBOMACHINERY:

Hydro dynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle

UNIT – V

HYDRAULIC TURBINES – I:

Layout of a typical Hydropower installation –Heads and efficiencies - classification of turbines, Pelton wheel - Francis turbine – Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-geometric similarity – cavitation.

UNIT– VI

CENTRAIFUGAL-PUMPS:

Pump installation details-classification-work done - Manometric head-minimum starting speed-losses and efficiencies-specific speed,multistagepumps-pumpsinparallelandseries-performanceofpumps-characteristiccurves- NPSH-Cavitation.

RECIPROCATINGPUMPS:

Introduction, classification, components, working, discharge, indicat or diagram, work done and slip.

Text Books:

1. Open Channel flow, K.Subramanya, Tata McGraw Hill Publishers
2. A text of Fluid mechanics and hydraulic machines, R.K.Bansal Laxmi Publications New Delhi
3. Fluid Mechanics, Modi and Seth, Standard book house.

References:

1. Fluid Flow in Pipes and Channels, G.L.Asawa, CBS
2. Fluid Mechanics and Machinery, C.S.P.OJHA, R.BERNDTSSON

and P.N.Chandramouli, Oxford Higher Education.

3. Fluid Mechanics and Machinery, Md.KaleemKhan, Oxford Higher Education.

B.TECH IV SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE4T04 **STRUCTURAL ANALYSIS-1**

Pre Requisites: Strength of Materials –I

Objectives: To make the students to understand the principles of analysis of structures of static and moving loads by various methods.

Course Outcomes: after the completion of the course student should be able to

CO1: Able to analyse the determinate and in-determinate structures

CO2: Able to understand the behavior of Structural systems

CO3: Able to evaluate the response of structural systems subjected to static and moving loads

SYLLABUS

UNIT – I

ANALYSIS OF PERFECT FRAMES:

Determinate and indeterminate structures. Degree of freedom. Types of frames- Perfect, Imperfect and Redundant pin jointed frames. - Analysis of determinate pin jointed frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT-II

Columns and Struts:

Introduction–Types of columns–Short, medium and long columns– Axially loaded compression members–Crushing load–Euler's theorem-assumptions-derivation of Euler's critical load formulae for various end conditions–Equivalent length of a column–slenderness ratio–Euler's critical stress–Limitations of Euler's theory– Rankine–Gordon formula–Long columns subjected to eccentric loading–Secant formula–Empirical formulae–Straight line formula–Prof. Perry's formula.

UNIT – III

PROPPED CANTILEVER and FIXED BEAMS:

Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - Shear force and Bending moment diagrams for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams; effect of sinking of support, effect of rotation of a support.

UNIT – IV

CONTINUOUS BEAMS:

Introduction-Continuous beams. Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang. Effects of sinking of supports.

SLOPE DEFLECTION METHOD:

Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Determination of static and kinematic indeterminacies for frames. Analysis of Single Bay – Single storey Portal Frames by Slope Deflection Method Including Side Sway. Shear force and bending moment diagrams and Elastic curve.

UNIT – V

MOVING LOADS AND INFLUENCE LINES:

Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length. Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section - Point loads, UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses. Equivalent uniformly distributed load. Focal length.

Text Books:

1) Structural Analysis Vol–I & II by V. N. Vazirani and M. M. Ratwani, Khanna Publishers.
2) Structural Analysis Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.
3) Basic Structural Analysis by K.U.Muthu *et al.,* I.K.International Publishing House Pvt.Ltd.

References:

1) Structural Analysis by R.C.Hibbeler, Pearson Education
2) Mechanics of Structures Vol – I and II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
3) Structural Analysis by Devdas Menon, Narosa Publishing House.
4) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Education Pvt. Ltd.
5) Fundamentals of Structural Analysis by M.L.Gamhir, PHI Learning Pvt. Ltd
6) Structural Analysis -I by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

B.TECH IV SEMESTER

HSMC	L	T	P	C
	3	0	0	3

20CE4T05 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product

CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs

CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units

CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis

CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

SYLLABUS

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of

Demand, Types of Elasticity of Demand and Measurement Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.

2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition

3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.

4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd

5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd

6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

B.TECH IV SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20CE4L06 ENGINEERING GEOLOGY LAB

Course Objectives:

The objective of this lab is that to provide practical knowledge about physical properties of minerals, rocks, drawing of geological maps, showing faults, uniformities etc.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand the method and ways of investigations required for Civil Engineering projects

CO2: Identify the various rocks, minerals depending on geological classifications

CO3: Learn to couple geologic expertise with the engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects and the quantification of processes such as rock slides and settlement.

CO4: Write a technical laboratory report

LIST OF EXPERIMENTS

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite;

   Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
4. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Pegmatite, and Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.

5. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
6. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
7. Study of topographical features from Geological maps. Identification of symbols in maps.
8. Simple structural Geology Problems (Strike & Dip and Bore hole data)

LAB EXAMINATION PATTERN:

1. Description and identification of minerals
2. Description and identification of rocks (igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problem.
5. Simple bore hole data problem.

Note: Any10 Experiments must be completed**.**

B.TECH IV SEMESTER		**PCC**	**L**	**T P**	**C**
			0	**0 3**	**1.5**
20CE4L07	**FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**				

LIST OF EXPERIMENTS

1. Calibration of Venturimeter & Orificemeter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouthpiece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jetonvanes
8. Study of Hydraulic jump.
9. Performance test on Peltonwheel turbine
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Efficiency test on reciprocating pump.

Note: Any10 Experiments must be completed**.**

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B.TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20CE4L08 ADVANCED SURVEYING LAB

LIST OF EXPERIMENTS

1 The odolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.

2 The odolite Survey: Finding the distance between two in accessible points.

3 The odolite Survey: Finding the height off arobject.

4 Tachometric Survey: Heights and distance problems using tachometric principles.

5 One Exercise on Curve setting.

6 One Exercise on contours.

7 Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallax error.

8 Total Station: Determination of area using total station.

9 Total Station: Traversing

10 Total Station: Contouring

11 Total Station: Determination of Remote height.

12 Total Station: Distance between two in accessible points.

Note: Any10 field work assignments must be completed.

B.TECH IV SEMESTER		SC	L	T	P	C
			0	0	4	2
20CE4S09	REVIT ARCHITECTURE (Skill Oriented Course-II)					

1 Introduction to Revit Architecture Software, User Interface,
2 Introduction to BIM
3 Introduction to Basic Commands, Templates
4 Setting of units, explaining about Walls Doors, Windows, Edit Type
5 Placing of Components, Explaining about Modify Tools
6 Creating Floor, Ceiling, Editing Floor and Ceiling
7 Curtain Walls, Wall Opening
8 Roofs Types of Roofs
9 Staircase Types of Staircase
10 Ramp, Railing, Creating Section View
11 Text, Dimension, Annotations, Model Text, Model line, Room & Area
12 Paint, Colour Scheme, Creating new Materials, Sweep, Extrude Modeling

B.TECH IV SEMESTER

	L	T	P	C
MC	2	-	-	-

20CE4M10 **CONSTITUTION OF INDIA**

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand historical background of the constitution making, importance for building a democratic India, features and principles of Indian Constitution.

CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO3: Understand the roles and powers of State Government and its Administration and value of the fundamental rights and duties for becoming good citizen of India.

CO4: Understand and analyze the decentralization of power between Union, State and Local self-Government and local administration.

CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission, UPSC, Welfare commissions for sustaining democracy.

SYLLABUS

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution -Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, Rajya Sabha, The Supreme Court and High Court: Powers
and Functions;

UNIT III

State Government and its Administration Governor, Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV

A Local Administration, District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy(Different departments),
Village level, Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V

Election Commission: Election Commission, Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.

2) Subash Kashyap, Indian Constitution, National Book Trust

3) J.A. Siwach, Dynamics of Indian Government & Politics

4) D.C. Gupta, Indian Government and Politics

5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

6) J.C. Johari, Indian Government and Politics Hans

7) J. Raj Indian Government and Politics

8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in

Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-sources:

1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5)www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

B.TECH V SEMESTER

PCC	L	T	P	C
	3	0	0	3

20CE5T01 GEOTECHNICAL ENGINEERING-1

Course Objectives: The objective of this course is to

- Understand the formation of soil and classification of the soils
- Determine the Index & Engineering Properties of Soils
- Determine the flow characteristics & stresses due to externally applied loads Estimate the consolidation properties of soils
- Estimate the shear strength and seepage loss

Course Outcomes: On successful completion of this course, the student will be able to

CO1: Characterize and classify the soils

CO2: Able to estimate seepage, stresses under various loading conditions and compaction characteristics

CO3: Able to analyze the compressibility of the soils

CO4: Able to understand the strength of soils under various drainage conditions

SYLLABUS

UNIT–I:

INTRODUCTION: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity-Field density by core cutter and sand replacement methods-Relative density.

INDEX PROPERTIES OF SOILS: Grain size analysis – consistency limits and indices –I. S. Classification of soils.

UNIT–II:

PERMEABILITY: Soil water – capillary rise – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems.

EFFECTIVE STRESS & SEEPAGE THROUGH SOILS: Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT–III:

STRESS DISTRIBUTION IN SOILS: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

COMPACTION: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

UNIT–IV:

CONSOLIDATION: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil - pre consolidation pressure and its determination - Terzaghi's 1-D consolidation theory-coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

UNIT–V:

SHEAR STRENGTH OF SOILS: Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt Ltd,
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.

Reference Books:

1. Foundation Engineering by P.C.Varghese, PHI
2. Soil Mechanics and Foundation Engg. By K. R. Arora, Standard Publishers and Distributors, Delhi.
3. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.
4. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
5. Geotechnical Engineering Principles and Practices by Cuduto, PHI Intrernational.
6. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.
7. Soil Mechanics and Foundation by byB.C.Punmia, Ashok Kumar Jain and Arun KumarJain, Laxmi, publications Pvt. Ltd., New Delhi.

B.TECH V SEMESTER **PCC**

L	T	P	C
3	0	0	3

20CE5T02 TRANSPORTATION ENGINEERING -1

Course Objectives: The objective of this course is to

- Highway development in India an understanding factors to be considered while aligning of highways.
- Understand the necessity of highway geometric design.
- Introduce traffic characteristic, road safety and parking issues.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand the longitudinal and cross sectional elements of a highway.

CO2: Design the horizontal and vertical alignment of roads.

CO3: Understanding the concept of intersections, interchanges.

CO4: Understanding the various parking parameters.

SYLLABUS

UNIT-I:

HIGHWAY DEVELOPMENT AND PLANNING: Highway Development in India – Necessity for Highway Planning- Different Road Development Plans; Classification of Roads - Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports – Highway Project.

UNIT–II:

HIGHWAY GEOMETIC DESIGN: Importance of Geometric Design - Design controls and Criteria - Highway Cross Section Elements - Sight Distance Elements- Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance - Design of Horizontal Alignment - Design of Super elevation and Extra widening- Design of Transition Curves - Design of Vertical alignment-Gradients- Vertical curves.

UNIT–III:

TRAFFIC ENGINEERING & REGULATIONS: Basic Parameters of Traffic-Volume, Speed and Density - Traffic Volume Studies - Data Collection and Presentation - Speed studies - Data Collection and Presentation - Origin & Destination studies, Parking Studies – On street & Off street Parking - Road Accidents - Causes and Preventive Measures – Accident data Recording – Condition Diagram and Collision Diagrams - Traffic Signs – Types and Specifications – Road Markings - Need for Road Markings-Types of Road Markings - Design of Traffic Signals – Webster Method

UNIT–IV:

Highway Materials and Construction : Subgrade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen– Bituminous paving mixes: Requirements – Marshall Method of Mix Design - Construction of Earthen , Gravel, Water Bound Macadam (WBM) Roads – Construction of Bituminous Pavements and Cement Concrete Pavements.

UNIT-V:

Design of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors.

Flexible Pavements: Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses –Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

Text books:

1. Highway Engineering – S.K. Khanna & C.E.G.Justo, A. Veera Ragavan Nemchand & Bros., 7th edition-2000.
2. Traffic Engineering & Transportation Planning – Dr.L.R. Kadyali, Khanna Publications – 6th Edition – 1997.

Reference Books:

1. Principles of Traffic and Highway Engineering – Garber & Hoel, Cengage Learning.
2. Principles and Practices of Highway Engineering – Dr. L. R. Kadiyali and Dr.N. B Lal - Kha nna Publications.
3. Highway Engineering – S.P. Bindra, Dhanpat Rai & Sons. – 4th Edition (1981).

B.TECH V SEMESTER	PCC	L	T	P	C
		3	0	0	3

20CE5T03 DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES

Course Objectives: The objective of this course is to

- Identify the basic components of any structural system and the standard loading for the RC structure
- Identify and tell the various codal provisions given in IS. 456
- Describe the salient feature of limit state method, compare with other methods And the concepts of limit state of collapse and limit state of serviceability
- Evaluate the behaviour of RC member under flexure, shear and compression, torsion and bond.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Compare and Design the singly reinforced, doubly reinforced and flanged sections.

CO2: Design the axially loaded, uniaxial and biaxial bending columns.

CO3: Classify the footings and Design the isolated square, rectangular and circular footings.

CO4: Distinguish and Design the one-way and two-way slabs.

SYLLABUS

UNIT-I:

Introduction- Structure - Components of structure - Different types of structures - Equilibrium and compatibility– Safety and Stability - Loads – Different types of Loads – Dead Load, Live Load, Earthquake Load and Wind Load– Forces – Different types of materials – RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method – Load combinations as per Limit state method - Materials - Characteristic Values – Partial safety factors – Behaviour and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 -2000. Limit state Analysis and design of sections in Flexure – Behaviour of RC section under flexure - Rectangular, T and L-sections, singly reinforced and doubly reinforced Beams – Detailing of reinforcement.

UNIT-II:

Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond –Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement.

UNIT-III:

Design of Two-way slabs with different end conditions, one-way slab, and continuous slab Using I S Coefficients - Design of dog-legged staircase – Limit state design for serviceability for deflection, cracking and codal provisions.

UNIT–IV:

Design of compression members - Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - I S Code provisions.

UNIT–V:

Design of foundation **-** Different types of footings – Design of wall footing – Design of flat isolated square, rectangular, circular footings and combined footings for two columns.

Text books:

1. Limit state designed of reinforced concrete – P.C. Varghese, PHI Learning Pvt. Ltd.
2. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill.
3. Reinforced concrete design by N.Krishna Raju and R.N. Pranesh, New age International Publishers.

IS Codes: IS Code 456-2000 (Permitted to use in examination hall) IS- 875 SP-16

Reference Books:

1. Reinforced concrete structures, Vol. 1, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd.
2. Fundamentals of Reinforced concrete design by M. L. Gambhir, Prentice Hall of India Pvt. Ltd.,
3. Design of Reinforced Concrete Structures by N. Subramanian, Oxford University Press
4. Design of concrete structures by J.N. Bandhyopadhyay PHI Learning Private Limited.
5. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand & Company.

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in two components as follows :

1. Descriptive examination - 25 Marks
2. Assignment - 5 Marks

NOTE:

Alternate weeks two periods of theory can be converted into drawing classes. The end examination paper should consist of Part – A and Part – B. Part – A should consist of two questions in design and drawing out of which one question to be answered. Part –B should consist of five questions in design out of which three to be answered. Weightage for Part – A is 40 % and Part – B is 60 %.

B.TECH V SEMESTER

PEC	L	T	P	C
	3	0	0	3

20CE5T06 STRUCTURAL ANALYSIS – II

(PROFESSIONAL ELECTIVE-I)

Course Objectives: **The objective of this course is to**

- Identify the various actions in arches.
- Understand classical methods of analysis for statically indeterminate structures.
- Differentiate the approximate and numerical methods of analysis for indeterminate structures.
- Find the degree of static and kinematic indeterminacies of the structures.
- Plot the variation of S.F and B.M when a moving load passes on indeterminate structure

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Understand the importance of various methods of slop and deflections for determinate structures.

CO2: Analyze the two hinged arches.

CO3: Solve statically indeterminate beams and portal frames using classical methods

CO4: Formulate the multistoried buildings by approximate methods

CO5: Formulate the stiffness matrix and analyze the beams by matrix methods

SYLLABUS

UNIT-I: ENERGY METHODS:

Introduction- expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem. Strain energy method for analysis of indeterminate structures, beams, pin jointed and rigid jointed structures, temperature effect, bending moment and shear force diagram.

UNIT–II: DISPLACMENT METHODS:

Moment Distribution Method - Analysis of continuous beams with and without settlement ofsupports using - Analysis of Single Bay Single Storey Portal Frames including side Sway -Analysis of inclined frames - Shear force and Bending moment diagrams, Elastic curve.

Kani's Method- Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two Storey Frames including Side Sway using Kani's Method - Shear force and bending moment diagrams - Elastic curve.

UNIT–III: APPROXIMATE METHODS:

Introduction – Analysis of multi-storey frames for lateral loads: Portal Method, Cantilever method. Introduction to Analysis of multi storey frames for gravity loads – Introduction to Substitute Frame method.

UNIT-IV: CABLES AND ARCHES

Cables and Suspension Bridges Introduction- Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges. Influence lines for three hinged stiffening girders.

Arches Introduction – Classification of Three and Two hinged Arches –Elastic theory of arches-Eddy's theorem- Analysis of three hinged, two hinged and fixed arches – Parabolic and circular arches Secondary stresses in three and two hinged arches due to elastic shortening of rib –Settlement and temperature effects

UNIT-V: MATRIX METHODS:

Introduction to Flexibility and Stiffness matrix methods of analyses using 'system approach' up to three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods

Computer Applications in Structural Analysis Introduction to software and its applications to 2D trusses and building frames. Advance structure analysis with Matlab.

Text Books:

1. Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S. Pandit S.P. Gupta Tata McGraw Hill Education Pvt. Ltd.
3. Indeterminate Structural Analysis by K.U. Muthu et al., I. K.International Publishing House Pvt.Ltd.

Reference Books:

1. Structural analysis T. S Thandavamoorthy, Oxford university Press
2. Mechanics of Structures Vol –II by H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd.
3. Basic Structural Analysis by C.S. Reddy., Tata McGraw Hill Publishers.
4. Examples in Structural Analysis by William M.C. McKenzie, Taylor & Francis.

B.TECH V SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE5T07 RURAL WATER SUPPLY AND ENVIRONMENTAL SANITATION

(PROFESSIONAL ELECTIVE-I)

Course Objectives: The objective of this course is to

- To Provide knowledge on Rural Water Supply and Rural Sanitation
- For Understanding the importance of Low Cost Water Treatment
- To get knowledge on Industrial Hygiene and Sanitation.
- To know about Solid Waste Management.

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Identify the problems pertaining to rural water supply and sanitation

CO2: Design water supply and sanitation system for rural community.

CO3: Design low cost waste management systems for rural areas.

CO4: Plan and design an effluent disposal mechanism.

SYLLABUS

UNIT-I:

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies

UNIT-II:

Low Cost Water Treatment: Introduction – Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

UNIT –III:

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines- Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas- stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems- Effluent disposal.

UNIT–IV:

Industrial Hygiene And Sanitation: Occupational Hazards- Schools- Public Buildings Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.

UNIT-V:

Solid Waste Management: Disposal of Solid Wastes- Composting- land filling -incineration-

Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

Text Books:

1. Park, J.E., and Park, K., Text Book of Preventive and Social Medicine, Banarsidas Bhanot, 1972
2. Rural Water Supply And Sanitation by Sanjay gupta , Vayu Education of India; First edition (1 January 2012); Vayu Education of India.

Reference Books:

1. Eulers, V.M., and Steel, E.W., Municipal and Rural Sanitation, 6^{th} Ed., McGraw HillBook Company, 1965
2. Wright, F.B., Rural Water Supply and Sanitation, E. Robert Krieger Publishing Company, Huntington, New York, 1977.
3. Juuti, P., Tapio S. K., and Vuorinen H., Environmental History of Water: Global Views on Community Water Supply and Sanitation, IWA Publishing (Intl Water Assoc), 2007.

B.TECH V SEMESTER

	L	T	P	C
PEC	3	0	0	3

20CE5T08 GEO SYNTHETICS

(PROFESSIONAL ELECTIVE-I)

Course Objectives:

The objective of this course is to

- Understand history and various manufacturing methods of geosynthetics.
- Know Properties and Testing methods of Geosynthetics.
- Design geotextiles.
- Design geogrids.
- Uses of Geomembranes in various Constructions.
- To learn Advantages of Geo composites

Course Outcomes:

On successful completion of this course , the students will be able to

CO1: Testing methods of Geo synthetics**.**

CO2: Design geo textiles.

CO3: Design geo grids.

CO4: Using Geo membranes in various constructions.

CO5: Using Geo composites in various constructions.

SYLLABUS

UNIT–I: Introduction:

Introduction to Geo synthetics – Basic description – History – Manufacturing methods – Uses and Applications.

UNIT–II: Geotextiles:

Designing for Separation – Reinforcement – Stabilization – Filtration – Drainage and Moisture barriers. Properties and Testing methods of Geotextiles.

UNIT–III: Geo grids:

Designing for Reinforcement – Stabilization – Designing Gabions – Construction methods – Design of retaining walls. Properties and Testing methods of Geogrids.

UNIT-IV: Geo membranes:

Survivability Requirements – Pond Liners – Covers for Reservoirs – Canal Liners – Landfill Liners – Caps and closures – Dams and Embankments. Properties and Testing methods of Geo membranes.

UNIT-V: Geo composites:

Geo composites – An added advantage – Geo composites in Separation – Reinforcement– Filtration – Geo composites as Geo webs and Geo cells – Sheet drains – Strip drains and Moisture barriers. Properties and Testing methods of Geo composites.

Text Books:

1. "Engineering with Geosynthetics",by G.Venkatappa Rao and GVS Suryanarayana Raju – Tata McGraw Hill Publishing Company Limited – New Delhi.
2. Ground Improvement Techniques by P.Purushothama Raj ,Laxmi Publications; Second edition (1 January 2016).

Reference Books:

1. "Designing with Geosynthetics by Robert M. Koerner Prantice Hall, Eaglewood cliffs, NJ 07632.
2. "Construction and Geotechnical Engineering using Synthetic Fabries" by Robert M. Koerner and Josoph P. Welsh. John Willey and Sons, New York.
3. "Foundation Analysis and Design" by J.E. Bowles McGraw Hill Publications.

B.TECH V SEMESTER

PEC	L	T	P	C
	3	0	0	3

20CE5T09 INTERIOR DESIGNS AND DECORATIONS

(PROFESSIONAL ELECTIVE-I)

Course Objectives: The objective of this course is to

- Understand the elements and principles of interior designs and decorations.
- Learn the importance of art elements in the composition of building spaces.
- Learn the new design concepts for developing interiors of buildings.
- Learn the application of colors, lightings, furniture in creating beautiful interiors.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Understand the importance of interior designs and decorations.
CO2: Should realize the use of art elements in the composition of building spaces.
CO3: Should learn the new design concepts for developing interiors of buildings.
CO4: Learn be able to apply colors, lightings, furniture in creating beautiful interiors.

SYLLABUS

UNIT-I:

Development of interior design concepts- importance for interiors in modern buildings, changing trends and salient features, objectives of aesthetic planning - beauty, expressiveness, functionalism, economy- good taste - meaning and importance- developing skill in aesthetics.

UNIT-II:

Designs- concepts, meaning, purpose, types - structural and decorative characteristics, forms to function relationship, elements of designs - line and direction, form and shape, size, colour, light, pattern, texture and space - application of elements to form designs.

UNIT-III:

Application of colour harmonies in the interiors and exteriors –effects of light on colour, Illusion of colour, psychology of colour, effect of colour on each other-uses and application of colours- walls, wall finishes, ceilings, roofs, decorative exteriors.

UNIT-IV:

Importance of lighting – artificial lighting - light sources, types and uses of light, specific factors in lighting- measurements of lighting, psychological aspects of light, glare, types of glare and prevention– selection of lamps, lighting fixtures, lighting for various areas and activities.

UNIT–V:

Interior furnishings- floors, floor coverings, soft furnishings, furniture- selection and arrangement, placement of accessories, home accessories- interior decorations- flower arrangement, floor decorations, interior decoration trends in India.

Text Books:

1. 'Interior Design and Decoration' by Premavathy Seetharaman and Praveen Pannu, CBS Publishers and distributors, New Delhi, 2005.
2. 'Building Construction' by Rangawala, S.C, Charter publishing house, Anand, 1963.
3. 'Interior Design Principles and practice' by Pratap R.M., Standard publishers distribution, Delhi, 1988.

Reference Books:

1. 'How to see, how to paint it' by Judy M., Harpen Colling publishers, London, 1994.
2. 'Lighting for a beautiful Home' by Jan Orcharchd, Dunestyle publishing Ltd., U.S.A., 1993.
3. 'The Complete Home Decorator' by Stewart and Sally .W., Annes publishers Ltd., New York, 1997.

B.TECH V SEMESTER **PCC LAB**

L	T	P	C
0	0	3	1.5

20CE5L10 GEOTECHNICAL ENGINEERING LAB

Course Objectives: To obtain index and engineering properties of locally available soils, and to understand the behavior of these soil under various loads.

Course Outcomes: At the end of the course, the student will be able to Classify and evaluate the behavior of the soils subjected to various loads.

LIST OF EXPERIMENTS

1. Atterberg Limits (Liquid Limit, Plastic Limit, and Shrinkage Limit)
2. a) Field density by core cutter method and b) Field density by sand replacement method
3. Determination of Specific gravity of soil Grain size distribution by sieve analysis
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation (square root time fitting method)
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Triaxial compression test

Reference Books:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International publications.
2. Determination of Soil Properties by J. E. Bowles.
3. IS Code 2720-relevant parts.

B.TECH V SEMESTER **PCC LAB**

L	T	P	C
0	0	3	1.5

20CE5L11 TRANSPORTATION ENGINEERING LAB

Course Objectives:

- To test crushing value, impact resistance, specific gravity and water absorption,Percentage attrition, percentage abrasion, flakiness index and elongation index for the given road aggregates.
- To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
- To test the stability for the given bitumen mix
- To carry out surveys for traffic volume, speed and parking.

LIST OF EXPERIMENTS

Experiments to be conducted on following materials and should determine the corresponding values.

I. ROAD AGGREGATES:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

III. BITUMINOUS MIX:

1. Marshall Stability test.

IV. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.
2. Spot speed studies.

Text Books:

1. Highway material testing manual by S.K.Khanna, C.E.G. Justo and A. Veeraraghavan Neam Chand Publications ,New Delhi.

Reference Books:

1. IRC Codes of Practice
2. Asphalt institute of America manuals
3. Code of Practice of B.I.S.

B.TECH V SEMESTER

SC	L	T	P	C
	0	0	4	2

20CE5S12 STAAD PRO LAB
(Skill Oriented Course)

Course Objectives: The objective of this course is to

- Understand the details of STAAD. Pro software package.
- Prepare input data for RCC & Steel structures.
- Design different components of structures.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Understand the details of STAAD.Pro software package.

CO2: To prepare input data of STAAD.Pro.

CO3: Run STAAD.Pro for analysis and desing of structures.

CO4: Design different components of structures.

EXPERIMENTS

1. Design of simply supported RCC beam.
2. Design of cantilever RCC beam.
3. Design of continuous RCC beam.
4. Design of simply supported Steel beam.
5. Design of continuous Steel beam.
6. Design of RCC columns with different end conditions.
7. Design of Steel columns with different end conditions.
8. Design of steel trusses.
9. Design of RCC portal frames.
10. Design of steel portal frames.

Text Books:

1. Concept and Techniques of GIS by C.P.L.O Albert, K.W. Yong, Printice Hall Publishers.

B.TECH V SEMESTER

MC	L	T	P	C
	2	0	0	0

20CE5M13 ESSENCE OF INDIAN KNOWLEDGE TRADITION

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing.
- Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Understand the significance of Indian Traditional Knowledge

CO2: Classify the Indian Traditional Knowledge

CO3: Compare Modern Science with Indian Traditional Knowledge system.

CO4: Analyze the role of Government in protecting the Traditional Knowledge

CO5: Understand the impact of Philosophical tradition on Indian Knowledge System.

SYLLABUS

Unit I

Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in Global Economy.

Unit II

Basic structure of Indian Knowledge System: Astadash Vidya- 4 Ved - 4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi),6vedanga (Shisha, Kalppa, Nirukha,Vykaran, Jyothisha & Chand),4upanga (Dharmashastra, Meemamsa, purana & Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System: Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge -

Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain &Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, Nruthya Yevam Sahithya.

Text Books

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.

References

1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, BharatiyaVidya
2. Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan
3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
4. Pramod Chandra, India Arts, Howard Univ. Press, 1983.
5. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html
2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf
3.https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_tex t.pdf

B.TECH V SEMESTER

	L	T	P	C
I	0	0	0	1.5

20CE5I14 SUMMER INTERNSHIP

A) There shall be an Industrial oriented Internship / Summer Internship in Collaboration withan Industry (or) Government organization of the relevant specialization to be registered immediately after IVth Semester Examinations and VIth Semester taken up during the summer vacation for about Minimum six weeks duration.

B) The industry-oriented Internship or Summer Internship shall be submitted in a report form, and a presentation of the same shall be made before a Committee, which evaluates it for 50 marks. The committee shall consist of Head of the Department, the supervisor of internship and a Senior Faculty Member of the Department. There shall be no internal marks for Industry oriented internship/ Summer Internship. The internship shall be evaluated in the V SEM and VII Semester

B.TECH VI SEMESTER

PCC	L	T	P	C
	3	0	0	3

20CE6T01 DESIGN AND DRAWING OF STEEL STRUCTURES

Course Objectives: The objective of this course is to

- Explain the mechanical properties of structural steel, plasticity, yield.
- Describe the salient features of Limit State Method of design of Steel structures.
- Identify and explain the codal provisions given in IS.800.
- Analyze the Behavior of steel structures under tension, compression and flexure.
- Design the tension, Compression, flexural members and plate girder
- Design the connection in steel structure, ‘build -up member and (bolted and welded).

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Analyze the tension members, compression members

CO2: Design the tension members, compression members and column bases And joints and connections

CO3: Analyze and Design the beams including built-up sections and beam and connections.

CO4: Identify and Design the various components of welded plate girder Including stiffeners

SYLLABUS

UNIT-I:

Materials: Types of structural steel, Mechanical properties of steel, Concepts of plasticity, yield strength, Loads and Stresses, Local buckling behavior of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states, Design Strengths, deflection limits, serviceability, stability check.

Design of Connections: Different types of connections, Bolted connections, Design strength, efficiency of joint, prying action, Welded connections, Types of welded joints – Design requirements, Design of Beam, column connections, Eccentric connections, Type I and Type II connection – Framed connection.

UNIT–II:

Flexural Members: Plastic moment, Plastic section modulus for different sections, Design of Flexural Members, laterally supported and unsupported Beams – Design of laterally supported beams, Bending and shear strength/buckling, Built-up sections Beam splice.

UNIT–III:

Design of tension members –Simple and built up members - Design strength – Design procedure for splicing - lug angle.

Design of compression members – Buckling class – slenderness ratio –Design of simple compression members and struts.

UNIT–IV:

Design of Columns - Built up compression members-Design of Lacings and Battened Columns- Design principle of eccentrically loaded columns-Splicing of columns- Design of Column Foundation-Design of slab base and gusseted base.

UNIT–V:

Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener–intermediate stiffeners – Design of web splice and flange splice.

Design of Gantry Girder: Impact Factors-Longitudinal and Lateral Forces- Design of Gantry Girder.

***Note:* Design of structural members include detailed sketches.**

Text Books:

1. Design of steel structures by S.K. Duggal, Tata Macgrawhill publishers, 2000, 2nd Edition
2. Design of steel structures by N.Subramanian , Oxford University press, 2008

Reference Books:

1. Design of steel structures by K.S.Sairam, Pearson Educational India, 2ndEdition,2013
2. Design of steel structures by Edwin H.Gayrold and Charles Gayrold, Tata Mac-graw hill publishers,1972
3. Design of steel structures by L. S. JayaGopal, D.Tensing, Vikas Publishing House

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in two components as follows:

1. Descriptive examination - 25 Marks
2. Assignment - 5 Marks

NOTE:

Alternate weeks two periods of theory can be converted into drawing classes. The end examination paper should consist of Part – A and Part – B. Part – A should consist of two questions in design and drawing out of which one question to be answered. Part –B should consist of five questions in design out of which three to be answered. Weightage for Part – A is 40 % and Part – B is 60 %.

B.TECH VI SEMESTER

PCC	L	T	P	C
	3	0	0	3

20CE6T02 WATER RESOURCES ENGINEERING-1

Course Objectives: The objective of this course is to

- Introduce hydrologic circle
- Derive various formulas used in estimation of different basic components of surface and Ground water cycle.
- Understand the concept of water requirement for irrigation and connectivity of hydrology to the field requirement.

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Understand the different concepts and terms used in engineering hydrology

CO2: To identify and explain various formulae used in estimation of surface and Ground water hydrology components

CO3: Demonstrate their knowledge to connect hydrology to the field requirement

SYLLABUS

UNIT-I:

Introduction: Concepts of Hydrologic cycle, Global Water Budget, Applications in Civil engineering Sources of data.

Precipitation

Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Arithmetic,Theissen's and Isohyetal methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth-duration- frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

UNIT-II:

Abstractions from precipitation

Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney & Criddle Methods, potential evapotranspiration over India, actual evapotranspiration, , interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices. Runoff - Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.

UNIT-III:

Hydrographs

Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall– Base Flow- Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function- Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

UNIT-IV:

Groundwater Hydrology

Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law.

Well Hydraulics - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.

UNIT-V:

Canal Systems: Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Regime channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals-Types of lining- Advantages and disadvantages. Drainage of irrigated lands-necessity, methods.

Text Books:

1. Hydrology by K. Subramanya (Tata McGraw-Hill)
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers
3. G L Asawa, Irrigation Engineering, Wiley Eastern

Reference Books:

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications)
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K. N. Duggal and J.P. Soni (New Age International.

B.TECH VI SEMESTER

	L	T	P	C
PCC	3	0	0	3

20CE6T03 ENVIRONMENTAL ENGINEERING

Course Objectives: The objective of this course is to

- Provide the knowledge of water sources
- Provide the knowledge of water treatment
- Design of distribution system
- Impart knowledge on Waste water treatment
- know the safe disposal methods.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Assess characteristics of water and wastewater and their impacts

CO2: Estimate quantities of water and waste water and plan conveyance components

CO3: Design components of water and waste water treatment plants

CO4: Be conversant with issues of air pollution and control

SYLLABUS

UNIT–I:

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

UNIT–II:

Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

UNIT-III:

characteristics of sewage –waste water collection–Estimation of waste water and storm water decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming –self-purification of rivers.

UNIT–IV:

Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment-trickling filters – ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

UNIT–V:

Air pollution– classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior – Control of particulates – Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

Text Books:

1. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
3. Environmental Engineering, I and II by BC Punmia, Std. Publications.
4. Environmental Engineering, I and II by SK Garg, Khanna Publications.
5. Environmental Pollution and Control Engineering CS Rao, Wiley Publications

Reference Books:

1. Water and Waste Water Technology by Steel, Wiley
2. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.Wiley, 2007.
5. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication

B.TECH VI SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE6T04 GEOTECHNICAL ENGINEERING-2
(PROFESSIONAL ELECTIVE-II)

Course Objectives: The objective of this course is to

- Impart to the student knowledge of types of shallow foundations and Theories required for the determination of their bearing capacity.
- Enable the student to compute immediate and consolidation settlements of shallow foundations.
- Impart the principles of important field tests such as SPT and Plate bearing test.
- Enable the student to imbibe the concepts of pile foundations and determine Their load carrying capacity.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics.

CO2: The student must be able to compute the magnitude of foundation settlement to decide the size of the foundation.

CO3: The student must be able to use the field test data and arrive at the bearing capacity.

CO4: The student must be able to design Piles based on the principles of bearing capacity.

SYLLABUS

UNIT–I:

Shallow Foundations & Settlement analysis:

Bearing Capacity Criteria: Types of foundations and factors to be considered in their location - Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory - IS Methods.

Settlement Criteria: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures.

UNIT–II:

Pile Foundations: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load tests - Load carrying capacity of pile groups in sands and clays.

UNIT-III:

Well Foundations: Types – Different shapes of well – Components of well – functions – forces acting on well foundations

Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – planning of Programme and preparation of soil investigation report.

UNIT–IV:

Stability of Slopes: Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices – Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions.

UNIT-V:

Earth Retaining Structures: Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils.

Text Books:

1. Principles of Foundation Engineering, Das, B.M., (2011), 6th edition Cengage learning
2. Basic and Applied Soil Mechanics, Gopal Ranjan & A.S.R. Rao, New Age International Pvt. Ltd, (2004).

Reference Books:

1. Foundation Analysis and Design, Bowles, J.E., (1988), 4th Edition, McGraw-Hill Publishing Company, Newyork.
2. Analysis and Design of Substructures by Swami Saran, Sarita Prakashan, Meerut

B.TECH VI SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE6T05 AIR POLLUTION AND CONTROL
(PROFESSIONAL ELECTIVE-II)

Course Objectives: The objective of this course is to

- know the analysis of air pollutants
- know the Threshold Limit Values (TLV) of various air pollutants
- acquire the design principles of particulate and gaseous control
- learn plume behaviour in different environmental conditions
- to learn carbon credits for various day to day activities

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Decide the ambient air quality based on the analysis of air pollutants
CO2: Design particulate and gaseous control measures for an industry
CO3: Judge the plume behaviour in a prevailing environmental condition
CO4: Estimate carbon credits for various day to day activities

SYLLABUS

UNIT–I:

Air Pollution: Sampling and analysis of air pollutants, conversion of ppm into μg/m^3. Definition of terms related to air pollution and control - secondary pollutants - Indoor air pollution – Ozone holes and Climate Change and its impact - Carbon Trade.

UNIT-II:

Thermodynamics and Kinetics of Air-pollution: Applications in the removal of gases like SOx, NOx, CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

UNIT–III:

Meteorology and Air Pollution: Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena on plume behaviour and Air Quality - Wind rose diagrams and Isopleths.

UNIT-IV:

Ambient Air Quality Management: Monitoring of SPM - RPM SO2; NOx and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring – Noise Monitoring - Weather Station. Emission Standards- Gaussian Model for Plume Dispersion

UNIT-V:

Air Pollution Control: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipment – Settling Chambers, Cyclone separators –Fabric filters–Scrubbers, Electrostatic precipitators

Text Books:

1. Air Pollution and Control, K.V.S.G. Murali Krishna, Laxmi Publications, NewDelhi, 2015
2. Air Pollution, M. N. Rao and H. V. N. Rao, Tata McGraw Hill Company.

Reference Books:

1. An Introduction to Air pollution, R. K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution by Wark and Warner - Harper & Row, New York.

B.TECH VI SEMESTER	PEC	L	T	P	C
		3	0	0	3

20CE6T06 URBAN TRANSPORTATION PLANNING (PROFESSIONAL ELECTIVE-II)

Course Objectives: The objective of this course is to

- To learn various procedures for travel demand estimation.
- To various data collection techniques for OD data.
- To know various models and techniques for trip generation, trip distribution, mode choice and traffic assignment.
- To develop alternative urban transport network plans.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Estimate travel demand for an urban area.

CO2: Plan the transportation network for a city.

CO3: Identify the corridor and plan for providing good transportation facilities.

CO4: Evaluate various alternative transportation proposals.

SYLLABUS

UNIT-I:

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT-II:

Data Collection and Inventories: Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT–III:

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution.

UNIT -IV

Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation.

UNIT-V:

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements.

Text Books:

1. 'Introduction to Urban System Planning' by Hutchinson, B.G., McGraw Hill.
2. 'Transportation Engineering - An Introduction' by Khisty C.J., Prentice Hall.
3. 'Fundamentals of Transportation Planning' by Papacostas, Tata McGraw Hill.

Reference Books:

1. 'Urban Transportation Planning: A decision-oriented Approach' by Mayer M and Miller E, McGrawHill.
2. 'Introduction to Transportation Planning' by Bruton M.J., Hutchinson of London.
3. 'Metropolitan Transportation Planning' by Dicky, J.W., Tata McGraw Hill.
4. 'Traffic Engineering and Transportation Planning' by Kadiyali.L.R., Khanna Publishers, New Delhi.

B.TECH VI SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE6T07 GROUND WATER DEVELOPMENT AND MANAGEMENT (PROFESSIONAL ELECTIVE-II)

Course Objectives: The objective of this course is to

- learn about Ground water occurrence
- Know about Ground water movement
- Acquire knowledge of well design.

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Understand Ground Water occurrence,

CO2: Ground Water Movement

CO3: Well design

UNIT-I:

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT–II:

Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT–III:

Steady groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theim's equations, Assumptions, Formation constants, yield of an open well Well interface and well tests – Recuperation Test. Unsteady flow towards a well – Non equilibrium equations – Theis' solution – Jocob and Chow's simplifications, Leaky aquifers – Well Interference.

UNIT–IV:

Well Design: Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery. Well Construction and Development Water wells, drilling methods-rotary drilling, percussion drilling, well construction, well development, well completion, well disinfection, well maintenance.

UNIT–V:

Groundwater: Modelling and Management Basic principles of groundwater modelling-Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models, Concepts of groundwater management, basin management by conjunctive use-case studies.

Text Books:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H. M. Raghunath, Wiley Eastern Ltd.
3. Ground Water Hydrology by D.K. Todd and L.R Mays John Willey.

Reference Books:

1. Groundwater Hydrology by Bower, John Wiley & sons.
2. Groundwater System Planning & Management – R. Willes & W. W. G. Yeh, Prentice Hall.

B.TECH VI SEMESTER	PCC LAB	L	T	P	C
		0	0	3	1.5

20CE6L10 ENVIRONMENTAL ENGINEERING LAB

Course Objectives: The objective of this course is to

- Perform the experiments to determine water and waste water quality
- Understand the water & waste water sampling, their quality standards
- Estimate quality of water, waste water, Industrial water

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Understand about the equipment used to conduct the test procedures

CO2: Perform the experiments in the lab

CO3: Examine and Estimate water, waste water, air and soil Quality

CO4: Compare the water, air quality standards with prescribed standards set by the Local governments

CO5: Develop a report on the quality aspect of the environment

LIST OF EXPERIMENTS

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Acidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD/ DO
12. Determination of Residual Chlorine
13. Total count No.
14. Noise level measurement

Reference Books:

1. Chemical Analysis of Water and Soil by Dr.K.V.S.G. Murali Krishna, Reem Publications Pvt. Ltd.
2. Manual on Water Supply & Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi.

B.TECH VI SEMESTER

	L	T	P	C
PCC LAB	0	0	3	1.5

20CE6L11 DESIGN AND DRAWING OF IRRIGATION STRUCTURES

Course Objectives:

To understand design principle of various irrigation structures

Course Outcomes:

At the end of the course the student will be able to design various irrigation structures.

SYLLABUS:

Design and drawing of

1. Surplus weir
2. Tank sluice with a tower head
3. Canal drop-Notch type
4. Canal regulator
5. Under tunnel
6. Syphon aqueduct type III

Final Examination Pattern:

Any two question of the above six designs may be asked out of which the candidate has to answer one question. The duration of the examination is three hours.

Text Books:

1. Water Resources Engineering – Principles and Practice by C. Satyanarayana Murthy, New age International Publishers.

Reference Books:

1. Irrigation Engineering and Hydraulic Structures, S. K. Garg, Standard Book House.
2. Irrigation and Water Power Engineering, B. C Punmia & Lal, Lakshmi Publications Pvt. Ltd., New Delhi.

B.TECH VI SEMESTER **PCC LAB**

L	T	P	C
0	0	3	1.5

20CE6L12 GEOGRAPHICAL INFORMATION SYSTEMS LAB

Course Objectives:

Objective of this course is to introduce concepts of GIS through QGIS open source software

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Describe fundamental concepts related to GIS

CO2: Work with vector data

CO3: Work with raster data

CO4: Perform data digitalization and process

CO5: Work with attributes, external files

CO6: Prepare map

LIST OF EXPERIMENTS

1 Understanding coordinate systems, raster and vector data

2 Preparing QGIS environment

3 Working with vector data

4 Applying styles

5 Working with raster data

6 Data digitalization and processing

7 Working with attributes

8 External files and spatial interpolation

9 Maps and visualization

Software Used: QGIS

B.TECH VI SEMESTER **SC**

L	T	P	C
0	0	4	2

20CE6S13 SOFT SKILLS
(Skill Oriented Course)

Course Outcomes:

The student will acquaint himself with various nuances of Soft Skills and Personality Development besides aspects related to Campus Recruitment Process.

1 Life Skills

2 JAM

3 Presentation Skills

4 Resume Writing

5 Group Discussion

6 Interview Skills

Reference Books:

1. ***Interact***, Orient Blackswan
2. **Communication Skills,** Sanjay Kumar and Pushp Latha. OUP, 2011

B.TECH VI SEMESTER **MC**

L	T	P	C
2	0	0	0

20CE6M14 DISASTER MANAGEMENT

Course Learning Objectives: The objective of this course is to

1. Understand Types of disasters like Earthquake, Landslide, Flood, Drought, Fire
2. Know Panchayati Raj Institutions/ Urban Local Bodies (PRIs/ ULBs), States, Centre, and other stakeholders
3. Understand Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India
4. Understand Role of GIS and Information Technology Components in Preparedness, Risk Assessment
5. Know various case studies

Course Learning Outcomes: On successful completion of this course, the students will be able to

CO1: Differentiate the types of disasters, causes and their impact on environment and society

CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation.

CO3: Draw the hazard and vulnerability profile of India, Scenarios in the Indian context

CO4: Analyze the Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

CO5: Understand about Risk Assessment, Response and Recovery Phases of Disaster Disaster Damage Assessment

UNIT-I:

INTRODUCTION TO DISASTERS Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT-II:

APPROACHES TO DISASTER RISK REDUCTION (DRR) Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural-nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders-Institutional Processes and Framework at State and Central Level State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT-III:

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT-IV:

DISASTER RISK MANAGEMENT IN INDIA Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT-V:

DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Text Books:

1. Singhal J.P.“Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T01 TRANSPORTATION ENGINEERING-2 (PROFESSIONAL ELECTIVE-III)

Reference Books:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009

Course Objectives: The objective of this course is to

- know various components and their functions in a railway track
- acquire design principles of geometrics in a railway track.
- know various techniques for the effective movement of trains.
- acquire design principles of airport geometrics and pavements.
- know the planning, construction and maintenance of Docks and Harbours.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Design geometrics in a railway track.

CO2: Design airport geometrics and airfield pavements.

CO3: Plan, construct and maintain Docks and Harbours.

SYLLABUS

A. RAILWAY ENGINEERING

UNIT–I:

Components of Railway Engineering: Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzingof Sleepers- Sleeper density – Rail joints.

UNIT–II:

Geometric Design of Railway Track: Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT–III:

Turnouts & Controllers: Track layouts – Switches – Design of Tongue Rails – Crossings– Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations.

B. AIRPORT ENGINEERING

UNIT–IV:

Airport Planning & Design: Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

UNIT–V:

Runway Design: Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.

Text Books:

1. Railway Engineering, Satish Chandra and Agarwal M. M., Oxford University Press, New Delhi
2. Airport Engineering, Khanna & Arora - Nemchand Bros, New Delhi

Reference Books:

1. Railway Engineering, Saxena & Arora – Dhanpat Rai, New Delhi.
2. Transportation Engineering Planning Design,Wright P. H. & Ashfort N. J., John Wiley & Sons.
3. Transportation Engineering Volume II, C Venkatramaiah, 2016, Universities Press, Hyderabad.
4. Transportation Engineering, Railways, Airports, Docks & Harbours, Srinivasa Kumar R, University Press, Hyderabad
5. Airport Engineering Planning & Design, Subhash C. Saxena, 2016, CBS Publishers,

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T02 SOLID AND HAZARDOUS WASTE MANAGEMENT (PROFESSIONAL ELECTIVE-III)

Course Objectives: The objective of this course is to

- Impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.
- acquire the principles of treatment of municipal solid waste
- know the impact of solid waste on the health of the living beings
- learn the criterion for selection of landfill and its design
- plan the methods of processing such as composting the municipal organic waste

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Design the collection systems of solid waste of a town
CO2: Design treatment of municipal solid waste and landfill
CO3: Know the criteria for selection of landfill
CO4: Characterise the solid waste and design a composting facility
CO5: Know the Method of treatment and disposal of Hazardous wastes.

SYLLABUS

UNIT-I:

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities, Terms related to ISWM like WTE, ULB, TLV etc..Measurement of NPK and Calorific value.

UNIT-II:

Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

Transfer, Transport and Transformation of Waste: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements. Unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization

UNIT-III:

Processing and Treatment: Processing of solid waste - Waste transformation through combustion and composting. Market yard wastes and warming composting and vermin composting, anaerobic methods for materials recovery and treatment – Energy recovery– biogas generation and cleaning– Incinerators.

UNIT-IV:

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation. Case studies

UNIT-V:

Hazardous Waste Management- sources, collection, transport, treatment and disposal methods; Biomedical waste Management; Electronic waste Management; Environmental law related to waste Management; Case studies.

Text Books:

1. Integrated Solid Waste Management, George Techobanoglous, McGraw Hill Publication, 1993

Reference Books:

1. Solid Waste Engineering, Vesilind, P. A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
2. Hazardous Waste Management, Charles A. Wentz, McGraw Hill Publication, 1995.
3. Solid and Hazardous Waste Management PM Cherry, CBS Publishers and Distributors. New Delhi, 2016.
4. Solid Waste Engineering, William A Worrell, P Aarue Vesilind, Cengage Learning, New Delhi 2016

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T03 BRIDGE ENGINEERING (PROFESSIONAL ELECTIVE-III)

Course Objectives: The objective of this course is to

- Impart knowledge on different types of Bridges and IRC standards
- Equip student with concepts and design of Slab Bridges, T Beam Bridges, Box Culverts
- Understand concepts of design of Plate Girder Bridges
- Know the different methods of inspection of bridges and maintenance

Course Outcomes: **On successful completion of this course , the students will be able to**

CO1: Explain different types of Bridges with diagrams and Loading standards

CO2: Carryout analysis and design of Slab bridges, T Beam bridges, Box culvers and suggest structural detailing

CO3: Carryout analysis and design of Plate girder bridges

CO4: Organize for attending inspections and maintenance of bridges and prepare reports.

SYLLABUS

UNIT-I:

Introduction- Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, Pre stressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading

UNIT-II:

Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon’s – Massonet Method –Hendry- Jaegar Methods- Courbon’s theory- Pigeaud’s method

UNIT-III:

T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondary beams- Reinforcement detailing.

UNIT-IV:

Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

UNIT-V:

Box Culverts: Loading – Analysis and Design- Reinforcement detailing.

Text Books:

1. Essentials of Bridge Engineering, Jhonson Victor D
2. Design of Bridge Structures, T. R. Jagadeesh, M.A. Jayaram, PHI
3. Design of Bridges, N. Krishna Raju, Tata McGraw Hill

Reference Books:

1. Design of Concrete Bridges, Aswini, Vazirani, Ratwani
2. Design of Steel Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications
3. Design of R C Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T04 GROUND IMPROVEMENT TECHNIQUES (PROFESSIONAL ELECTIVE-III)

Course Objectives: The objective of this course is to

- make the student appreciate the need for different ground improvement methods adopted for improving the properties of remoulded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
- Make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
- Enable the students to know how geotextiles and geo synthetics can be used to improve the engineering performance of soils.
- make the student learn the concepts, purpose and effects of grouting.

Course Outcomes: **On successful completion of this course, the students will be able to**

CO1: Possess the knowledge of various methods of ground improvement and their suitability to different field situations.

CO2: Design a reinforced earth embankment and check its stability.

CO3: Know the various functions of Geo synthetics and their applications in Civil Engineering practice.

CO4: Understand the concepts and applications of grouting.

SYLLABUS

UNIT-I:

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT–II:

Dewatering – sumps and interceptor ditches – single and multi stage well points –vacuum well points – horizontal wells – criteria for choice of filler material around drains– electro osmosis

UNIT-III:

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime– bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT-IV:

Geosynthetics – geotextiles – types – functions , properties and applications –geogrids , geomembranes and gabions - properties and applications.

UNIT-V:

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests

Text Books:

1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi.
3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

Reference Books:

1. Ground Improvement, M.P. Moseley, Blackie Academic and Professional, USA.
2. Designing with Geosynethetics, R. M Koerner, Prentice Hall

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T05 WATER RESOURCES ENGINEERING – 2 (PROFESSIONAL ELECTIVE-IV)

Course Objectives: The objective of this course is to

- Introduce the types, concepts of planning and design of irrigation systems
- Discuss about irrigation projects of India
- Discuss the relationships between soil, water and plant and their significance in planning an irrigation system
- Understand design methods of erodible and non-erodible canals
- Know the principles of hydraulic structures on permeable foundations
- Know the concepts for analysis of storage and diversion head works

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Estimate irrigation water requirements

CO2: Design irrigation canals and canal network and can plan and canal irrigation system

CO3: Find the capacity of a reservoir

CO4: Analyze stability of gravity dams

CO5: Apply suitable spillways and energy dissipation works

SYLLABUS

UNIT-I:

Irrigation: Necessity and importance; Terminology of Irrigation and Irrigation structures; Major Irrigation projects in India– Polavaram, Nagarjuna sagar, Kaleswaram, Bakranangal ; Principal crops and crop seasons of India; Types of irrigation and methods of applying water to crops ; Recent irrigation technologies Crop Water Requirement: soil-water-plant relationship, soil moisture constants, consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, Time factor, Crop ratio, Overlap allowance, Irrigation efficiencies.

UNIT-II:

Assessment of Irrigation water: Water Logging; Land Reclamation; Standards of Irrigation water Canals: Classification, canal alignment, lining of irrigation canals, types of lining design of lined canals; Silting and scouring; Silt theories-Kennedy's silt theory and Lacey's regime theory, Application of Kennedy's and Lacey's theory to channel design, comparison.

UNIT-III:

Canal Structures: Definition and usage of Canal Falls, Regulators, Cross Drainage Works, Outlets; Cross Drainage Works-Types, selection; Basic design principles of canal structures Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. Causes and failures of weirs on permeable foundations, Bligh's creep theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-IV:

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir. Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Life of reservoir .Dams: Types of dams, selection of type of dam, selection of site for a dam.

UNIT-V:

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, limiting height of a dam, stability analysis, drainage galleries Spillways: Types, types of spillway crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

Text Books:

1. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications (P) Ltd.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.

Reference Books:

1. Irrigation and Water Resources Engineering, Asawa GL (2013), New Age International Publishers.
2. Irrigation Water Resources and Water Power Engineering, Modi P N (2011), Standard Book House, New Delhi

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T06 FINITE ELEMENT METHODS (PROFESSIONAL ELECTIVE-IV)

Course Objectives: The objective of this course is to

- Equip the students with the fundamentals of Finite Element Analysis
- Enable the students to formulate the design problems into FEA.
- Enable the students to solve Boundary value problems using FEM

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Solve simple boundary value problems using Numerical technique of Finite element method.

CO2: Develop finite element for mulation of one- and two-dimensional problems and solve them.

CO3: Assemble Stiffness matrices, apply boundary conditions and solve for the displacements

CO4: Compute Stresses and Strains and interpret the result.

SYLLABUS

UNIT-I:

Introduction: Review of stiffness method- Principle of Stationary potential energy- Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation. Principles of Elasticity- Equilibrium Equations- Strain Displacement relationships- Constitutive relationship for plane stress, plane stain and axi symmetric bodies of revolution with axi symmetric loading.

UNIT-II:

Finite element formulation of Beam elements: Beam stiffness- assemblage of beam stiffness matrix- Examples on Analysis of beams Subjected to Concentrated and Distributed loading.

UNIT-III:

Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix –Selection of approximate displacement functions- solution of a plane truss transformation matrix- Galerkin's method for 1-D truss – Computation of stress in a truss element.

UNIT-IV:

Finite element formulation for plane stress and plane strain problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces

UNIT-V:

Iso-parametric Formulation: An isoparametric bar element- plane bilinear isoparametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature for performing numerical integrations.

Text Books:

1. A first course in the Finite Element Method, Daryl L. Logan, Thomson Publications.
2. Introduction to Finite Elements in Engineering, Tirupati R. Chandrupatla, Ashok D. Belgundu, PHI publications.
3. Introduction to Finite Element Method, Desai & Abel CBS Publications

Reference Books:

1. Concepts and applications of Finite Element Analysis, Robert D. Cook, Michael E Plesha, John Wiley & sons Publication.

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T07 PAVEMENT DESIGN
(PROFESSIONAL ELECTIVE-IV)

Course Objectives: The objective of this course is to

- Know the concept of pavement design
- Acquire Knowledge on material characteristics
- Design of flexible, rigid pavements
- Design low volume roads.

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Design Concepts of Pavements

CO2: Know the Pavement material characteristics

CO3: Design of flexible pavements

CO4: Design of rigid pavements

CO5: Design of pavement for low volume roads

SYLLABUS

UNIT–I:

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT–II:

Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements.

Stresses In Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts.

Stresses In Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

UNIT–III:

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent

Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics.

UNIT-IV:

Design Of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods

Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

UNIT-V:

Design of Pavement for Low Volume Roads: Pavement design for low volume roads, Rural road designs – code of practice. Design of Overlays: Types of Overlays, Suitability, Design of overlays.

Text Books:

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc

Reference Books:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Principles of Pavement Design, Yoder.J. & Witzorac Mathew, W. John Wiley & Sons Inc
3. Pavement and Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes 37, 58, 62, 81 for Flexible and Rigid Pavements design, low volume roads and overlays.

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T08 PORT AND HARBOUR STRUCTURES (PROFESSIONAL ELECTIVE-IV)

Course Objectives: The objective of this course is to

- have a knowledge about growth and regulation of ports
- acquire knowledge on harbor planning site investigation
- Know the concept of ocean waves, berthing structures
- Design principles of dock structures

Course Outcomes: On successful completion of this course, the students will be able to

CO1: have a knowledge about growth and regulation of ports

CO2: harbor planning site investigation

CO3: Concept of ocean wave

CO4: Concept of berthing structures

CO5: Design principles of dock structures

SYLLABUS

UNIT-I:

Growth and regulation of Ports: History of Port. Classification of Harbours - Factors affecting the growth of Port. - Requirement of a Harbour - General Planning. Port capacity. traffic analysis - Berth occupancy. financial evaluation - EIA -Description of selected Indian ports.

UNIT-II:

Harbour Planning (Technical) Site investigation. harbour entrance - Navigational Channel. Depth of harbour. Turning basin. Anchor basin. berthing area. Storage area - Shipping terminal facilities. Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals.

UNIT-III:

Introduction to ocean waves. Wave transformation. Wave and wind climate inside Harbour – Break waters: Types. Factors determining their selection. Forces on break waters. Design of rubble mound and vertical break waters. Physical Model Studies.

UNIT-IV:

Berthing structures. Types. Loads. Selection of berthing structures. Design principles of diaphragm walls, dolphins and piles. Selection and Design principles of Dock fenders and Mooring accessories.

UNIT-V:

Design principles of dock structures - Graving dry dock. Slip way. floating dry dock - Monitoring and repair of harbour structures - Dredging - Navigational aids. Light house.

Text Books:

1. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 1993.
2. Oza and Oza, "A course in Docks & Harbour Engineering".

Reference Books:

1. Harbour and Coastal Engineering (Indian Scenario) Vol - I & Vol . II; S. Narasimhan & S. kathiroli, NIOT- Chennai
2. Design and construction of Port and marine Structures. Alonzo Def. Quinn.McGraw. Hill book Company
3. IS: 7314 1974 - Glossary of terms relating to Port and harbour Engineering.
4. IS: 4651 – Code of practice for Planning and Design of Port and harbour (Part. I) Site Investigation.
5. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part. II) Earth Pressure.
6. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part. III) Loading.
7. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part. IV) General Design Consideration.
8. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part. V) Layout and functional Requirement.

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T09 ESTIMATION, SPECIFICATION AND CONTRACTS (PROFESSIONAL ELECTIVE-V)

Course Objectives: The objective of this course is to

- Understand the quantity calculations of different components of the buildings.
- Understand the rate analysis of different quantities of the buildings components.
- Learn various specifications and components of the buildings.

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: The student should be able to determine the quantities of different components of buildings.

CO2: The student should be in a position to find the cost of various building components.

CO3: The student should be capable of finalizing the value of structures.

SYLLABUS

UNIT–I:

General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estimating.

UNIT–II:

Rate Analysis – Working out data for various items of work over head and contigent charges.

UNIT-III:

Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

UNIT–IV:

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation of buildings Standard specifications for different items of building construction.

UNIT-V:

Detailed Estimation of Buildings using individual wall method- Detailed Estimation of Buildings using center line method.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of SIX questions from Unit 1 to Unit 4, out of which THREE are to be answered (60% weight-age) & ONE mandatory question (40% weight-age) from Units 5 & 6 is to be answered.

Text Books:

1. Estimating and Costing, B.N. Dutta, UBS publishers, 2000.
2. Civil Engineering Contracts and Estimates, B. S. Patil, Universities Press

(India) Pvt. Ltd., Hyd.

3. Construction Planning and Technology, Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. Estimating and Costing, G.S. Birdie.

Reference Books:

1. Standard Schedule of rates and standard data book, Public works department.
2. IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil Engg Works – B.I.S.
3. Estimation, Costing and Specifications, M. Chakraborthi; Laxmi publications.
4. National Building Code

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T10 PRESTRESSED CONCRETE (PROFESSIONAL ELECTIVE-V)

Course Objectives: The objective of this course is to

- Familiarize Students with concepts of prestressing
- Equip student with different systems and devices used in prestressing
- Understand the different losses of prestress including short and long term losses
- Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion

Course Outcomes: **On successful completion of this course , the students will be able to**

CO1: Understand the different methods of prestressing

CO2: Estimate effective prestress including the short and long term losses

CO3: Analyze and design prestressed concrete beams under flexure and shear

CO4: Understand the relevant IS Codal provisions for prestressed concrete

SYLLABUS

UNIT-I:

Basic concepts of Prestressing- Advantages and Applications of Prestressed Concretes, High Strength Concrete- Permissible Stresses, Shrinkage, Creep, Deformation Characteristics, High strength Steel- Types, Strength- Permissible Stresses- Relaxation of Stress, Cover Requirements. Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems.

UNIT-II:

Basic Assumptions in Analysis of prestress and design, Analysis of prestress, Resultant Stresses at a section- pressure line- Concepts of load balancing- Stresses in Tendons, Cracking moment.

UNIT-III:

Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned membersdue to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation stress in steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design.

UNIT-IV:

Design for Flexural resistance- Types of flexural failure – Code procedures- Design of sections for flexure- Control of deflections- Factors influencing Deflection- Prediction ofshort term and long term deflections.

UNIT-V:

Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

Text Books:

1. Prestressed Concrete, N. Krishna Raju, Tata McGraw hill
2. Prestressed Concrete, S. Ramamrutham

Reference Books:

1. Prestressed Concrete, P. Dayaratnam
2. Prestressed Concrete, T. Y. Lin & Burns, Wiley Publications

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T11 GEOENVIRONMENTAL ENGINEERING (PROFESSIONAL ELECTIVE-V)

Course Objectives: The objective of this course is to

1. study the sources of contamination and characterization of contaminated ground.
2. study and model the contaminable Transport.
3. identify appropriate remediation technique for the contaminated.

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Able to identify appropriate remediation techniques for containmination & provide models.

SYLLABUS

UNIT-I:

Sources and Site Characterization: Scope of Geoenvironmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterisation methods.

UNIT- II:

Solid and Hazardous Waste Management: Classification of waste, Characterisation solid wastes, Environmental Concerns with waste, waste management strategies.

UNIT-III:

Contaminant Transport: Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation.

Unit –IV:

Remediation Techniques: Objectives of site remediation, various active and passive methods, remediation NAPL sites, Emerging Remediation Technologies.

UNIT-V:

Landfills: Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

Text Books:

1. Bedient, Refai & Newell - Ground Water Contamination
2. Sharma, H. D. and Reddy, K. R. - Geoenvironmental Engineering

Reference Books:

1. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Handbook
2. Reddi, L. N. and Inyang, H. I. - Geoenvironmental Engineering
3. LaGrega, M. D., Buckingham, P. L. and Evans, J. C. - Hazardous Waste Management

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T12 WATER HARVESTING AND CONSERVATION (PROFESSIONAL ELECTIVE-V)

Course Objectives:

- The main aim of this course is to discuss various aspects of water resources development and management on watershed basis
- The various sections in the course will focus on the technical aspects of Watershed management
- Perspectives on water management
- Skills of analyzing the complex issues in water management and on specific knowledge on issues of watershed management.

Course Outcomes:

CO1: Water harvesting methods and principles

CO2: Water recovery and reuse

CO3: Sustainable watershed management practices

CO4: Watershed modeling techniques

CO5: Methods of soil and water conservation

SYLLABUS

UNIT-I:

Water Harvesting: Principles of water harvesting-methods of rainwater harvesting-design of rainwater harvesting structures-Purification Techniques for direct use- Harvesting of surface runoff-onsite detention basin - ponds - types - Recycling of harvested water

UNIT–II:

Water Recovery and Reuse: Perspective on recycle and reuse- factors affecting the development of water reclamation and reuse criteria- elements/components of water reclamation and reuse criteria / guidelines- sewage irrigation- Waste water reclamation- wastewater recharge for reuse – Treatment Requirements for Water Reuse-methods

UNIT–III:

Sustainable Watershed Approach & Watershed Management Practices: Concept of watershed- Introduction to watershed management- Integrated water resources management- natural resources management-agricultural practices-integrated farming Conjunctive use of water Regions-Case studies-Short term and long term strategic planning.

UNIT–IV:

Watershed Modeling: Standard modeling approaches and classifications, system concept for watershed modeling, overall description of different hydrologic processes, modeling of rainfall-runoff process, subsurface flows and groundwater flow.

UNIT–V:

Soil and Water Conservation: Scope of soil and water conservation-Mechanics and types of erosion-their causes-Soil erosion control measures - bank protection-vegetative barriers contour bund- contour trenches-contour stone walls-contour ditches-terraces-outlets and grassed waterways-Gully control structures - temporary and permanent - design of permanent soil conservation structures-Design of farm ponds and percolation ponds.

Text Books:

1. Pierce, F.J. and Frye, W. W. (1998): Advances in Soil and Water Conservation, Ann Arbor Press, Michigan.
2. Schwab, G. O., Fangmeier, D. D., Elliot, W. J. and Frevert, R. K. (1993): Soil and Water Conservation Engineering, 4th Ed. John Wiley and Sons Inc., USA
3. Murty, J.V.S. "Watershed Management", New Age Intl., New Delhi 1998.
4. Murthy, J.V.S., Watershed Management in India, Wiley Eastern, New Delhi, 1994 .

Referrence Books:

1. Dilip Kumar Majumdar, Irrigation water management - Principles and Practice, PHI Pvt. Ltd. NewDelhi-1.
2. Madan Mohan Das & Mimi Das Saikia, Irrigation and water power Engineering, PHI learning pvt. Ltd., NewDelhi-1
3. Chatterjee, S. N., Water Resources Conservation and Management, Atlantic Publishers, 2008

B.TECH VII SEMESTER

HSMC	L	T	P	C
	3	0	0	3

20CE7T17 UNIVERSAL HUMAN VALUES 2
Understanding Harmony

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcome

On completion of this course, the students will be able to

CO1: Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society

CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.

CO3: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society

CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.

CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

SYLLABUS

UNIT- I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I

2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential

Validation- as the process for self-exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority

5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT- II

Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

10. Understanding the characteristics and activities of 'I' and harmony in 'I'

11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT- III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships

in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

22. Definitiveness of Ethical Human Conduct

23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

24. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

25. Case studies of typical holistic technologies, management models and production systems

26. Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations

27. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Readings

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

B.TECH VII SEMESTER **SC**

L	T	P	C
0	0	4	2

20CE7S18 ETABS
(Skill Oriented Course)

Course Objective: Objective of this course to introduce concepts of ETABS

Exercises:

1). Load Combinations

2). Wind load analysis

3). Seismic Analysis

4). Composite column building design

5). Reinforcement details of beams

6). Slab Design

7). RCC building design – Single column building design

8). Multistory building.

Software Used : ETABS

B.TECH VII SEMESTER

	L	T	P	C
I	0	0	0	3

20CE7I19 INTERNSHIP

A) There shall be an Industrial oriented Internship / Summer Internship in Collaboration withan Industry (or) Government organization of the relevant specialization to be registered immediately after IVth Semester Examinations and VIth Semester taken up during the summer vacation for about Minimum six weeks duration.

B) The industry-oriented Internship or Summer Internship shall be submitted in a report form, and a presentation of the same shall be made before a Committee, which evaluates it for 50 marks. The committee shall consist of Head of the Department, the supervisor of internship and a Senior Faculty Member of the Department. There shall be no internal marksfor Industry oriented internship/ Summer Internship. The internship shall be evaluated in the V SEM and VII Semester.

B.TECH VIII SEMESTER

PROJ	L	T	P	C
	0	0	0	12

20CE8P01 PROJECT

Course Content:

Project work is intended to provide training in the solution of field engineering problems involving Surveying, Planning, drawing plans, Designing, Estimating and Marking out of a Building/Highway/Irrigation/Public health project.

Project work will also include the preparation of the feasibility report for any one type of enterprise under self – employment schemes. Students shall be divided into groups of four (or) five each and shall be assigned a problem that calls for application of the knowledge he/she acquired in the course and also which involves some extra study of reference materials.

Sample Project Titles

a) Planning and designing of a Residential Colony.
b) Multi storied Building project.
c) Industrial complex
d) Irrigation project.
e) Rural Water Supply Scheme.
f) Sanitary Engineering Scheme
g) Bridge project.
h) Low Cost Housing Scheme.
i) Set up of a small enterprise under self-employment scheme etc.

Every student should prepare a project report and submit the same for assessment. Every student puts his share to the work in all the operations of the project. The end examination in Project work shall consist of Power point presentation and Viva-voce test to be assessed by a panel of examiners comprising of an External examiner, the Head of Section, and member of staff who guided the project as internal examiner.

Suggested Learning Outcomes: After completion of the subject, the student shall be able to

Identify different works to be carried out in the Project.
Collect data relevant to the project.
Carry out Site Surveys.
Select the most efficient method from the available choices based on preliminary investigation.
Design the required elements of the project as per standard Practice.
Prepare working drawings for the project.
Estimate the cost of project, men, materials and equipment required.

Prepare schedule of time and sequence of operations.

Prepare project report.

Prepare C.P.M. Chart.

Collect the requirements to start a Small Enterprise/ Industry under Self Employment Scheme.

The aim of the Project work is to develop capabilities among the students, for a comprehensive analysis of implementation of Good Hygienic Practices in conducting investigation and report writing in a systematic way and to expand students understanding on the subject.

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B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE5T04 ARCHITECTURE AND TOWN PLANNING
(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

- Initiating the students to different architectures of the world.
- Salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization.
- Architectural Design concepts, Principles of Planning and Composition.
- To understand town planning from ancient times to modern times.
- To impart the concepts of town planning standards.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Student should be able to distinguish architectural styles of eastern and Western world.
CO2: Student should understand the importance of Orders of Architecture.
CO3: Should be able to compose spaces of buildings using design concepts, planning principles.
CO4: Student should understand the town planning standards, landscaping features.

SYLLABUS

UNIT-I:

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace – Fort - Tomb.

UNIT-II:

Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT-III:

Principles of Planning: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements,

Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wright, Walter Groping.

UNIT-IV:

Histroical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT-V:

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- neighbor hood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation planning regulations and limitations.

Text books:

1. 'The great ages of World Architecture' by G.K. Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y. S.Sane.
3. 'Professional Practice' by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, NewDelhi.
4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning'by G.K. Haraskar.

Reference Books:

1. 'Drafting and Design for Architecture' by Hepler, Cengage
2. Learning 'Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.
3. 'Mordern Ideal Homes for India' by R. S. Deshpande.
4. 'Town and County Planning' by A.J. Brown and H.M. Sherrard.
5. 'Town Design' by Federik Glbbard, Architectural press, London.

B.TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20CE5T05 ELEMENTS OF CIVIL ENGINEERING
(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources, Water Supply, Sanitary, Electrical Works in Building and Highway engineering.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: The student should be able to know the basics of civil engineering and concepts of surveying.

CO2: The student should be able to know various properties of building materials and various types of building.

CO3: The student should be able to know the fundamentals of Water Resources, Water Supply, Sanitary and Electrical Works in Building.

CO4: The student should be able to know the fundamental concepts highway engineering.

SYLLABUS

UNIT-I:

Introduction. Introduction of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on economy of country.

UNIT-II:

Surveying Introduction: Definition of Surveying, Fundamental principles of surveying, Classification of surveying.

Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining and Ranging.

Angular Measurement: Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing local attraction.

Levelling: Objectives and applications-terminology-Instruments, component parts of dumpy level, Types of levelling, levelling staff

UNIT-III:

Building Materials and Construction Materials: Introduction to construction materials - Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen. Construction: Classification of buildings, Building components and their functions.

UNIT-IV:

Water Resources Hydrologic cycle, water use and its conservation, Introduction to dams, barrages and check dams. Water Supply, Sanitary and Electrical Works in Building Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

UNIT–V:

Transportation Engineering, classification of roads, Introduction of flexible and rigid pavements, Introduction to road traffic and traffic control mechanism.

Text Books:

1. Elements of Civil Engineering, Mimi Das Saikia, Bhargab Mohan Dasand Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, Publisher: McGraw Hill Education, India Pvt. Ltd.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, Arun kumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books:

1. Surveying Theory and Practice, James M Anderson and Edward, 7th Edition, M Mikhail Publisher: McGraw Hill Education, India Pvt. Ltd.
2. Surveying and Leveling, R. Subramanian Publisher, Oxford University.
3. Building drawing, M.G. Shah, C.M.Kale and S.Y. Patki Publisher: TataMcGraw Hill.

B.TECH V SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE5T04 BASICS OF CONTROL SYSTEMS
(OPEN ELECTIVE-I)

Course Objectives:

- To Enable the student to understand the importance of Modelling of Control systems
- To understand the First order & second order systems
- To understand the transfer function analysis
- To understand the Stability of the systems
- To understand the States Space Analysis

Course Outcomes:

At the end of the course, the student will be able to

CO1: Understand the different Classification of control systems and modelling

CO2: Understand the functioning of Signals & time response analysis

CO3: Understand the concept of Root Locus & Construction of Root Loci

CO4: Understand the concept of Bode plot & Nyquist Plot

CO5: Understand the concept of States Space Analysis of LTI System

SYLLABUS

UNIT – I

Mathematical Modeling of Control Systems: Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems

UNIT-II

Time Response Analysis: Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III

Stability and Root locus Technique: The concept of stability – Routh's stability criterion –limitations of Routh's stability –Root locus concept - construction of root loci

UNIT–IV

Frequency Response Analysis: Introduction to Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots.

UNIT–V

State Space Analysis of LTI Systems: Concepts of state variables and state model, state space representation of transfer function, Diagonalization- Solving the time invariant state equations.

Text Books:

1. Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2nd Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems, Manik Dhanesh N, Cengage publications.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International
   Publications, 5th Edition.
4. Control Systems Engineering, S.Palani,TataMcGraw Hill Publications.

B.TECH V SEMESTER	**OE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE5T05 SPECIAL ELECTRICAL MACHINES

(OPEN ELECTIVE-I)

Course Objective:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor**.**
- To explain the theory of travelling magnetic field and applications of linear motors.

Course Outcomes:

The student should be able to

CO1: Distinguish between brush dc motor and brush less dc motor**.**

CO2: Explain the performance and control of stepper motors, and their applications.

CO3: Explain theory of operation and control of switched reluctance motor.

CO4: Explain the theory of travelling magnetic field and applications of linear motors.

CO5: Understand the significance of electrical motors for traction drives.

SYLLABUS

Unit I: Stepper Motors: Classification and construction details of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of stepper motors – Applications of stepping motors.

Unit II: Switched Reluctance Motors: Construction – Comparison of conventional and switched reluctance motors –Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

Unit III : Brushless DC Motor: Construction – Principle of operation of BLDM – sensing and logic scheme, basic drive circuit, power converter circuit, transient analysis Theory of brushless DC motor as variable speed synchronous motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency.

UNIT-IV: **Linear motors:** Linear induction motor: Construction– principle of operation– applications. Linear synchronous motor: Construction – principle of operation– applications.

Unit V: Electric Motors for traction drives: AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:

1. Special electrical Machines, K. Venkata Ratnam, University press, 2009, New
2. "Linear Electric Motors: Theory, Design and Practical application" , Naser A and Boldea I, Prentice Hall Inc, New Jersey, 1987.

Reference Books:

1. Generalized Theory of Electrical Machines – PS Bhimbra, Khanna Publishers.
2. "Brushless Permanent Magnet and Reluctance Motor Drives" , Miller T.J.E. Clarendon Press, Oxford, 1989.
3. Electric Machines – Theory, operation, Applications and Control - Charles I. Hubert – Pearson Publications.

B.TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME5T04 **DESIGN THINKING & PRODUCT INNOVATION (OPEN ELECTIVE-I)**

Pre-requisite: Managerial Economics and Financial Analysis,

Management Science.

Course Objective: At the end of the course, The student will able to

1. Design and develop the new product
2. Explain the basics of design thinking.
3. Describe the role of reverse engineering in product development.
4. Identify the needs of society and convert into demand.
5. Explain the product planning and product development process

Course Outcomes: At the end of the course, student will be able to

CO1: To bring awareness on innovative design and new product development.

CO2: To explain the basics of design thinking.

CO3: To familiarize the role of reverse engineering in product development.

CO4: To train how to identify the needs of society and convert into demand.

CO5: To introduce product planning and product development process.

SYLLABUS

UNIT-I: SCIENCE TO ENGINEERING:

Job of engineers, engineering units and measurement, elements of engineering analysis, forces and motion, energy, kinematics and motion, conversion of linear motion to rotary and vice versa, motion transmission. Physics to Engineering: Application of Newton laws, Pascal's law, Bouncy, Bernoulli's theorem, Ohm's law, electrical induction in
engineering products.

UNIT-II: HISTORICAL DEVELOPMENT:

Invention wheel, early mechanics in design, mechanical advantages,
industrial revolution, steam and petrol for mobility. Innovations in Electrical and Electronics: Electrical energy generation, electrical bulb, electrical equipment, electronics and automation, computing for early days to present, innovations in communications.

UNIT-III: SYSTEMATIC APPROACH TO PRODUCT DEVELOPMENT:

Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation. Solution finding methods: Conventional, intuitive, discursive, methods for combining solution, decision making for new design.

UNIT-IV: REVERSE ENGINEERING IN PRODUCT DEVELOPMENT:

Reversing engineering methods, identifying the bad features in a product, reduction in size and weight, usage of new materials, 3D printing, study of introducing electrical and electronic controls to the old products, importance of ergonomics in product development, environmental considerations in design, safety considerations in design.

UNIT-V:

Study of Product Development- Agriculture, development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy. Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of electrical vehicles, unmanned vehicles, design principles in drones.

Text Books:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, “Exploring Engineering: An Introduction to Engineering and Design”, 4th edition, Elsevier, 2016.
2. David Ralzman, “History of Modern Design”, 2nd edition, Laurence King Publishing Ltd., 2010
3. An AVA Book, “Design Thinking”, AVA Publishing, 2010.

Reference Books:

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, “Engineering Design: A Systematic Approach”, 3rd edition, Springer, 2007.
2. Tom Kelley, Jonathan Littman, “Ten Faces in Innovation”, Currency Books, 2006.

B.TECH V SEMESTER		**OEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME5T05	**NANOTECHNOLOGY (OPEN ELECTIVE-I)**					

Pre-requisite: Materials Science

Course Objective:

- To familiarize with principles of quantum mechanics on which nano materials behave
- To elucidate applications of nanotechnology

Course Outcomes:

At the end of the course, student will be able to

CO1: Analyze the concepts and preparation methods of Nano materials

CO2: Understand the nano material properties and their behavior

CO3: Use various techniques for investigating nano material

CO4: Know the importance of Nano Technology for advanced materials processing

CO5: Know the importance of Nano structured Materials for Various Energies.

SYLLABUS

UNIT-I: Introduction to Nano technology:

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects

UNIT-II: Unique Properties of Nanomaterials:

Microstructure and Defects in nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple, and disclinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility, Magnetic Properties: Soft magnetic Nanocrystalline alloy, Permanent magnetic Nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT-III: Synthesis Routes :

Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method ,Self assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

UNIT-IV: Nanomaterials for Energy Conversion Systems:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy, Conversion Systems, Fuel Cells, Principles and nanomaterials design for Proton exchange membrane fuel cells (PEMFC); Direct methanol fuel cells (DMFC).

UNIT-V:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy Storage Systems, Primary and Secondary Batteries (Lithium ion Batteries), Cathode and anode materials, Nanostructured Carbon based materials, Nano-Oxides, Novel hybrid electrode materials, Current status and future trends.

Text books:

1. Electrochemical methods: Fundamentals and Applications, Allen J.Bard and Larry R. Faulkner, 2ndEdition John Wiley & Sons. Inc (2004)
2. D. Linden Ed., Handbook of Batteries, 2nd edition, McGraw-Hill, New York (1995)
3. G.A. Nazri and G. Pistoia, Lithium Batteries: Science and Technology, KulwerAcdemic Publishers, Dordrecht, Netherlands (2004).
4. J. Larmine and A. Dicks, Fuel Cell System Explained, John Wiley, New York (2000).

Reference Books:

1. Science and Technology of Lithium Batteries-Materials Aspects: An Overview, A. Manthiram, Kulwer Academic Publisher (2000).
2. M. S. Whittingham, A. J. Jacobson, Intercalation Chemistry, Academic Press, New York (1982).
3. M. Wakihara, O. Yamamoto, (Eds.) Lithium Ion Batteries: Fundamentals and Performance, Wiley –VCH ,Weinheim (1998).

B. Tech V SEMESTER	OEC	L	T	P	C
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20EC5T04 LINEAR SYSTEM ANALYSIS
(OPEN ELECTIVE –I)

Pre-requisite: Basic knowledge about vectors, differentiation and integration

COURSE OBJECTIVES:
The main objectives of this course are given below:

	At the end of the course, student will be able to
1	To understand basics of Signals and Systems required for all Engineering related courses.
2	To understand the behaviour of signal in time and frequency domain.
3	To understand the characteristics of LTI systems.
4	To understand concepts of Signals and Systems and its analysis using different transform techniques.
5	To understand sampling, convolution and correlation.

COURSE OUTCOMES:
At the end of this course the student will able to:

	At the end of the course, student will be able to
CO1:	Differentiate various signal functions.
CO2:	Represent any arbitrary signal in time and frequency domain.
CO3:	Understand the characteristics of linear time invariant systems.
CO4:	Analyse the signals with different transform technique.
CO5:	Understand the concept of sampling.

SYLLABUS

UNIT-I: Signal Analysis

Analogy between Vectors and Signals, Orthogonal Signal Space, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function

UNIT-II: Fourier series & Fourier transforms

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series.Deriving Fourier Transform from Fourier series,

Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform.

UNIT-III: Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Pauley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time.

UNIT-IV: Laplace Transforms & Z–Transforms

Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal.

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms

UNIT-V: Sampling theorem & Correlation

Graphical and analytical proof for Band Limited Signals, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parseval's Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation.

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2nd Ed.

Reference Books:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH

B. TECH V SEMESTER

		L	T	P	C
	OEC	3	0	0	3

20EC5T05 DIGITAL LOGIC DESIGN (OPEN ELECTIVE –I)

Course Objectives:

At the end of the course, student will be able to

1. To represent numbers and conversion between different representations.
2. To analyze logic processes and implement logical operations.
3. To develop the combinational logic circuits.
4. To understand concept of programmable logic devices like PROM, PLA, PAL.
5. To design and analyze the concepts of sequential circuits.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand different number systems and their conversions.

CO2: Analyze the logical operations and Boolean algebra

CO3: Develop combinational circuits and perform logical operations.

CO4: Understand different programmable logic devices.

CO5: Design the sequential logic functions.\

SYLLABUS

UNIT-I:

Number Systems: Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r's Complement- (r-1)'s Complement- Subtraction of Unsigned Numbers- Signed Binary Numbers- Problems.

UNIT-II:

Logic Gates and Boolean Algebra: Basic Gates- Universal Gates- Ex-Or and Ex-Nor Gates- SOP- POS- Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- K Map Method- Minimization of Boolean Functions.

UNIT-III: Signal Transmission through Linear Systems

Combinational Logic Circuits: Design of Half Adder- Full Adder- Half Subtractor- Full Subtractor- Ripple Adder and Subtractor- Design of Decoders- Encoders- Multiplexers- Demultiplexers- Magnitude Comparator.

UNIT-IV: Laplace Transforms & Z–Transforms

Introduction to Programmable Logic Devices (PLDs): PLA- PAL- PROM- Realization of Switching Functions Using PROM- Comparison of PLA, PAL and PROM.

UNIT-V: Sampling theorem & Correlation

Introduction to Sequential Logic Circuits: Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear)- Design of Registers- Universal Shift Register- Ring Counter- Johnson Counter.

TEXT BOOKS

1. Digital Design, M.Morris Mano, Michael D Ciletti, 4thEdition, PEA, 2003.

2. Fundamentals of Logic Design, Roth, 5thEdition, Cengage, 2004

REFERENCE BOOKS

1. Switching and Finite Automata Theory, Kohavi, 3rd Edition, Jha, Cambridge, 2005

2. Digital Logic Design, Leach, Malvino, Saha, TMH, 2000.

B. TECH V SEMESTER	OEC	L	T	P	C
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SOLID STATE DEVICES
20EC5T06 (OPEN ELECTIVE –I)

Course Objectives: Students undergoing this course, are expected to

1. Familiarize with the fundamentals of Semiconductor physics
2. Familiarize with various diodes and characteristics.
3. Familiarize with the transistors and their configurations.
4. Disseminate Amplifications with transistors
5. Understand the operation and working of Oscillators

Course Outcomes:

After undergoing the course, students will be able to

CO1: Understand importance of semiconductors.

CO2: Analyze Diode characteristics.

CO3: Differentiate various Transistor BJT configurations.

CO4: Design amplifiers at different applications using transistor.

CO5: Analyze different Feedback amplifiers & oscillators design

SYLLABUS.

Unit I: Basics Concepts of Semiconductor Physics, Charged Particles, Field Intensity, Potential, Energy, the eV unit of energy, Energy Band theory of Crystals, Insulators, Semiconductors and metals, Mobility and Conductivity, Electrons and Holes, Donor and Acceptor impurities, Charge Densities in a Semiconductor, Electrical properties of Ge and Si, Hall Effect, Diffusion and Drift Currents, Mass action Law, Fermi-Dirac distribution.

Unit II: Diodes: PN junction diode- Energy band diagram of PN junction Diode- V-I Characteristics –Current components in PN junction Diode- Diode equation- Diode resistance and capacitance, Characteristics of Zener Diode, Varactor Diode- SCR and UJT.

Unit III: Transistors Bipolar Junction Transistor: Transistor current components- Transistor equation- Transistor configurations- Characteristics of a transistor in CB, CC&CE configurations- Transistor as a Switch,Transistor as an amplifier. Field Effect Transistors (FET): Junction Field Effect Transistor construction & operation, characteristics of CS, CD & CG

Unit IV: Small Signal Transistor Amplifier models: Low Frequency Transistor Amplifier Models: Two port network, Transistor hybrid model, determination of h- parameters, generalized analysis of transistor amplifier model using h-parameters

Unit V: Feedback Amplifiers and Oscillators: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and their analysis. Generalized analysis of LC Oscillators, Hartley and Colpitt‘s oscillators with BJT and their analysis.

Text Books:

1) Millman, Halkias, ―Integrated Electronics- Analog and Digital Circuits and Systems, TMH.

2).Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGrawHill,Second Edition.

Reference Books:

1) Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.

2) . Basic Electronic Circuits -V.K.Mehta, S-chand Publications,2008

B. TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

INTRODUCTION TO ARTIFICIAL INTELLIGENCE
20CS5T07 (OPEN ELECTIVE –I)

Course Objectives:

- To gain a historical perspective of Artificial Intelligence and its foundations.
- To familiarize the basic principles of Artificial Intelligence towards problem solving Inference, Perception, Knowledge representation and Learning.
- To understand advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems.

Course Outcomes: At the end of the course, the students will be able to:

CO1: To Understand the history of Artificial Intelligence and its foundations.

CO2: Apply various Artificial Intelligence Techniques for problem solving.

CO3: Formalization of knowledge using the framework of predicate logic.

CO4: Ability to apply knowledge representation and reasoning to real world problems.

CO5: Derive conclusions from uncertain knowledge and quantify the uncertainty in the Conclusions obtained.

SYLLABUS

UNIT-1:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT-2: Problem Solving:

State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem Reduction and Game Playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT-3: Logic Concepts:

Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-4: Knowledge representation:

Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT-5: Expert system and applications:

Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning (Units 1,2,3,4,5)

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
4. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

OPERATING SYSTEMS
20CS5T08 (OPEN ELECTIVE –I)

Course Objectives:

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes:

CO1: Understand the importance, functions and structures of operating systems.

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

SYLLABUS

UNIT - I: Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication

UNIT - II: Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multithreading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT – III: Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures

UNIT - IV: Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock- Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Dead lock.

UNIT - V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling

TEXT BOOKS:

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley, 9thedition.(Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition–2005.(Unit-5)

REFERENCES:

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley ,Operating Systems: A Design-Oriented Approach, Tata Mc Graw Hill Education,1996.

B. TECH V SEMESTER

	L	T	P	C
OEC	3	0	0	3

SOFTWARE ENGINEERING
20CS5T09 (OPEN ELECTIVE –I)

Course Objective:

- Gain knowledge about software process models.
- Familiarize the basic software engineering methods, practices and its applications.
- Facilitate students in software design.

Course Outcomes:

CO1: Understand the software life cycle models

CO2: Understand the scrum approach to agile project management.

CO3: Analyze the software requirements and generate SRS document

CO4: Understand some of the different models that may be used to design

CO5: Understand various software testing approaches and quality control to ensure good quality software

SYLLABUS

Unit-I:

Introduction to Software Engineering: Nature of software, Software engineering, The Software Processes, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialised Process models, The Unified Process, Personal and Team Process Models.

Unit-II:

Requirements Engineering: Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

Requirements Modelling: Requirement Analysis, Scenario-Based Modelling, Data Modelling Concepts, Class-Based Modelling

Unit-III:

Design Concepts: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Unit-IV:

Understanding of UML diagrams: Structural diagrams - class diagram, object diagram, component diagram, deployment diagram, Behavioural diagrams - Use-case diagram, activity diagram, sequence diagram, collaboration diagram, state chart diagram.

Unit-V:

Implementation: Structured coding Techniques, Coding Styles-Standards and Guidelines, Implementation Issues.

Software Testing Strategies: A Strategic approach to Software Testing, Strategic Issues and Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing, Software Quality concepts.

TEXT BOOKS:

1. Roger S. Pressman (2010), Software Engineering, A Practitioner’s Approach, 7th Edition, McGraw-Hill International Edition, India.
2. Ian Sommerville (2011), Software Engineering, 9th Edition, Pearson education, India.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.Jim ConallenKelli A. Houston," Object-Oriented Analysis and Design with Applications", 3rd edition.

REFERENCES:

1. Pankaj Jalote (2010), Software Engineering, A Precise Approach, Wiley India.
2. Waman S. Jawadekar (2008), Software Engineering: A Primer, McGraw-Hill, India.
3. Hans Van Vilet (2008), Software Engineering Principles and Practice, 3rd Edition, John Wiley & Sons Ltd.
4. Rajib Mall (2005), Fundamental of Software Engineering, PHI.
5. Deepak Jain, Software Engineering, Principles and Practices, Oxford, University Press, India.

B. TECH V SEMESTER

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

COMPUTER NETWORKS

20IT5T07 (OPEN ELECTIVE –I)

Course Objectives:

- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the students to basic principles of networking using the goals like protocol layering and top down approach.
- Build an understanding of the basics of the internetworking and routing used in the computer networks.
- To provide guidelines in developing network applications

Course Outcomes:

At the end of the course, student will be able to

CO1- Independently enumerate the layers of the OSI model and TCP/IP.

CO2- Identify the different types of network topologies and protocols.

CO3- Compare and contrast methods to identify Errors and correct them

CO4- Differentiate between various network routing algorithms.

CO5- Understand WWW and HTTP Architectures.

SYLLABUS

UNIT - I: Introduction:

OSI overview, TCP/IP and other networks models, Examples of Networks: Arpanet, Internet, Network Topologies Wide Area Networks(WAN), Local Area Networks(LAN), Metropolitan Area Networks(MAN).

UNIT - II: Physical Layer and overview of PL Switching:

Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, introduction to switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT – III: Data link layer:

Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction, CRC, Checksum: idea, one's complement internet checksum, services provided to Network.

Elementary Data Link Layer protocols: Simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.

Sliding window protocol: One bit, Go-back N, Selective Repetitive protocol, Stop and wait protocol.

UNIT - IV: Random Access:

ALOHA, MAC addresses, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access(CDMA).

Network layer: Shortest Path, Distance Vector Routing Algorithm, Hierarchal routing algorithm.

UNIT - V: Application layer (WWW and HTTP):

WWWARCHITECTURE: Client (Browser), Server, Uniform Resource Locator, Resource Record, HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Request Message Format, HTTP Response Message Format

TEXT BOOKS:

1. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH. (Units 1,2,4,5)
2. Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education(Units 1, 3, 4)

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

B. TECH V SEMESTER

	L	T	P	C
OEC	3	0	0	3

COMPUTER GRAPHICS
20IT5T08 (OPEN ELECTIVE –I)

Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

Course Outcomes:

After learning the course, the student will be able:

CO1: Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations.

CO2: Apply projections and visible surface detection techniques for display of 3D scene on 2D screen.

CO3: Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics.

CO4: Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).

CO5: Know and be able to discuss hardware system architecture for computer graphics. This Includes, but is not limited to: graphics pipeline, frame buffers, and graphic accelerators/co-processors.

SYLLABUS

UNIT - I: Introduction to Graphics:

Application area of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT - II: 3D Concepts:

Parallel and Perspective projections, Three dimensional object representation-Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT – III: Graphics Programming:

Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Key frame. Graphics programming using OPENGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes

UNIT – IV: Rendering:

Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadow of objects, Building a camera in a program, Creating shaded objects

UNIT - V: Overview of Ray Tracing:

Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics– C Version, second edition, Pearson Education, 2004

REFERENCES:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007

B. TECH V SEMESTER **OEC**

L	T	P	C
3	0	0	3

20HS5T01 QUANTITATIVE APTITUDE AND REASONING (OPEN ELECTIVE –I)

SYLLABUS

Unit-I: Divisibility and remainder rules of numbers, Unit digit , square root, cube root and simplification of numbers, HCF and LCM of numbers, Averages and Percentages, Alphabetical and miscellaneous series, Coding and decoding and Blood Relations

Unit-II: Profit & loss, Simple interest and Compound interest, Direction, Order and Ranking, Sitting arrangement and Puzzle

Unit-III: Ratio & proportions, Partnership, Alligation and mixtures and Ages.
Data sufficiency, Inequalities and Decision making.

Unit-IV: Time and work, Pipes & cisterns and Time and distance.
Syllogism, Statement and course of action and Statement and Assumption.

Unit-V: Boats and streams, Areas, Volume and surface areas.
Statement and argument, Cause and effect and Drawing inference.

Text Books:

1. "Objective Arithmetic" by R.S. Agarwal, S. Chand Publications.
2. Verbal and non-verbal Reasoning, R.S. Agarwal, S. Chand Publications

Reference Books:

1. Quantitative Aptitude by Dinesh Khattar, Pearson Education.
2. Quantitative Aptitude by Abhjit Guha.
3. Fast Track objective Arithmetic, Rajesh Verma, Arihant publications.

B. TECH V SEMESTER	OEC	L	T	P	C
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PRINCIPLES OF MANAGEMENT
20MB5T01 (OPEN ELECTIVE –I)

COURSE OBJECTIVE

This course ensures that the students understand

1. Management Concepts
2. Applications of Concepts in Practical aspects of business and Development of Managerial Skills.
3. Managers manage business organizations in the dynamic global environment and maintain competitive advantage.
4. Business decisions are made using various tools and techniques to remain competitive
5. Managers use problem-solving strategies, critical thinking skills in real-life situations and implement successful planning.

COURSE OUTCOME

After learning the contents of this course, the student would be able to know

CO1: What are the circumstances that lead to management evolution and how it will affect future managers.

CO2: Analyze and evaluate the influence of historical forces on the current practice of management

CO3: Develop the process of management's functions: Planning and Organizing.

CO4: Evaluate leadership styles to anticipate the consequences of each leadership style and directing.

CO5: Identify the areas to control and selecting the appropriate controlling methods/techniques.

SYLLABUS

UNIT I

Introduction to Management: Definition, Functions, Process, Scope and Significance of Management.

Nature of Management, Functions of Management, Managerial Roles, Levels Managerial Skills and Activities, Difference between Management and Administration, Significance of Values and Ethics in Management.

Challenges of Management

UNIT II

Evolution of Management Thought: Approaches to Management - Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT III

Planning and Organizing: Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing.

UNIT IV

Directing: Effective Directing, Supervision, Motivation, Different Theories of Motivation-Maslow, Herzberg, McClelland, Vroom, Porter and Lawler, Job Satisfaction. Concept of Leadership- Theories and Styles. Communication Process, Channels and Barriers, Effective Communication.

UNIT V

Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

TEXT BOOKS

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Management-Tasks, Responsibilities & Practices, Drucker, F. Peter
4. Principles of Management, Terry and Franklin

REFERENCES

1. Essentials of Management, Koontz Weihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

NPTEL WEB COURSE:

nptel.ac.in/courses/122108038/

NPTEL VIDEO COURSE:

nptel.ac.in/courses/122108038/#

B. TECH V SEMESTER	OEC	L	T	P	C
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TECHNOLOGY MANAGEMENT
20MB5T02 (OPEN ELECTIVE –I)

Course Objective

- The course aims at providing an overview of various issues connected with Management of Technology in organizations.

Course Outcomes

CO1: To understand the importance of technology and innovation management

CO2: To understand the technology absorption, incremental innovation, research and development, technovation and technology fusion that dominate the contemporary world industry.

CO3: To understand the nature, significance, dimensions requirements, concepts, issues, themes, policies and structure of the management of technology and technovation.

SYLLABUS

UNIT-I

Evolution of Technology-Effects of New Technology- Technology Innovation.-Invention-Innovation- Diffusion- Revolutionary and Evolutionary Innovation- Product and Process Innovation- Strategic Implications of Technology- Technology – Strategy Alliance -Convergent and Divergent Cycle- The Balanced Approach.

UNIT-II

Technology Assessment- Technology Choice- Technological Leadership and Followership- Technology Acquisition- Technological Forecasting- Exploratory, Intuitive, Extrapolation, Growth Curves, Technology Monitoring- Normative: Relevance Tree, Morphological Analysis, Mission Flow Diagram.

UNIT-III

Diffusion of Technology- Rate of Diffusion; Innovation Time and Innovation CostSpeed of Diffusion- Technology Indicators- Various Indicators- Organizational Implications of Technology- Relationship between Technical Structure and Organizational Infrastructure- Flexible Manufacturing Management System (FMMS).

UNIT-IV

Financial Aspects in Technology Management- Improving Traditional Cost - Management System- Barriers to the Evaluation of New Technology- Social Issues in Technology Management- Technological Change and Industrial Relations- Technology Assessment and Environmental Impact Analysis.

UNIT-V

Human Aspects in Technology Management- Integration of People and Technology Organizational and Psychological Factors- Organizational Outcome- Technology Transfer-Technology Management Scenario in India.

Text Books

1. Sharif Nawaz: Management of Technology Transfer & Development, APCFT, Bangalore, 1983.

2. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,New Delhi.

References

1. Betz Fredrick: Managing Technology, Prentice Hall, New Jersey.
2. Gaynor: Handbook of Technology Management, McGraw Hill.
3. Tarek Khalil: Management of Technology, McGraw Hill International, 2000.
4. “Managing Technology and Innovation”, Robert & Roland, 1st Edition, Routledge.

B. TECH V SEMESTER

OEC	L	T	P	C
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FOUNDATIONS OF DATA SCIENCE
20AD5T07 (OPEN ELECTIVE –I)

Course Objective: *This* ***course*** explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

UNIT-1: Data science in a big data world: Benefits and uses of data science and big data, Facets of data, The data science process, The big data eco system and data science, An introductory working example of Hadoop.

UNIT-2:

The data science process: Overview of the data science process, Step 1: Defining research goals and creating a project charter, Step 2: Retrieving data, Step 3: Cleansing, integrating, and transforming data, Step 4: Exploratory data analysis, Step 5: Build the models, Step 6: Presenting findings and building applications on top of them. Machine learning: What is machine learning and why should you care about it?, The modeling process, Types of machine learning, Semi-supervised learning.

UNIT-3:

Handling large data on a single computer: The problems you face when handling large data, General techniques for handling large volumes of data, General programming tips for dealing with large data sets, Case study 1: Predicting malicious URLs, Case study 2: Building a recommender system inside a database.

UNIT-4: First steps in big data: Distributing data storage and processing with frameworks, Case study: Assessing risk when loaning money, Join the NoSQL movement: Introduction to NoSQL, ACID: the core principle of relational databases,

CAP Theorem: the problem with DBs on many nodes, The BASE principles of NoSQL databases, NoSQL database types, Case study: What disease is that?

UNIT-5: The rise of graph databases: Introducing connected data and graph databases , Introducing Neo4j: a graph database, Connected data example: a recipe recommendation engine, Text mining and text analytics: Text mining in the real world, Text mining techniques, Case study: Classifying Reddit posts.

Text Book:

Introducing Data Science by Davy Cielen, Arno D. B. Meysman, and Mohamed Ali

B. TECH V SEMESTER

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OEC	3	0	0	3

20AM5T07 INTRODUCTION TO MACHINE LEARNING (OPEN ELECTIVE –I)

Pre-requisite: Probability and Statistics, Linear Algebra

Course Objective: *This* ***course*** explains basic concepts of Machine Learning and teaches you to use recent machine learning software for solving problems and understanding supervised and unsupervised learning methods

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the characteristics of machine learning.

CO2: Summarize the Model building and evaluation approaches.

CO3: Apply Bayesian learning and regression algorithms for real-world Problems.

CO4: Apply supervised learning algorithms to solve the real-world Problems.

CO5: Apply unsupervised learning algorithms for the real world data.

SYLLABUS

Unit-1: Introduction to Machine Learning and Preparing to Model:

Introduction to Machine Learning- Introduction, What is Human Learning? Types of Human Learning, What is Machine Learning? Types of Machine Learning, Problems Not To Be Solved Using Machine Learning, Applications of Machine Learning.

Preparing to Model- Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

Modeling & Evaluation, Basics of Feature Engineering:

Modeling & Evaluation - Introduction, Selecting a Model, Training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model.

Basics of Feature Engineering - Introduction, Feature Transformation, Feature Subset Selection.

Unit-2: Bayesian Concept Learning and Regression:

Bayesian Concept Learning - Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network.

Regression: Introduction, Regression Algorithms - Simple linear regression, Multiple linear regression, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

Unit-3: Supervised Learning: Classification, Ensemble Learning: Classification-Introduction, Example of Supervised Learning, Classification Model, Classification

Learning Steps, Common Classification Algorithms - k-Nearest Neighbour (KNN), Decision tree, Random forest model, Support vector machines.

Ensemble Learning- Boosting, Bagging

Unit-4: Basics of Neural Network

Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network, Learning Process in ANN, Backpropagation, Deep Learning

Unit-5: Unsupervised Learning:

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning.

Principle Component Analysis: Introduction, Probabilistic PCA- Maximum Likelihood PCA, EM Algorithm for PCA, Bayesian PCA, Factor Analysis; Kernel PCA

Clustering: Clustering as a Machine Learning task, Different types of clustering techniques, Partitioning methods, Hierarchical clustering, Density-based methods: DBSCAN.

Finding Pattern using Association Rule - Definition of common terms, Association rule, Apriori algorithm.

Text Books:

1. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, "Machine Learning", Pearson Education India ,1st edition.
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning". New York :Springer, 2006.

Reference Books:

1. Tom M. Mitchell, "Machine Learning', MGH, 1997.
2. Shai Shalev-Shwartz, ShaiBen David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge.
3. Peter Harington, "Machine Learning in Action" , Cengage, 1st edition, 2012.

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B.TECH VI SEMESTER	**OEC**	**3**	**0**	**0**	**3**

20CE6T08 REMOTE SENSING AND GIS
(OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Learn various types of sensors and platforms
- learn concepts of visual and digital image analyses
- Understand the principles of spatial analysis
- Appreciate application of RS and GIS to Civil engineering

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Be familiar with ground, air and satellite based sensor platforms.

CO2: Interpret the aerial photographs and satellite imageries

CO3: Create and input spatial data for GIS application

CO4: Apply RS and GIS concepts in water resources engineering

SYLLABUS

UNIT–I:

Introduction to remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems. Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

UNIT–II:

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT–III:

Geographic Information System: Introduction, key components, application areas of GIS, map projections. Data entry and preparation: spatial data input, raster data models, vector data Models.

UNIT – IV:

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT–V:

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications. Application to Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management.

Text Books:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

Reference Books:

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A KW Yeung, Prentice Hall (India), 2006
3. 'Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. 'Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE6T09 ENVIRONMENTAL IMPACT ASSESSMENT (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- impart knowledge on different concepts of Environmental Impact Assessment
- know procedures of risk assessment
- learn the EIA methodologies and the criterion for selection of EIA methods
- pre-requisites for ISO 14001 certification
- know the procedures for environmental clearances and audit
- appreciate the importance of stakeholder participation in EIA

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Prepare EMP, EIS, and EIA report

CO2: Identify the risks and impacts of a project

CO3: Selection of an appropriate EIA methodology

CO4: Evaluation the EIA report

CO5: Estimate the cost benefit ratio of a project

CO6: Know the role of stakeholder and public hearing in the preparation of EIA

SYLLABUS

UNIT–I:

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA.

UNIT–II:

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP.

UNIT-III:

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV:

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with

reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT–V:

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

Reference Books:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE6T08 RENEWABLE ENERGY SOURCES (OPEN ELECTIVE-II)

Course Objective:

- To give sufficient knowledge about the promising new and renewable sources of energy
- Explain the concept of various forms of renewable energy
- Learn the present energy scenario
- Analyse the environmental aspects of renewable energy resources.

Course Outcomes:

CO1: Know the need of various renewable energy systems

CO2: understand the concepts of bio-energy,

CO3: Acquire the knowledge of OTEC, tidal,

CO4: Acquire the knowledge of geothermal and Alternative energy sources

SYLLABUS

UNIT-I

Introduction: Introduction to energy sources, reserves and estimates, global energy scenario, renewable energy -environment implications, global warming and climate change, limitations of conventional energy sources, classification of non-conventional energy sources - solar energy, wind energy, bio-energy, Ocean Thermal Energy Conversion (OTEC), tidal, geothermal and hydro.

UNIT-II

Bio-energy: Biomass and its sources, energy plantation, production of fuel wood, bio-conversion processes, bio-gas, bio-diesel and ethanol production and utilization, thermo-chemical processes, biomass gasification, process, types of reactors, utilization of producer gas for thermal and electricity generation.

UNIT-III

Ocean thermal energy conversion, tidal, geothermal: Tidal energy, wave energy, data, technology options; open and closed *Ocean thermal energy conversion* cycles, geothermal energy sources, power plant and environmental issues.

UNIT-IV

Fuel Cells: Hydrogen generation-storage, transport and utilization, applications, power generation. Fuel cells-Technologies, types, economics and power generation.

UNIT-V

Solar Energy Storage and Applications:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2006
2. Renewable Energy Resources – Twidell&Wier, CRC Press(Taylor & Francis), 2012
3. *Y. W. B. Charles, B.H. Essel, ―Biomass Conversion and Technology‖*, John Wiley, Latest Edition

Reference Books:

1. Renewable energy resources by G. N. Tiwari, M. K. Ghosal, Alpha Science International, 2005.
2. Renewable Energy Technologies by R. Ramesh, K. Uday Kumar, M. Anandakrishnan, Narosa Publishing House, 1997
3. Non-Conventional Energy Systems by K Mittal, A. H. Wheeler Publishing Company Limited, 01-Jan-1999.
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, P.H.I.
5. Godfrey Boyle, ―Renewable Energy- Power for a Sustainable Future‖, Oxford University Press, U.K.,
6. Twidell, J.W. & Weir, A., ―Renewable Energy Sources‖, E.F.N Spon Ltd., UK.

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE6T09 **ENERGY AUDIT, CONSERVATION AND MANAGEMENT (OPEN ELECTIVE-II)**

Course Objective:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Course Outcomes:
At the end of the course student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

SYLLABUS

UNIT-I

Basic Principles of Energy Audit and management: Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Piecharts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions –Language – Questionnaire – Check list for top management.

UNIT-II

Lighting: Modification of existing systems – Replacement of existing systems – Priorities**:** Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level –Illumination of inclined surface to beam – Luminance or brightness – Types of lamps –Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT-III

Power Factor and energy instruments: Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters– Tong testers – Power analyzer.

UNIT-IV

Space Heating and Ventilation: Ventilation – Air–Conditioning (HVAC) and Water Heating**:** Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning –Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

UNIT-V

Economic Aspects and Financial Analysis: Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems.

Computation of Economic Aspects

Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment –Numerical examples.

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill

2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd– 2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevierpublications. 2012

2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.

3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.

4. Energy management hand book by W.C.Turner, John wiley and sons.

5. Energy management and conservation –k v

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME6T07 **INDUSTRIAL ROBOTICS (OPEN ELECTIVE-II)**

Pre-requisite: Kinematics and Mathematics

Course Objective:

1. The student will be exposed to the concepts of automation and fundamentals of robotics
2. The students will be exposed to the concepts of transformations and robot kinematics,
3. The students will understand the functioning of sensors and actuators
4. The students will be exposed to robot programming languages and Programming.
5. The student will be exposed to the applications of robotics in manufacturing.

Course Outcomes: At the end of the course, student will be able to

CO1	Understand various applications of robotics and classification of coordinate system and control systems.
CO2	Build the concepts of components of industrial robotics.
CO3	Apply kinematic analysis with D-H notation, forward and inverse kinematics and Solve dynamic analysis with Lagrange – Euler and Newton – Euler formulations.
CO4	Model trajectory planning for a manipulator by avoiding obstacles.
CO5	Understand different types of actuators and applications of robots in manufacturing.

SYLLABUS

UNIT-I:

Introduction: Automation and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT-II: MOTION ANALYSIS AND CONTROL:

Motion Analysis: Basic Rotation Matrices, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT-III:

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion straight line motion.

UNIT-IV:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools.

UNIT-V:

Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.

Text Book(s)

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson, 3rd edition.

References

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
4. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley

5. Introduction to Robotics by SK Saha, The McGrah Hill Company, 6th, 2012
6. Robotics and Control / Mittal R K &Nagrath I J / TMH

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME6T08 **3D PRINTING (OPEN ELECTIVE-II)**

Pre-requisite: Manufacturing Process

Course Objective:

The course aims at the importance of Additive Manufacturing, Classifications, models, specifications of various Additive Manufacturing Techniques. To learn the different tools, soft-wares required and the applications of Additive Manufacturing

Course Outcomes: At the end of the course, student will be able to

CO1:	Understand the working principle and process parameters of AM processes
CO2:	Explore the applications of AM processes in various fields
CO3:	Apply the suitable process and material for fabricating a given product
CO4:	Use the suitable post process based on product application
CO5:	Design and develop a product for AM Process

SYLLABUS

UNIT-I:

Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT-II:

Machines for Rapid Prototyping: Overview of Polymerization: Stereolithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT-III:

Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive Manufactured Tools, Indirect Rapid

UNIT-IV:

Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture of Metal Components

UNIT-V:

Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2015, 2nd Edition.
2. 3D Printing and Additive Manufacturing: Principles & Applications, Chua Chee Kai, Leong Kah Fai, World Scientific, 2015, 4th Edition.

References:

1. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venuvinod and Weiyin Ma, Springer, 2004.
2. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.
3. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006.

B.TECH VI SEMESTER | **OEC** | **L T P C** | **3 0 0 3**

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC6T07 ELECTRONIC CIRCUITS AND NETWORKS (OPEN ELECTIVE-II)

Course Objectives:

At the end of the course, student will be able to

1. To understand the Differentiator and Integrator circuits
2. To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
3. To Introduce to Time-base Generators and Principles of Synchronization and Frequency division.
4. To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.
5. To understand and Design gates using various logic families.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand the basic concepts of Optoelectronic Devices

CO2: Design linear wave shaping circuits.

CO3: Design Non- linear wave shaping circuits.

CO4: Design Different Time Base Generators

CO5: understand the concepts of one port networks

SYLLABUS

UNIT-I: Optoelectronic Devices

Introduction, Photo sensors, Photoconductors, Photodiodes, Phototransistors, Light-Emitting Diodes, Liquid Crystal Displays, Cathode Ray Tube Displays, Emerging Display Technologies, Opto couplers.

UNIT-II: LINEAR WAVE SHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT-III: NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of

voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT-IV: VOLTAGE TIME BASE GENERATORS

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator.

UNIT-V: Synthesis of one port networks

Synthesis of one port networks
Synthesis of reactive one-ports by Foster's and Cauer methods (forms I and II) - Synthesis of LC, RC and RL driving-point functions.

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.

2. K. S. Suresh Kumar, ―Electric Circuit Analysis‖, Pearson Publications, 2013.

Reference Books:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC6T08 PRINCIPLES OF COMMUNICATIONS (OPEN ELECTIVE – II)

Course Objectives:

At the end of the course, student will be able to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Familiarize with the fundamentals of digital communication systems
4. Familiarize with various techniques for digital modulation and demodulation of signals
5. Distinguish the figure of merits of various analog modulation methods

Course Outcomes:

At the end of this course the student will able to:

CO1: Differentiate various Analog modulation schemes

CO2: Analyze demodulation schemes and their spectral characteristics

CO3: Analyze demodulation schemes and their spectral characteristics

CO4: Analyze demodulation schemes and their spectral characteristics

CO5: Analyze noise characteristics of various analog modulation methods

SYLLABUS

UNIT-I: Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver

UNIT-II: Angle Modulation, Frequency and Phase modulation, frequency deviation, Bandwidth, FM Modulators and Demodulators, Narrow band and wide band FM, FM Broadcasting.

UNIT-III: Pulse digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Generation and Demodulation, Frequency Division Multiplexing, Time Division Multiplexing

UNIT-IV: Digital Representation of Analog Signals, Pulse Code Modulation (PCM), Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Mathematical Representation of Noise.

UNIT-V: Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops.

Text Book:

1. Herbert Taub and Donald L. Schilling, ―Principles of Communication Systems., Tata McGrawHill.

2. Rishabh Anand, Communication Systems, Khanna Publishers

Reference Books:

1. B.P.Lathi,―Modern Digital and Analog communication Systems, 3rd Edition, Oxford University Press.

2. Simon Haykin, ―Communication Systems, 4th Edition, Wiley India

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20EC6T09 MICROCONTROLLERS & ITS APPLICATIONS (OPEN ELECTIVE-II)

Course Objectives:

At the end of the course, student will be able to

1. To understand the basics of 8051 Microcontroller and its functionalities
2. To understand the 8051 family instruction set
3. To develop machine language programming in microprocessors.
4. Todesign and develop microcontroller based interfacing for real time applications using low level language like ALP.
5. To understand the basics of ARM architectures and its functionalities.

Course Outcomes:

At the end of this course the student will able to:

CO1: To be able to understand the overview of 8051 Micro controller in general.

CO2: To be able to understand the instruction set of 8051 microcontroller

CO3: To be able to understand the Assembly Language Programming in microcontrollers.

CO4: To be able to understand the microcontroller is interfacing with I/O devices, memory, and serial communication using ALP.

CO5: To be able to understand the overview of ARM Architecture in general.

SYLLABUS

UNIT-I: Introduction to 8051 Microcontrollers

Overview of 8051 microcontrollers, Architecture**,** I/O ports, Memory organization, Addressing modes, SFRs, Counters and timers, Synchronous serial-cum, Asynchronous serial communication, Interrupts and priorities.

UNIT-II: 8051 FAMILY MICROCONTROLLERS INSTRUCTION SET

Basic assembly language programming, Data transfer instructions, Data and bit- manipulation instructions, Arithmetic instructions, Instructions for logical operations on the test among the registers, Program flow control instructions, Interrupt control flow.

UNIT-III: 8051 REAL TIME CONTROL

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the serial communication Interrupts, programming Timers and Counters, serial port and its programming,

UNIT-IV: I/O and Memory Interface and Serial Communication and Bus Interface

I/O and Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer, USART, External Communication Interfaces-RS232,USB

UNIT-V: ARM Architecture:

ARM processor fundamentals, ARM Architecture –Register, exceptions and interrupts, interrupt vector table, ARM instruction set- Data processing, Branch, load and store instructions; Software instructions, Program status register instructions loading constants

TEXTBOOKS:

1. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System
   Design, 2/e, Pearson Education, 2005.
2. Kenneth. J. Ayala, The 8051 Microcontroller, 3/e, Cengage Learning, 2004.

REFERENCE:

1. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems, 2/e, Pearson Education, 2007
2. ARM system Developers guide, Andrew N Sloss, Dominic Symes, Chris Wright, Elsevier,2012

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

INTRODUCTION TO MACHINE LEARNING
20CS6T07 (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

INFORMATION SECURITY
20CS6T08 (OPEN ELECTIVE –II)

Course Objectives:

- Understand the concepts of classical encryption techniques and concepts of finite fields and number theory
- Understand Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Understand the Design issues and working principles of various authentication protocols, PKI standards
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications.

Course Outcomes:

CO1: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

CO2: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO3: Apply different digital signature algorithms to achieve authentication and create secure applications

CO4: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

CO5: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

SYLLABUS

UNIT - I: Classical Encryption Techniques:

The OSI Security Architecture, Security Attacks, Services & Mechanisms, Symmetric Cipher Model, Substitution Techniques: Caesar Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques: Rail fence, Row Transposition cipher, Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT - II:

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Block Cipher Modes of Operations.

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem

UNIT – III:

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security.

Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution

UNIT - IV:

User Authentication: Remote User Authentication Principles, Kerberos.

Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.

UNIT - V:

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS)

Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration

TEXT BOOKS:

1. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition. [Units 1,2,3,4,5]
2. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition. [Units 1,2,3,4,5]

REFERENCES:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

AGILE TECHNOLOGIES
20CS6T09 (OPEN ELECTIVE –II)

COURSE OBJECTIVES:

1. To have an understanding of the Agile Manifesto and Principles
2. To Apply Agile based techniques in each of the development phases.

COURSE OUTCOMES:

CO1: Understand the Agile Manifesto and Principles.
CO2: Apply agile software development practices to create high-quality software.
CO3: Acquire Knowledge on software design, set of software technologies and APIs.
CO4: Examine and demonstrate knowledge of Agile development
CO5: Demonstrate the Agile Approach to estimate project variables, control and Risk Management

SYLLABUS

UNIT-I

Agile Software Development: Genesis of Agile, Introduction and Background, Traditional Model Vs Agile Model, Values of Agile, Agile Manifesto and Principles, Stakeholders, Challenges.

UNIT-II

Lean Approach: Waste Management, Kaizen and Kanban, Add process and products add Value, Roles related to life cycle, Differences between Agile and Traditional Plans, Differences at different life cycle phases, Key techniques, Principles, Understand as a means of assessing the initial status of the project, How agile helps to build quality.

UNIT-III

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, **Agile Requirements:** User story definition, Characteristics and contents of user stories, Acceptance tests and verifying stories, Product Velocity, Burn down chart, Sprint planning and retrospective, Daily Scrum, Scrum roles- Product Owner, Scrum Master, Scrum Team, Scrum Case Study, Tools for Agile Project Management.

UNIT-IV

Agile Software Design and Development: Agile Design practices, Role of design principles including Single Responsibility principle, Open Closed Principle, Liskov Substitution principle, Interface Segregation principles, Dependency Inversion principle in Agile Design, Refactoring- Need and significance, Refactoring techniques, Continuous Integration, Automated Build tools, Version Control.

UNIT-V

Agile Testing and Review: Agile Testing Techniques, Test Driven Development, User Acceptance Test, Agile Metrics and Measurements, The Agile Approach to estimate project variables, Agile control- The 7 control parameters, Agile Approach to Risk, Agile approach to Configuration Management, Atern Principles and Philosophy, Best practices to manage Scrum.

TEXT BOOKS:

1. Robort C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013(Units 1, 3, 5)

2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson(Units 3,4)

3. Mike Cohn, Succeeding with Agile: Software Development Using Scrum, Addison Wesley Series.(Units 3, 4)

REFERENCES:

1. David J. Anderson and Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer,.

3. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley.

4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and management, Butterworth-Heinemann.

B. TECH VI SEMESTER

OEC	L	T	P	C
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20IT6T07 FUNDAMENTALS OF MACHINE LEARNING (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
4. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20IT6T08 DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE –II)

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases

Course Outcomes:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT-I: Database System Applications:

A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT-II: Introduction to the Relational Model:

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III: SQL:

QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL.

UNIT-IV: Schema Refinement (Normalization):

Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.

UNIT-V: Transaction Management and Concurrency Control:

Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, "Data base Management Systems", 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL" by Shashan k Tiwari, 2011, WROX Press.

REFERENCE:

1. Peter Rob & Carlos Coronel, "Data base Systems design, Implementation, and Management", 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, "Data base System Concepts", 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2007.
4. C.J.Date, "Introduction to Database Systems", 7th Edition, Pearson Education, 2002

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

OPERATIONS RESEARCH
20HS6T01 (OPEN ELECTIVE –II)

Course Objectives:

1) Identify and develop operational research models from the verbal description of the real system.
2) Understand the mathematical tools that are needed to solve optimization problems.
3) Use mathematical software to solve the proposed models.
4) Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

Course Outcomes:

CO1: Understand the methodology of Operations Research& concepts of linear programming

CO2: Formulate the solutions to transportation problems

CO3: Explain the solutions for various sequencing problems

CO4: Illustrate the solutions to different replacement policies

CO5: Apply game theory to solve real world problems

SYLLABUS

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

UNIT-II

Transportation Problem. Formulation, Solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.

UNIT-III

Assignment model. Formulation. Hungarian Method for optimal solution. Solving Unbalanced problem. Sequencing Models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines Processing n Jobs through m Machines.

UNIT-IV

Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

UNIT-V

Game Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

Inventory models. Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

TEXT BOOKS:

1) P. SankaraIyer,"Operations Research", Tata McGraw-Hill, 2008.
2) A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

REFERENCES:

1) J K Sharma. "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2) P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20MB6T01 ORGANIZATIONAL BEHAVIOUR (OPEN ELECTIVE –II)

Course Objectives

1 To understand the fundamentals of Organizational Behaviour.
2 For the understanding and balancing of Values and Emotions at work place.
3 To improve the student's Personality and Attitude.
4 To understand and improve the skill of perception and Group Behaviour.
5 Understanding and managing organizational culture, leadership and conflict.

Course Outcomes

Learning Organizational Behavior enables engineers:

CO1: To understand the psychology of workers and other members in the organization.

CO2: To be equipped with the right knowledge and skills regarding organizational processes, group behavior, organizational structure and culture.

CO3: To build up strategies for development at their work place.

CO4: To motivate and control employees.

CO5: To resolve organizational conflict effectively.

SYLLABUS

UNIT I

Fundamentals of OB: Definition, Scope and Importance of OB, Relationship between OB and the individual, Evolution of OB, Models of OB (Autocratic, Custodial, Supportive, Collegial & SOBC), Limitations of OB.

Unit II

Values, Attitudes and Emotions: Introduction, Values, Attitudes, Definition and Concept of Emotions, Emotional Intelligence - Fundamentals of Emotional Intelligence, The Emotional Competence Framework, Benefits of Emotional Intelligence, difference between EQ and IQ. Stress at workplace: Work Stressors – Prevention and Management of stress – Balancing work and Life, Workplace spirituality.

Unit III

Personality & Attitude: Definition Personality, importance of personality in Performance, The Myers-Briggs Type Indicator and The Big Five personality model, Johari Window, Transaction Analysis. Attitude – Definition, Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude.

Unit IV

Perception: Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). Motivation:

Definition & Concept of Motive & Motivation. Group and Team Dynamics: Meaning Group Dynamics, Types of Groups, Group Development, Team Effectiveness & Team Building.

Unit V

Organizational Culture: Types of Culture, Creating and Maintaining Organization Culture, Managing Cultural Diversity. Organizational Change: Types of Organizational change, Forces that acts as stimulants to change, overcome the Resistance to Change, Developing a Learning Organization. Leadership: Introduction, Managers V/s Leaders. Overview of Leadership- Traits and Types. Conflict Management: Sources of Conflict, Types of Conflict, Conflict Management Approaches.

Text Books

1. Pareek Udai: "Understanding Organizational Behavior", Oxford University Press, New Delhi, 2007.

1. K.Aswathappa: "Organizational Behavior-Text, Cases and Games", Himalaya Publishing House, New Delhi,2008.

2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "Organizational Behavior", Tata McGraw Hill Education, New Delhi, 2008.

References

1. Jerald Greenberg and Robert A Baron: "Behavior in Organizations", PHI Learning Pvt Ltd, New Delhi, 2009.

2. Robbins, Stephen P. Organizational behavior, 14/E. Pearson Education India, 2001.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

20MB6T02 **PROJECT MANAGEMENT (OPEN ELECTIVE –II)**

Course Objectives

The objective of this course is to enable the students to gain basic knowledge about the concept of project, project management, project life-cycle, project appraisal; to acquaint the students about various issues of project management.

SYLLABUS

Unit -I

Basics of Project Management –Concept– Project environment – Types of Projects – Project life cycle – Project proposals – Monitoring project progress – Project appraisal and Project selection – Causes of delay in Project commissioning– Remedies to avoid overruns. Identification of Investment opportunities – Sources of new project ideas, preliminary screening of projects – Components for project feasibility studies.

Unit- II

Market feasibility -Market survey – Categories of Market survey – steps involved in conducting market survey– Demand forecasting techniques, sales projections.

Unit- III

Technical and Legal feasibility: Production technology, materials and inputs, plant capacity, site selection, plant layout, Managerial Feasibility Project organization and responsibilities. Legalities – Basic legal provisions. Development of Programme Evaluation & Review Technique (PERT) –Construction of PERT (Project duration and valuation, slack and critical activities, critical path interpretation) – Critical Path Method (CPM)

Unit- IV

Financial feasibility – Capital Expenditure – Criteria and Investment strategies – Capital Investment Appraisal Techniques (Non DCF and DCF) – Risk analysis – Cost and financial feasibility – Cost of project and means of financing — Estimation of cash flows – Estimation of Capital costs and operating costs; Revenue estimation – Income – Determinants – Forecasting income –Operational feasibility - Breakeven point – Economics of working.

Unit -V

Project Implementation and Review: Forms of project organization – project planning – project control – human aspects of project management – prerequisites for successful project implementation – project review – performance evaluation – abandonment analysis.

Text Books

1. Prasanna Chandra, ―Projects, Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill Company Pvt. Ltd., New Delhi 1998.

2. Gido: Effective Project Management, 2e, Thomson, 2007.

References

1. Singh M.K, ―Project Evaluation and Management‖.

2. Vasanth Desai, Project Management, 4th edition, Himalaya Publications 2018.

3. Clifford F. Gray, Erik W. Larson, ―Project Management, the Managerial Emphasis, McGraw Hill, 2000.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20AM6T07 BIG DATA ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: Data Base Management System

<u>Course objectives</u>:

In this course student will learn about

1. To understand the need of Big Data, challenges and different analytical architectures
2. Installation and understanding of Hadoop Architecture and its ecosystems
3. Processing of Big Data with Advanced architectures like Spark.
4. Describe graphs and streaming data in Spark.

Course Outcomes: At the end of the course, student will be able to

CO1: Discuss the challenges and their solutions in Big Data

CO2: Understand and work on Hadoop Framework and eco systems.

CO3: Explain and Analyze the Big Data using Map-reduce programming in Both Hadoop and Spark framework.

CO4: Demonstrate spark programming with different programming languages.

CO5: Demonstrate the graph algorithms and live streaming data in Spark.

SYLLABUS

Unit-I:

Introduction to big data: Data, Types of digital data, Evolution and Definition of big data, Challenges of big data, Characteristics and Need of big data.

Introduction to Hadoop: Introducing Hadoop, need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Hadoop Distributors.

HDFS (Hadoop Distributed File System): HDFS Daemons, Anatomy of file read, Anatomy of file write, working with HDFS commands.

Unit-II:

Introduction to MAPREDUCE Programming: Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Mapper, Reducer, Combiner, Partitioner, Searching, Sorting , Compression, Hadoop EcoSystem.

Unit-III:

Introduction to Pig: Key Features of pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, Relational Operators.

Introduction to HIVE: HIVE features, HIVE architecture, HIVE datatypes, HIVE File Formats, HIVE Query Language.

Unit-IV:

NoSQL: Introduction to NOSQL, Types of NoSQL Databases, and Advantages of NoSQL databases, CAP Theorem, BASE, SQL versus NoSql.

NoSQL databases: Introduction to MongoDB, Data types in MongoDB, MongoDB query language.

Unit-V:

Spark: Introduction to data analytics with Spark, Spark Stack, Programming with RDDS, Working with key/value pairs, Spark SQL, Schema RDDs,

Sparking Streaming: High level architecture of Spark Streaming, DStreams, Transformations on DStreams, Different Types of Transformations on DStreams.

Text Books:

[1].SeemaAcharya, SubhashiniChellappan, Big Data and Analytics, Wiley Publishers

[2].Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia, "Learning Spark: Lightning-Fast Big Data Analysis", O'Reilly Media, Inc.

Reference Books:

[1]. TomWhite, Hadoop,“TheDefinitiveGuide”,3rdEdition,O’ReillyPublications, 2012.

[2].David Loshin, "BigDataAnalytics: From Strategic Planning to Enterprise IntegrationwithTools,Techniques,NoSQL,andGraph”,MorganKaufmannPublishers, 2013

[3].Hadoopin PracticebyAlexHolmes, MANNING

[4].Hadoop in Action byChuckLam, MANNING

[5] Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , “Understanding Big Data Analytics for Enterprise ClassHadoopandStreamingData”, 1st Edition, TMH,2012.

[6] HienLuu, Beginning Apache Spark 2

E-resources and Other digital materials:

[1].Big Data Use cases for Beginners | Real Life Case Studies | Success Stories https://www.youtube.com/watch?v=HHR0-iJp2sM

[2]. Alexey Grishchenko, Hadoopvs MPP, https://0x0fff.com/hadoop-vs-mpp/

[3]. Random notes on bigdata- SlideShare: Available www.slideshare.net/yiranpang/random-notes-on-big-data-26439474

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

20AD6T07 VISUAL ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: There is no prerequisite to learn this course.

Course Objective: *This **course*** explains apply the fundamentals of Tableau tool, Use all the basic functionality to visualize their data, Connect to various data sources, Build a variety of basic charts, Combine insights into a useable dashboard, Share and publish visualizations.

Course Outcomes: At the end of the course, student will be able to

CO1: Examine, navigate, and learn to use the various features of Tableau

CO2: Create and design visualizations and dashboards for your intended audience

CO3: apply predicative analytics to improve business decision making

CO4: Assess the quality of the data and perform exploratory analysis

CO5: Combine the data to and follow the best practices to present your story

SYLLABUS

UNIT-1:

Introduction: Tableau Application Suite, Installing and Activating Tableau Desktop, Data Preparation, Finding the Dataset, Understanding the Data, The Tableau Workspace, Saving, Opening, and Sharing Your Workbooks, Setting Up a Data Connector, Adding a Table to a Data Model, Data Extracts and Live Connections, Data Protection and Data Governance, Data Types, Data Collection with IFTTT and Google Sheets, Website Analysis with Google Analytics, Performance Optimization.

UNIT-2:

Data Visualizations and Aggregate Functions: Chart Types, Scatter Plots, Bar Charts, Legends, Filters, and Hierarchies, Line Charts, Straight Lines, Step Charts, Continuous Date Fields, Highlight Tables, Heat maps, Bullet Charts, Aggregate Functions, Calculated Fields, Aggregations in Calculated Fields, Text Operators, Splits, Date Fields, and Formats, Working with NULL Values, Parameters

UNIT-3:

Table Calculations and Maps: Different Types of Calculations, Quick Table Calculations, Customized Table Calculations, Bump Charts, Dual Axis Charts, Keywords and Syntax, Cohort Analysis, Regional Averages, Different Types of Maps, Map Layers, Maps with Pie Charts: Creating a Pie Chart Map, Dual Axis Map Embedding the Chart in Tooltips, Mapbox Maps, Mapbox in Tableau, Using the Background Map, Spatial Data.

UNIT-4:

Advanced Analytics and Interactive Dashboards: Overview of the Tableau Analytics Pane, Constant, Average, and Reference Lines, Trend Lines, Forecasts, Model Description, Cluster Analysis, Clustering in Tableau, Python, R, and MATLAB Integration, Connecting Tableau with TabPy, Security, The Dashboard Pane, Placing Charts on the Dashboard, Dashboard Actions, Filter Actions, Adding Web Content via URL Actions, Design Tips for Creating a Dashboard

UNIT-5:

Data Preparation with Tableau: Connecting to Data, Wildcard Unions, Inspecting the Data, Removing Unneeded Fields, Data Cleaning and Formatting, Cleaning Steps and Built-in Cleaning Features, Unions, Joins, Splits Grouping, Running the Flow and Outputting the Data, Saving Flows.

Text Book:

Alexander Loth, “**Visual Analytics with Tableau**”, ISBN: 978-1-119-56020-3, Wiley 2019

Reference Books:

1. "**Visual Thinking for Design”** by Colin Ware
2. "**Storytelling With Data: A Data Visualization Guide for Business Professionals”** by Cole Nussbaumer Knaflic
3. "**Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”** by Nathan Yau

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE7T13 CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE-III)

Course Objectives:

- To introduce to the student the concept of project management including network drawing and monitoring
- To introduce various equipments like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
- to introduce the importance of safety in construction projects

Course Outcomes:

CO1: appreciate the importance of construction planning

CO2: understand the functioning of various earth moving equipment

CO3: the methods of production of aggregate products and concreting and usage of machinery required for the works.

CO4: apply the gained knowledge to project management and construction techniques

SYLLABUS

UNIT-I:

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts– critical Path Method – Applications

UNIT-II:

Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT-III:

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types

UNIT–IV:

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers –graders – scrapers– draglines - clamshell buckets

UNIT –V:

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers– selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality

control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder, Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

Reference Books:

1. Construction Project Management - An Integrated Approach, Peter Fewings, Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE7T14 GREEN BUILDINGS (OPEN ELECTIVE-III)

Course Objectives:

- To introduce the different concepts of green building techniques and how they may be synthesized to best fit a construction.
- To Know the importance of Green buildings
- To know and implement energy conservation and renewable resources
- To understand the knowledge of ECBC, LEED, GRIHA etc.

Course Outcomes:

CO1: Able to describe the importance and necessity of green building.

CO2: Able to suggest materials and technologies to improve energy efficiency of building.

CO3: Able to assess a building on the norms available for green building.

SYLLABUS

UNIT-I:

Introduction of Green Buildings, Salient features of green buildings, Advantages of Green Buildings- Sustainable site selection and planning of buildings to improve comfort, day lighting, ventilation, planning for drainage.

UNIT-II:

ENERGY EFFICIENT BUILDINGS Passive cooling and day lighting – Active solar and photovoltaic, building energy analysis methods, Lighting system design, Lighting economics and aesthetics, Impacts of lighting efficiency, Technological options for energy management.

UNIT-III:

ENERGY CONSERVATION Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings, waste to energy management in residential complexes or gated communities.

UNIT-IV:

RENEWABLE ENERGY RESOURCES Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar, windand hydro power appliances, success case studies of fully solar, wind and hydro power energies.

UNIT-V:

ENERGY REQUIREMENT AND GREEN BUILDING RATING SYSTEMS Energy

Conservation Building Code (ECBC) requirement for green buildings, Requirement for green rating systems - Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment (GRIHA), Building automation and building management systems.

Text Books:

1. 'Handbook on Green Practices published by Indian Society of Heating Refrigerating and Airconditioning Engineers', 2009
2. 'Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddyand K.S. Nanjunda Rao.
3. 'Green Building Handbook' by Tomwoolley and Samkimings, 2009

Reference Books:

1. 'Complete Guide to Green Buildings' by Trish riley.
2. 'Non-Conventional Energy Resources' by G. D. Rai, Khanna Publishers.
3. 'Standard for the design for High Performance Green Buildings' by Kent Peterson, 2009
4. Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE7T13 CONCEPT OF POWER SYSTEM ENGINEERING (OPEN ELECTIVE-III)

Course Objective: To develop problem solving skills and understanding of Power System concepts through the application of techniques and principles of electrical Power Generation methods.

Course Outcomes: At the end of the course, student will be able to

CO1: Various electrical Power System Components, Supply systems

CO2: Thermal Power Station working procedure, each module path directions

CO3: Hydro Power Station working procedure, classifications

CO4: Nuclear Power Station working procedure, Chain Reaction

CO5: Solar power generation & Wind Power Generation, Applications

SYLLABUS

UNIT-I: **Power System Components**

Single line Diagram of Power system, Different kinds of supply system, conventional and Non-conventional energy sources, Applications.

UNIT-II: Thermal Power Stations

Choice of site Selection, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super, heaters, Economizers, electrostatic precipitators

UNIT-III: Hydro & Nuclear Power Stations

Choice of site, arrangement of hydroelectric installations, Hydrology. Mass curve, flow duration curve, classification of Hydro Power Plants, Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components

UNIT-IV: Solar power generation & Wind Power Generation

Solar radiation spectrum. Radiation measurement. Applications of solar thermal systems Solar Photovoltaic (SPV) systems, Introduction to wind energy, basic principles of wind energy conversion.

UNIT-V: Transmission & Distribution

Transmission structure, classifications, types of conductors, primary & secondary distribution, Substation Equipments , layout.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagarand, A Chakrabarti, DhanpatRai& Co. Pvt. Ltd.

2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers
3. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE7T14 INSTRUMENTATION
(OPEN ELECTIVE-III)

Course Objectives:

1. To study the basics of measuring system.
2. To study various Electrical transducers and to measure the various types of Non–electrical quantities
3. To study various types of digital voltmeters
4. To study the working principles of various types of oscilloscopes and their applications.
5. To study various types of signal analyzers

Course Outcomes:

CO1: Able to study the basics of measuring system.

CO2: Acquire proper knowledge to use various types of Transducers and able to monitor and measure various parameters such as strain, Fow, temperature and pressure

CO3: Acquire proper knowledge and working principle of various types of digital voltmeters.

CO4: Able to measure various parameters like phase and frequency of a signal with the help of CRO.

CO5: Acquire proper knowledge and able to handle various types of signal analyzers.

SYLLABUS

UNIT-I

Basics of Measuring System: Measuring Systems, Performance Characteristics – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors and Random Errors, Statistical analysis of random errors.

UNIT-II

Transducer Basics and Applications: Definition of transducers – Classification of transducers – Advantages of Electrical transducers –Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers. Measurement of Temperature, Pressure, Strain and Flow.

UNIT-III

Digital Voltmeters: Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type DVM, digital frequency meter – Digital phase angle meter.

UNIT-IV

Oscilloscope: Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns – Sampling oscilloscope, data logger, Transient recorder.

UNIT-V

Signal Analyzers: Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co

Reference Books:

1. Measurement and Instrumentation theory and application, Alan S.Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doeblin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson/Prentice Hall ofIndia
4. Modern Electronic Instrumentation and Measurement techniques – by A.D HelfrickandW.D.Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

B.TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME7T10 GREEN ENGINEERING SYSTEMS (OPEN ELECTIVE -III)

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: The course aims to highlight the significance of alternative sources of energy, green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

Course Outcomes: At the end of the course, student will be able to

- **CO1:** Evaluate the impact of technology on environment
- **CO2:** Compare biological ecology to industrial ecology
- **CO3:** Design eco-friendly product
- **CO4:** Create sustainable products, facilities, processes and infrastructure
- **CO5:** Asses the life cycle of a product to evaluate its impact on energy and materials use. Determine the effects of air and water quality

SYLLABUS

UNIT-I:

INTRODUCTION: SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT-III:

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV: ENERGY EFFICIENT SYSTEMS:

(A) ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V: ENERGY EFFICIENT PROCESSES:

Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/ TMH
2. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3. Green Manufacturing Processes and Systems, Edited / J. Paulo Davim/Springer 2013

References:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international

2. Principles of Solar Engineering / D.YogiGoswami, Frank Krieth& John F Kreider / Taylor & Francis
3. Non-Conventional Energy / Ashok V Desai /New Age International (P) Ltd
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Non conventional Energy Source/ G.D Roy/Standard Publishers
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd
7. Fuel Cell Technology –Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

B.TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME7T11 HYBRID ELECTRIC VEHICLES (OPEN ELECTIVE -III)

Pre-requisite: Internal-Combustion engines.

Course Objective:

The main objective of this course is to provide the knowledge on architecture of Hybrid Electric Vehicles, Fuel cells and their sub-systems. The focus is as well on explaining the requirements of hybrid electric vehicles and Fuel-cells for automobile applications. At the same time, various design considerations in fuel cell vehicles and electric vehicles will be explained.

Course Outcomes: At the end of the course, student will be able to

CO1:	Compare and contrast the working of Conventional and Electric Vehicles.
CO2:	Comprehend the use of Series and Hybrid Electric vehicle drive trains
CO3:	Apply the fundamentals of to develop the propulsion and storage systems for Hybrid Electric Vehicles.
CO4:	Perform a case study on Hybrid Electric vehicle drive trains for different parameters
CO5:	Describe the working principle of various types of fuel-cells.

SYLLABUS

UNIT-I:

ELECTRIC VEHICLES: Introduction, Electric Vehicle Principle- Components of Electric Vehicle Constituents of a conventional vehicle-Drive cycles and Drive Terrain, Operating principle of Fuel Cell, Differences between conventional battery and Electric battery, Transmission differences between conventional and Electric Vehicles, Differences between conventional lighting system and Electric vehicle lighting system.

UNIT-II:

HYBRID ELECTRIC VEHICLES: Introduction, A Brief history of Hybrid Electric vehicles (HEVs),Basics of Hybrid Electric Vehicles (HEVs), Architecture of HEVs-Series HEVs, Parallel HEVs, Series-Parallel HEVs.

HYBRID ELECTRIC VEHICLE DRIVE TRAINS: Parallel Hybrid Drive trains with Torque coupling, Parallel Hybrid Drive trains with both Speed coupling, Parallel Hybrid Drive trains with both speed Torque coupling.

UNIT-III:

ELECTRIC PROPULSION SYSTEMS: DC Motors- Operating principle and control of DC motors, Induction Motor Drives: Operating principle and Control Mechanisms, Brushless Motor Drives-Principle and Construction, Switched Reluctance Motor (SRM) Drives- Basic structure, Drive Convertor, Modes of Operation.

ENERGY STORAGE SYSTEMS: Electrochemical Batteries, Lead-Acid Batteries, Nickel Based Batteries, Lithium Based Batteries, Ultra Capacitors- Basic Principles and Performance, Ultrahigh-speed flywheels- Basic Principle and Power Capacity, Fly Wheel technologies.

UNIT-IV:

DESIGN OF SERIES HYBRID ELECTRIC VEHICLE DRIVES: Design of Series Hybrid Electric Vehicle Drive- Control Strategies, Sizing of Major Components and Case Study for designing for various parameters.

DESIGN OF PARALLEL HYBRID ELECTRIC VEHICLE DRIVES: Design of Parallel Hybrid Electric Vehicle Drive- Control Strategies of Drive Train and Design of Drive Train Parameters.

UNIT-V:

FUEL CELL ELECTRIC VEHICLES: Operating principles of fuel cells, Fuel and oxidant consumption, Fuel cell system characteristics, Fuel cell technologies- Proton Exchange membrane fuel cells, Alkaline Fuel cells, Phosphoric acid fuel cells, Molten carbonate fuel cells, Solid oxide fuel cells, Fuel supply- Hydrogen storage-Hydrogen production, Ammonia as hydrogen carrier, Non-Hydrogen fuel cells, Fuel Cell Hybrid Vehicle Drive Train.

Text Books:

1) MehrdadEhsani, YiminGao, Ali Emadi, 2nd edition, Modern Electric, Hybrid Electric and Fuel cell vehicles, CRC Press, Taylor and Francis Group, 2010.
2) Chris Mi, M.AbulMasrur and David WenzhongGao, 1st Edition, Hybrid Electric Vehicles, John Wiley & Sons, Ltd, 2011.

B. TECH VII SEMESTER **OEC**

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20EC7T10 DATA COMMUNICATIONS (OPEN ELECTIVE-III)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To focus on information sharing and networks.
2. To Introduce flow of data, categories of network, different topologies.
3. To focus on different coding schemes.
4. To brief the students regarding protocols and standards.
5. To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices, etc.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Know basic knowledge of data Communication

CO2: Know basic knowledge of Analog & Digital Signals

CO3: Understand the basic knowledge of Analog Transmission

CO4: know Different types of transmission media

CO5: Focus on DTE-DCE Interface

SYLLABUS

UNIT-I:

Introduction to data communication and networking: Reason to study data communication, Data Communication, Networks, Protocols and Standards, Standards Organizations. Line Configuration, Topology, Transmission Modes, Categories of Networks Internet works. Study of OSI and TCP/IP protocol suit: The Model, Functions of the layers, TCP/IP Protocol Suites

UNIT-II:

Study of Signals: Analog and Digital, Periodic and Aperiodic Signals, Analog Signals, Time and Frequency Domains, Composite Signals, Digital Signals. Study of Digital transmission: Digital to Digital Conversion, Analog to Digital Conversion.

UNIT-III:

Study of Analog transmission: Digital to Analog Conversion, Analog to Analog Conversion. Study of Multiplexing: Many to one/one to Many, Frequency division Multiplexing, Wage division Multiplexing, Time division Multiplexing, Multiplexing applications.

UNIT-IV:

Types of transmission media: Guided Media, Unguided Media, Transmission Impairments, Performance Wavelength, Shannon Capacity, Media Comparison, PSTN, Switching. Error Detection and Correction: Types of Errors, Detection, Parity Check, Vertical Redundancy Check, Longitudinal Redundancy Check, Cyclic Redundancy Check, Checksum, Error Correction.

UNIT-V:

Study of DTE-DCE in brief: Digital data transmission, DTE-DCE Interface, Modems, 56K Modems, Cable Modems. Introduction to networks and devices: Network classes, Repeaters, Hub, Bridges, Switches, Routers, Gateways Routers, Routing Algorithms, Distance Vector Routing, Link State Routing.

Text Books:

1. Data communication & Networking by Bahrouz Forouzan.

2. Computer Networks by Andrew S. Tanenbaum

Reference Books:

1. Data and Computer Communications by William Stallings

2. Kleinrock, Leonard. Queueing Systems, Vol 1: Theory. New York, NY: Wiley J., 1975. ISBN: 0471491101.

B. Tech VII Semester **OEC**

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20EC7T11 MECHATRONICS (OPEN ELECTIVE III)

Course Objective: The main objective of this course is

- To introduce the integrative nature of Mechatronics.
- To describe the basic programming, different components and devices of mechatronics systems.

Course Outcomes:
At the end of this course the student will able to:

CO1: Basic concepts of mechatronics

CO2: To design mechatronics system with the help of Microprocessor

CO3: To design PLC and other electrical and Electronics Circuits

CO4: To understand the concept of solid state Devices

CO5: To know Dynamic models & controllers

SYLLABUS

UNIT-I:

Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors.

UNIT-II:

Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontrollers – Block diagram

UNIT-III:

Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC, Basic programming in PLC.

UNIT-IV:

Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning, operational amplifiers, noise reduction, filtering.

UNIT-V:

Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trend

TEXT BOOKS:

1. Bolton, ―Mechatronics‖, Printice Hall, 2000

2. Ramesh S Gaonkar, ―Microprocessor Architecture, Programming, and Applications with the 8085‖, 5th Edition, Prentice Hall, 2008.

REFERENCE BOOKS:

1. Mechatronics System Design / Devdas shetty/Richard/Thomson.

2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

B. TECH VII SEMESTER

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BIOMEDICAL INSTRUMENTATION.

20EC7T12 **(OPEN ELECTIVE III)**

Course Objectives:

1. To introduce student to basic biomedical engineering technology
2. To understand the anatomy & physiology of major systems of the body in designing equipment for medical treatments.
3. To impart knowledge about the principle and working of different types of bio-medical electronic equipment/devices.

Course- Outcomes:

After going through this course the student will able

CO1.To understand Physiological System of the Body and Bioelectric Potentials.

CO2.To understand Electrodes, Transducer and Sensors used in Biomedical field.

CO3 To understand the problem and identify the necessity of equipment for diagnosis and therapy.

CO4 To understand the importance of electronics engineering in medical field.

CO5 To understand the importance of telemetry in patient care

SYLLABUS

UNIT-1: INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT-II: ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output**.**

UNIT-III: CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV: PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids, Laparoscope, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention,

UNIT-V: DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring**.**

Text Books:

1. Bio-Medical Instrumentation‖, Cromwell , Wiebell, Pfeiffer
2. Hand Book of Bio-Medical Instrumentation‖, Instrumentation‖, Kandahar. McGraw-Hill

References

1. Introduction to Bio-Medical Equipment Technology‖, 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. “Bio-Medical Electronics and Instrumentation”, Onkar N. Pandey, Rakesh Kumar, Katson Books.

B. TECH VII SEMESTER

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20CS7T10 **ARTIFICIAL NEURAL NETWORKS. (OPEN ELECTIVE III)**

Course Objectives:

- To deal with the historical developments of artificial intelligence leading to artificial neural networks (ANN).
- To introduce the basic concepts and models of ANN for solving real world problems.

Course Outcomes:

At the end of this course the student will be able to:

CO1- Understand biological neuron & artificial neuron and basic building blocks of ANN.

CO2-Understand different single layer/multiple layer Perceptron learning algorithms.

CO3- Understand and analyze Adaline and Madeline Networks and their applications

CO4- Learning algorithms based on basic gradient descent, backpropagation and their modifications.

CO5- Understand self-organization learning, ART, Radial basis Functions.

SYLLABUS

UNIT - I: Introduction to Artificial Neural Networks:

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT - II: Fundamental Models of Artificial Neural Networks:

Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS)Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.

Perceptron Networks: Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks

UNIT – III: Adaline and Madaline Networks:

Introduction, Adaline, Madaline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

UNIT - IV: Feedback Networks:

Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets.

Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT - V: Self Organizing Feature Map:

Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

Adaptive Resonance Theory: Introduction, ART Fundamentals, ART 1, ART2.

TEXT BOOKS:

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL : 2005.

REFERENCES:

1. “Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

B. TECH VII SEMESTER

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CYBER SECURITY
20CS7T11 (OPEN ELECTIVE III)

Course Objective:

- Understand the importance of Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

Course Outcomes:

CO1: Understand and classify various forms of Cybercrimes

CO2: Interpret the reasons for Cyber offence

CO3: Detect and analyze vulnerabilities in Mobile and Wireless devices

CO4: Analyze tools used to perform cyber crimes

CO5: Understand cyber security Laws

SYLLABUS:

UNIT-I: Introduction, Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes

UNIT-II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT-III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT-IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-V: Cybercrimes and Cyber security:

The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

B. TECH VII SEMESTER

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SOFTWARE TESTING METHODOLOGIES
20CS7T12 (OPEN ELECTIVE III)

Course Objectives:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To Understand different levels of Testing
- Apply Black Box and White Box Testing Techniques
- To learn how to plan a test project, design test cases and data, conduct testing operations, and generate a test report.
- To understand software test automation problems and solutions.

Course Outcomes:

CO1: Have an ability to apply software testing knowledge and engineering methods.

CO2: Ability to identify the needs of software test automation, and define a test tool to support test automation.

CO3: Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

CO4: Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

CO5: Apply techniques and skills to use modern software testing tools to support software testing projects.

SYLLABUS

UNIT-I: Software Testing:

Introduction, Evolution, Dichotomies, Goals & Typical Objectives of Testing, Model for testing, Software Testing Principles, **Software Testing Terminology and Methodology:** Software Testing Terminology, Errors, Defects, Failures, Root Causes and Effects, Software Testing Life Cycle, Software Testing Methodology.

UNIT-II: Verification and Validation:

Verification & Validation Activities, Categories of Test Techniques: Dynamic Testing,

Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing,

White-Box Testing: Need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT-III: Static Testing:

Inspections, Structured Walkthroughs, Technical reviews, Benefits of Static Testing, Static Vs Dynamic Testing.

Levels of Testing: Unit testing, Integration Testing,. Function testing, System testing and Acceptance testing.

Regression testing: Progressive Vs Regressive testing, Objectives of regression testing, Regression testing techniques

UNIT-IV: Test Management:

Test Organization, Test Planning, Test Design and Test case specifications, Structure of a Testing Group, Reasons for the growth of a Test suite, Test suite Minimization, Test suite prioritization, Types of test case prioritization, prioritization techniques, Measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models

Debugging: Debugging process, Debugging Techniques, Correcting Bugs, Debuggers

UNIT-V: Automation and Testing Tools:

Need for automation, Testing Tool Considerations, Test Tool Classification, Benefits and Risks of Test automation, Special Considerations for Test execution and Test Management Tools, Principles for tool selection, Testing tools- success factors, Guidelines for automated testing, overview of some commercial testing tools.

Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web **engineering**, testing of web based systems, Testing mobile systems.

TEXT BOOKS:

1. Software testing techniques - Baris Beizer, International Thomson computer press, second edition. (Unit 1)
2. Software Testing, Principles and Practices, Naresh Chauhan, Oxford Publishers(Unit 2,3,4,5)

REFERENCES:

Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

1. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
2. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

B. TECH VII SEMESTER

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INTERNET OF THINGS
20IT7T10 (OPEN ELECTIVE III)

Course Objectives:

- Understand the architecture of Internet of Things and connected world.
- Explore on use of various hardware, communication and sensing technologies to build IoT applications
- Develop the real time IoT applications to make smart world.
- Understand challenges and future trends in IoT.

Course Outcomes:

CO1: Design and Deployment of IoT.

CO2: Design and comparing M2M with IoT.

CO3: Understand Platform design and modeling of IoT

CO4: Apply IoT in different devices using Python

CO5: Implement IoT and cloud platforms.

SYLLABUS

UNIT-I: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT Enabling Technologies, IoT levels and deployment, domains Specific IoTs.

UNIT-II: IoT and M2M :

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

UNIT-III: IoT Platforms Design Methodology:

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data Structures, control flow, functions, modules, packages, file handling. Raspberry PI with Python, other IoT devices.

UNIT-IV: IoT Protocols:

Messaging Protocols- MQ Telemetry Transport (MQTT), Constrained Application Protocol (CoAP) Transport Protocols-Light Fidelity (Li-Fi), Bluetooth Low Energy (BLE) IoT Protocols: Addressing and Identification: Internet Protocol Version 4 (IPV4), Internet Protocol Version 6(IPV6), Uniform Resource Identifier (URI)

UNIT-V: IoT Physical Servers And Cloud Offerings: Introduction to cloud storage models and communication APIs, WAMP –Auto Bahn for IoT, Xively cloud for IoT, case studies illustrating IoT design –home automation, smart cities, smart environment.

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things: A Hands-on-Approach”, VPT, 1st Edition, 2014. (Units1,2,3,5)
2. Matt Richardson, Shawn Wallace, “Getting Started with Raspberry Pi”, O’Reilly (SPD), 3rd Edition, 2014. (Unit 3)
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram “ Internet of Things” Wiley (Unit 4).

REFERENCE BOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons2014.

B. TECH VII SEMESTER

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COMPUTER VISION
20IT7T11 (OPEN ELECTIVE III)

Course Objectives:

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand motion analysis.
- To study some applications of computer vision algorithms

Course Outcomes:

CO1: Implement fundamental image processing techniques required for computer vision.

CO2: Perform shape analysis.

CO3: Apply Hough Transform for line, circle, and ellipse detections.

CO4: Apply 3D vision techniques.

CO5: Develop applications using computer vision techniques

SYLLABUS

UNIT - I:

IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology –texture.

UNIT - II: SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT – III: HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT - IV: 3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

.**UNIT - V: APPLICATIONS**

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

TEXT BOOKS:

1.D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.

2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.
2. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
3. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
4. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.

B. TECH VII SEMESTER

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FUZZY SETS
20HS7T01 (OPEN ELECTIVE III)

COURSE OBJECTIVES:

1) Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
2) Explain different types operations performed on fuzzy sets.
3) Provide the knowledge of Arithmetic operations on fuzzy numbers.
4) Emphasis on different kinds of crisp and fuzzy relations
5) Enable students to know the validity of arguments by fuzzy logic.

COURSE OUTCOMES:

CO1: Understand basic knowledge of fuzzy sets and fuzzy logic.
CO2: Apply various kinds of operations on fuzzy sets.
CO3: Understand the concepts of fuzzy arithmetic to solve fuzzy equations.
CO4: Illustrate the properties of fuzzy sets to design modeling software system.
CO5: Apply fuzzy logic to solve the problems in neural networks.

SYLLABUS

UNIT-I

Fuzzy Sets(all theorems without proofs): Introduction, Crisp sets, Fuzzy sets: Basic types and basic concepts, additional properties of α-cuts, representations of Fuzzy sets, extension principle for Fuzzy sets.

UNIT-II

Operations on Fuzzy Sets(all theorems without proofs): Types of operations, Fuzzy complements, Fuzzy intersections: t-norms, Fuzzy unions: t-conorms, Combinations of operations, Aggregation operations.

UNIT-III

Fuzzy Arithmetic(all theorems without proofs): Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations.

UNIT-IV

Fuzzy Relations(all theorems without proofs): Crisp versus Fuzzy relations, Projection and cylindrical extensions, Binary Fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations, Fuzzy compatibility relations, Fuzzy ordering relations, Fuzzy morphisms.

UNIT-V

Fuzzy Logic(all theorems without proofs): Classical logic: an over view, multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic hedges, Inference from conditional Fuzzy propositions, Inference from conditional and qualified propositions, Inference from quantified propositions.

TEXT BOOKS:

1. George J. Klir& Bo Yuan, Fuzzy Sets & Fuzzy Logic, Pearson Education, PHI, 1995.
2. H. J. Zimmermann, Fuzzy Set Theory and its Applications, 4th edition, Springer.

REFERENCES:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd edition, Wiley, 2010.
2. John Yen & Reza Langari, Fuzzy Logic, Pearson.

B. TECH VII SEMESTER

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20MB7T01 DIGITAL MEDIA MANAGEMENT (OPEN ELECTIVE III)

Course Objective

Digital marketing channels that can helps the students to understand the increased business visibility and brand awareness. Moreover, having a professional presence on social media helps them to reach a broader target audience to secure more leads and convert them into loyal customers.

SYLLABUS

Unit – I

Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

Unit – II

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How different segments use Digital Media –

Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

Unit – III

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Writing the Marketing Plan and Implementing the Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget.

Unit – IV

Search Engine Marketing and Online Advertising: Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

Unit – V

Social Media Marketing: Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

TEXT BOOKS

1 Richard Gay, Alan Charles worth and Rita Essen, Online Marketing, Oxford University Press, 2016.

REFERENCES

1. Dave Chaffey, Fiona Ellis-Chadwick, Richard Mayer, Kevin Johnston. Internet Marketing Strategy, Implementation and Practice,3rd Ed .Prentice Hall.

2. Rob Stokes e-Marketing: The essential guide to marketing in a digital world. 5th Ed. Quirk e-Marketing (Pty) Ltd.

B. TECH VII SEMESTER

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20MB7T02 ENTREPRENEURSHIP DEVELOPMENT (OPEN ELECTIVE III)

SYLLABUS

UNIT –I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.

2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International

3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

B. TECH VII SEMESTER

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20AD7T10 **DATA ANALYSIS AND VISUALIZATION WITH PYTHON (OPEN ELECTIVE III)**

Pre-requisite:

Course Objective: *This course* explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

Unit-1:

Preliminaries: What Kinds of Data?, Why Python for Data Analysis?, Python as Glue, Solving the "Two-Language" Problem, Why Not Python?, Essential Python Libraries, Installation and Setup.

Python Language Basics, IPython, and Jupyter Notebooks: The Python Interpreter, IPython Basics, Python Language Basics.

NumPy Basics: Arrays and Vectorized Computation:

The NumPy ndarray: A Multidimensional Array Object, Universal Functions: Fast Element-Wise Array Functions, Array-Oriented Programming with Arrays, File Input and Output with Arrays, Linear Algebra, Pseudorandom Number Generation.

Unit-2:

Introduction to pandas Data Structures: Series, DataFrame, Index Objects

Essential Functionality: Reindexing, Dropping Entries from an Axis, Indexing, Selection, and Filtering, Integer Indexes, Arithmetic and Data Alignment, Function Application and Mapping, Sorting and Ranking, Axis Indexes with Duplicate Labels, Summarizing and Computing Descriptive Statistics: Correlation and Covariance, Unique Values, Value Counts, and Membership.

Unit-3:

Data Loading, Storage, and File Formats Reading and Writing Data in Text Format: Reading Text Files in Pieces, Writing Data to Text Format, Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping

Binary Data Formats: Using HDF5 Format, Reading Microsoft Excel Files

Data Cleaning and Preparation:

Handling Missing Data: Filtering Out Missing Data, Filling In Missing Data

Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, Computing Indicator/Dummy Variables

Unit-4:

Data Wrangling: Join, Combine, and Reshape:

Hierarchical Indexing: Reordering and Sorting Levels, Summary Statistics by Level, Indexing with a DataFrame's columns.

Combining and Merging Datasets: Database-Style DataFrame Joins, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap.

Reshaping and Pivoting: Reshaping with Hierarchical Indexing, Pivoting “Long” to “Wide” Format, Pivoting “Wide” to “Long” Format.

Unit-5:

Plotting and Visualization

A Brief matplotlib API Primer: Figures and Subplots, Colors, Markers, and Line , Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, matplotlib Configuration.

Plotting with pandas and seaborn: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots, Facet Grids and Categorical Data, Other Python Visualization Tools.

Text Book:

“Python for Data Analysis” Data Wrangling With Pandas, Numpy, And Ipython Second Edition by Wes McKinney, Oreilly Publications.

B. TECH VII SEMESTER

OEC	L	T	P	C
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20AM7T10 NoSQL DATABASES (OPEN ELECTIVE III)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains define, compare and use the four types of NoSQL Databases, demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases, explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases, ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the type of NoSQL database to implement based on business requirements

CO2: Apply NoSQL data modeling from application specific queries

CO3: Understand NoSQL Storage Architecture

CO4: Use Atomic Aggregates and denormalization as data modeling techniques to optimize query processing

CO5: Apply indexing and ordering of data sets

SYLLABUS

Unit-1:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented

Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

Unit-2:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

Unit-3:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value

Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

Unit-4:

NoSQL Stores: Similarities between Sql and Mongodb Query Features, Accessing Data

From Column-Oriented Databases like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution in Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

Unit-5:

Indexing and Ordering Data Sets: Essential Concepts behind a Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Reference Books:

1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional,2012.
2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications,2013.
3) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN:978-0-470-94224-6
4) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE7T15 WASTE WATER TREATMENT
(OPEN ELECTIVE-IV)

Course Objectives: To study about waste water treatment

Course Outcomes: Able to provide waste management techniques

SYLLABUS

UNIT–I:

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

UNIT–II:

Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems, Industrial waste water discharges into streams. Lakes and oceans- consequent problems.

UNIT–III:

Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries, Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods. Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT-IV:

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT–V:

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

Text Books:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

Reference Books:

1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE7T16 REPAIR AND REHABILITATION OF CONCRETE STRUCTURES
(OPEN ELECTIVE-IV)

Course Objectives:

- Familiarize Students with deterioration of concrete in structures
- Equip student with concepts of NDT and evaluation
- To evaluate the performance of the materials for repair
- To strategize different repair and rehabilitation of structures.

Course Outcomes:

CO1: Explain deterioration of concrete in structures

CO2: Carryout analysis using NDT and evaluate structures

CO3: Students must gain knowledge on quality of concrete

CO4: Examine how the Concrete repair industry equipped with variety of repair Material sand techniques .

SYLLABUS

UNIT–I:

Maintenance and Repair Strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT-II:

Causes of Damage To Structures Causes of Distress in Structures - Extrinsic and Intrinsic causes for damage of structures; Effect of Chemical and Marine Environment on structures.

UNIT-III:

Semi Destructive Tests for Damage Assessment Core Test, LOK test, CAPO test, Penetration Tests Non-Destructive Tests for Damage Assessment Rebound Hammer Test, Ultrasonic Pulse Velocity test, Resistivity Test, Carbonation Test, Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

UNIT-IV:

Materials for Repair: Criteria for durable concrete repair, selection of repair materials, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete, FRP sheets.

UNIT-V:

Techniques for Repair: Crack repair techniques – Crack Stitching, Mortar and dry pack, vacuum concrete, Shotcreting, Epoxy injection, Mortar repair for cracks Methods of Strengthening: Repairs to overcome low member strength – Jacketing, blanketing

Text Books:

1. 'Maintenance & Repair of Civil Structures' by B.L. Gupta & Amit Gupta.
2. 'Rehabilitation of Concrete Structures' by B. Vidivelli, Standard Publishers.
3. 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation' by V. K. Raina

Reference Books:

1. 'Concrete Structures- protection Repair and Rehabilitation' by R. Doodge Woodson, BH Publishers
2. ShettyM.S., "Concrete Technology – Theory and Practice", S. Chand and Company, 2008.
3. Dov Kominetzky. M. S., "Design and Construction Failures", Galgotia Publications Pvt.Ltd., 2001
4. Ravishankar.K., Krishnamoorthy. T. S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
5. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008,
6. Gambhir. M. L., "Concrete Technology", McGraw Hill, 2013

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
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20EE7T15 POWER QUALITY
(OPEN ELECTIVE-IV)

Course Objective:

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

Course Outcome:

At the end of this course the student should be able to

CO1: Differentiate between different types of power quality problems.

CO2: Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.

CO3: Analyze power quality terms and power quality standards.

CO4: Explain the principle of voltage regulation and power factor improvement methods.

CO5: Explain the power quality monitoring concepts and the usage of measuring instruments.

SYLLABUS

Unit-I

Introduction to Power Quality: Terms and definitions of transients, Long Duration Voltage Variations: Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching DC offset; waveform distortion; voltage fluctuation; power frequency variations.

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction-capacitor switching

transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics, measurement of harmonics, THD; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, “Electrical Power System Quality” McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, “Power Quality Enhancement Using Custom Power Devices” Kluwer Academic Publishers
3. Sankaran, “ Power Quality” CRC Press.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis) Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE7T16 ELECTRIC VEHICLES

(OPEN ELECTIVE-IV)

Course Objective:

- To study the different drive train configurations of electric vehicles
- To propose the various propulsion and energy storage systems for EHVs
- To know the sizing of propulsion motors and other systems involved in EH vehicles
- To carry out different design case studies of EHv and BEVs

Course Outcomes: At the end of the course, the student will be able to:

CO1: Assess the performance, societal and environmental impact of EHVs having known their past history

CO2: Implement various drive train topologies and control strategies in Electric and Hybrid vehicles

CO3: Recommend, Design/Size and Control different electric propulsion units and other components of EHVs and BEVs

CO4: Appropriately select the energy storage system and strategize its management in EHVs

CO5: Define Ancillary Service Management and explain different ancillary services.

SYLLABUS

UNIT-I INTRODUCTION TO ELECTRIC VEHICLES:

History of electric vehicles (EV) and hybrid electric vehicle (EHV), need and importance of EV and HEV, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Power/energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics.

UNIT-II HYBRID ELECTRIC DRIVE-TRAINS: Basic architecture and concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

UNIT-III ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, and Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV BATTERY ENERGY STORAGE SYSTEMS:

Battery Basics - Lead-Acid Battery -Cell Discharge Operation - Cell Charge Operation-Construction-Battery Parameters - Battery Capacity-Discharge Rate - State of Charge- State of Discharge- Depth of Discharge-Technical Characteristics - Practical Capacity -Battery Energy -Constant Current Discharge -Specific Energy - Battery Power -Specific Power -Batteries for EV applications.

UNIT-V MODELLING OF EV/HEV:

Modelling and analysis of EV/HEV drive train sizing of motor, and design of traction power electronics, various vehicle subsystems.

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2010.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,2009.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

REFERENCES:

1. Jefferson, C.M., Barnard and R.H., Hybrid Vehicle Propulsion, WIT Press, Boston, 2002
2. Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012
3. SerefSoylu “Electric Vehicles - The Benefits and Barriers”, InTech Publishers, Croatia, 2011
4. Jack Erjavec and Jeff Arias, “Alternative Fuel Technology – Electric, Hybrid and Fuel Cell Vehicles”, Cengage Learning Pvt. Ltd., New Delhi, 2007
5. Seth Leitman, “Build Your Own Electric Vehicle” McGraw hill, New York, USA, 2013

B.TECH VII SEMESTER	OEC	L	T	P	C
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20ME7T12 **MICRO-ELECTRO- MECHANICAL SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Calculus and Differential Eq., Fundamentals of Physics (Mechanics, Optics, Electricity and magnetism), Fundamentals of Inorganic Chemistry.

Course Objective: The main objective of this course is to introduce the integrative nature of Micro Electro Mechanical systems. To describe the different components and devices of Micro Electro Mechanical systems.

Course Outcomes: At the end of the course, student will be able to

CO1:	Explain MEMS and Principles of sensing and actuation
CO2:	Explain Thermal Sensors and Actuators & Magnetic Sensors and Actuators
CO3:	Explain Micro-Opto-Electro Mechanical Systems
CO4:	Explain Radio Frequency (RF) MEMS & Micro Fluidic Systems
CO5:	Explain Chemical And Bio Medical Micro Systems

SYLLABUS

UNIT-I:

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT-II:

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, magnetic MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT-III: MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS:

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT-IV:

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

UNIT-V: CHEMICAL AND BIO MEDICAL MICRO SYSTEMS:

Sensing mechanism & principle, membrane transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (Enose), mass sensitive chemosensors, fluroscence detection, calorimetric spectroscopy.

Text Books:

1. MEMS, NitaigourPremchandMahalik, TMH Publishing co.

References:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. Bio-MEMS (Micro systems), Gerald Urban, Springer.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T13 **SOLAR ENERGY SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: To impart knowledge on non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

Course Outcomes: At the end of the course, student will be able to

CO1: Significance of renewable energy and describe the principles of solar radiation. Analyze various solar collectors.

CO2: Know the various storage methods and application of solar energy.

CO3: Understand the concept of converting wind energy into electrical energy using both horizontal and vertical axis wind machines.

CO4: Know biomass disasters, functional operation of geothermal systems. Generalize the operation of ocean, tidal and wave energy systems.

CO5: understand the operating principle of direct energy conversion systems .and to recognize the need and ability to engage in lifelong learning for further developments in this field.

SYLLABUS

UNIT-I: FUNDAMENTALS OF SOLAR RADIATION:

Energy conservation principle, Energy scenario (world and India), Solar angles, Solar time, Solar radiation: Outside earth's atmosphere, Earth surface, measurements of solar radiation: Pyrometer, Sunshine recorder, Pyro heliometer.

UNIT-II: ENERGY STORAGE SYSTEMS:

Energy –Environment-Economy Necessity of energy storage, Specifications of energy storage devices, energy storage Methods-Mechanical Energy Storage-Thermal Energy Storage-Sensible Heat Storage-Solid media storage.

UNIT-III: SOLAR COLLECTORS:

Classifications, comparison of concentrating and non-concentrating types – Liquid flat plate collectors, Evacuated tube collectors. Modified flat plate collectors: Compound parabolic concentrator(CPC), Cylindrical parabolic Concentrator, Fixed mirror solar concentrator, Paraboloid Dish Collector.

UNIT-IV: SOLAR THERMAL DEVICES:

Solar water heater, Solar space heating and cooling systems, Solar industrial heating systems, Solar refrigeration and air conditioning systems, Solar Desalination – Solar cooker: domestic, community – Solar pond – Solar drying.

UNIT-V: SOLAR PHOTOVOLTAIC SYSTEMS:

Solar cell fundamentals, Energy band model of semiconductors, Working Principle of photovoltaic cell, solar cell classification, solar cell technologies, solar PV systems-classification. Solar cell –module-array Construction.

Text Books:

1. Goswami D.Y., Kreider, J. F. and Francis., "Principles of Solar Engineering', Taylor and Francis, 2000.
2. Chetan Singh Solanki, "Solar Photovoltatics – Fundamentals, Technologies and Applications", PHI Learning Private limited, 2011.
3. Sukhatme S.P., Nayak.J.P, 'Solar Energy – Principle of Thermal Storage and collection", Tata McGraw Hill, 2008.
4. Solar Energy International, "Photovoltaic – Design and Installation Manual" – New Society Publishers, 2006.
5. Roger Messenger and Jerry Vnetre, "Photovoltaic Systems Engineering", CRC Press, 2010.

Reference Books:

1. B.H.Khan "Non – conventional Energy Resources" Tata McGraw Hill education Pvt. Ltd.
2. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons .

B. TECH VII SEMESTER

OEC	L	T	P	C
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INTRODUCTION TO EMBEDDED SYSTEMS
20EC7T13 (OPEN ELECTIVE –IV)

Course Objectives:
At the end of the course, student will be able to

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained
3. Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed
4. Embedded system implementation and testing tools are introduced and discussed.
   Technology capabilities and limitations of the hardware, software components
5. Design Methodologies

Course Outcomes:
At the end of the course, student will be able to

CO1: Understand the basic concepts of an embedded system and able to know an embedded system design Approach to perform a specific function.
CO2: The various embedded firmware design approaches on embedded environment.
CO3: Identify the unique characteristics of real-time systems
CO4: Design, implement and test an embedded system.
CO5: Define the unique design problems and challenges of real-time systems

SYLLABUS

UNIT-I: Introduction to Embedded systems

What is an embedded system Vs. General Computing system, history, classification, major application areas, and purpose of embedded systems, Core of embedded system, Characteristics and Quality Attributes of Embedded systems

UNIT-II: Embedded Hardware Design

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real-time clock, Application specific and Domain specific embedded systems-Examples

UNIT-III:

Embedded Firmware design approaches, Embedded Firmware Development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA,Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV:

Factors to be considered in selecting a controller, 8051 Architecture, RTOS and Scheduling Operating basics, types, RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Types of multitasking, Non preemptive Scheduling, Preemptive Scheduling.

UNIT-V: Design and Development

Embedded system development Environment – IDE, Simulators, Emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry

Text books:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.

2. Embedded Systems, Rajkamal, TMH, 2009.

References:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE

2. Embedded Systems: A Contemporary Design Tool Paperback by James K. Peckol

B. Tech VII Semester

	L	T	P	C
OEC	3	0	0	3

20EC7T14 INTERNET OF THINGS (OPEN ELECTIVE –IV)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To introduce the terminology, technology and its applications
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language which is used in many IoT devices
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To introduce the implementation of web-based services on IoT devices

COURSE OUTCOMES:

At the end of this course the student will able to:

At the end of the course, student will be able to

CO1: Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.

CO2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on Bwireless, energy, power, and sensing modules

CO3: Market forecast for IoT devices with a focus on sensors

CO4: Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

SYLLABUS

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Sensors, Actuators,
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II: IoT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT-III: IoT Physical Devices and Endpoints

Introduction to Arduino and Raspberry Pi- Installation,
Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT-IV: Controlling Hardware-

Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors

Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

UNIT-V: IoT Physical Servers and Cloud Offerings–

Introduction to Cloud Storage models and
communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

B. TECH VII SEMESTER **OEC**

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3	0	0	3

20EC7T15 ANALOG AND DIGITAL IC APPLICATIONS (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1. To understand the analysis & design of different types of active filters using op-amps
2. To learn the internal structure, operation and applications of different analog ICs
3. In this course, students can study Integrated circuits for all digital operational designs like adder, subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM.
4. Design and to develop the internal circuits for different digital operations and simulate them using hardware languages using integrated circuits.
5. Understand the concepts of Latches and Flip-Flops and Design of Counters using Digital ICs, modeling of sequential logic integrated circuits using VHDL

Course Outcomes:

At the end of the course, student will be able to

CO1: Design circuits using operational Amplifier for various applications

CO2: Understand the concept of A/D & D/A Converters

CO3: Analyze and design amplifiers and active filters using Op-amp.

CO4: Understand the concepts of Combinational logic circuits in digital system

CO5: Understand the concepts of sequential logic circuits in digital system

SYLLABUS

UNIT-I: OPERATIONAL AMPLIFIER

The Ideal Operational Amplifier; Operational Amplifier Internal Circuit. Op-Amp parameters & Measurement, DC Characteristics, input & output off set voltages & currents, slew rate, CMRR, PSRR, drift, AC Characteristics and Compensation Techniques.

UNIT-II: OPERATIONAL AMPLIFIER APPLICATIONS

Basic Op-Amp Applications; Inverting and Non-inverting amplifier,. Integrator and differentiator, Difference amplifier, Instrumentation Amplifier; AC Amplifier; V to I and I to V Converters. Op-Amp Circuits using Diodes, Sample and Hold Circuit, Comparator, Regenerative Comparator (Schmitt Trigger).

D-A AND A-D CONVERTERS Introduction; Series Op-Amp Regulator; Basic DAC Techniques Weighted Resistor DAC,R-2R DAC ; AD Converters, Flash ADC and Successive approximation Converter.

UNIT-III: FILTERS USING OP-AMP & 555 TIMERS

Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Description of Functional Diagram of 555 Timer; Monostable Operation; Astable Operation and its Applications and PLL, Applications PLL. VCO and its applications.

UNIT-IV: Digital Design Using HDL

Design flow, program structure, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Objects and Classes, Subprograms, Comparison of VHDL and Verilog HDL.

UNIT-V: Combinational And sequential Logic Design

Combinational Logic Design: Adders & Sub tractors, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Barrel Shifter, Simple Floating-Point Encoder, Dual Priority Encoder.

Sequential Logic Design: Flip-Flops, Counters, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Register. Linear feedback shift register and applications.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGrawHill,4th Edition,2005
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.

REFERENCES:

1. "Fundamentals of Digital logic design with VHDL". Stephen Brown & Zvonko Vranesic, Tata McGraw Hill, 2nd edition.2004
2. Designing with TTL Integrated Circuits: Robert L. / John R. Morris & Miller.

B. TECH VII SEMESTER **OEC**

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20CS7T13 **DATA ANALYTICS (OPEN ELECTIVE –IV)**

Course Objectives:

1. To understand Data Analytics lifecycle and Business Challenges.
2. To understand Analytical Techniques
3. To understand various tools and technologies to handle big data

Course Outcomes:

CO1: Understand big data and data analytics life cycle.
CO2: Explore various supervised learning methods.
CO3: Explore various unsupervised learning methods.
CO4: Understand and apply ARIMA model on time series data.
CO5: Learn various technology and tools in big data analytics.

SYLLABUS

UNIT-I

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the new big data Ecosystem, Examples of Big Data Analytics. Data Analytics Life Cycle: Data Analytics life cycle Overview, Discovery, Data Preparation, Model,Planning, Model Building, Communicate Results, Operationalize, Case Study.

UNIT-II

Supervised Learning: Decision Trees – Overview of Decision Trees, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree. Naive Bayes: Baye's Theorem, Naïve Baye's Classifier, Diagnostics of Classifiers.
Regression –Linear Regression, Logistic Regression.

UNIT-III

Unsupervised Learning: Association Rule Mining–Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules. Cluster Analysis –Overview of Clustering, k-means

UNIT IV

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model
Text Analysis: Text Analysis Steps, Example, Collecting Raw Data, Representing Text, TFIDF, Categorizing Documents by Topics, Determining Sentiments, Gaining Insights.

UNIT-V

Technology and Tools: MapReduce and Hadoop- Analytics for Unstructured Data, The Hadoop Ecosystem In-DataBase Analytics: SQL Essentials, In-Database Text Analysis, Advanced SQL.

TEXT BOOKS:

1. David Dietrich, Barry Hiller, “Data Science and Big Data Analytics”, EMC education services, Wiley publications, 2012.

REFERENCE BOOKS:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with
advanced analytics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O"
Reilly, 2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

B. Tech VII Semester **OEC**

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20CS7T14 BLOCK CHAIN TECHNOLOGY (OPEN ELECTIVE –IV)

Course Objectives

By the end of the course, students will be able to

- Understand how major block chain systems work.
- To securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

Course Outcomes

CO 1: Understand the design principles of Bitcoin and Ethereum.

CO 2: Understand and apply Nakamoto consensus.

CO 3: Analyze the differences between proof-of-work and proof-of-stake consensus.

CO 4: Understand cryptocurrency

CO 5: Understand cryptocurrency Regulations

SYLLABUS

Unit I: Basics:

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Unit II: Blockchain:

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Unit III: Distributed Consensus:

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV: Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Unit V: Cryptocurrency Regulation:

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.

Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Text Book

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,”Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

B. TECH VII SEMESTER	OEC	L	T	P	C
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20CS7T15 SOFTWARE PROJECT MANAGEMENT (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

CO1: Apply the process to be followed in the software development life-cycle models.

CO2: Apply the concepts of project management & planning.

CO3: Implement the project plans through managing people, communications and change

CO4: Conduct activities necessary to successfully complete and close the Software projects

CO5: Implement communication, modeling, and construction & deployment practices in software development.

SYLLABUS

UNIT I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

TEXT BOOKS:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

REFERENCES:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH VII SEMESTER **OEC**

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20IT7T13 CLOUD COMPUTING (OPEN ELECTIVE –IV)

Course Objectives:

- Explain the technology and principles involved in building a cloud environment
- To implement Virtualization
- Understand various types of cloud and its services
- Contrast various programming models used in cloud computing

Course Outcomes:

CO1: Describe the principles of parallel and distributed computing and evaluation of cloud computing from existing technologies

CO2: Illustrate Virtualization for Data-Center Automation.

CO3: Explain and characterize different cloud deployment models and service models

CO4: Program data intensive parallel applications in cloud.

CO5: Understand commercial cloud computing technologies such as AWS, AZURE and AppEngine

SYLLABUS

UNIT-I: Introduction:

Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Microsoft Aneka.

UNIT-II: Virtualization:

Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen, VMware, Microsoft Hyper – V.

UNIT-III: Cloud Computing Architecture:

Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy.

UNIT-IV: Data Intensive Computing: Map-Reduce Programming:

What is Data-Intensive Computing? Characteristics, Challenges, Historical Perspective. Technologies for Data Intensive Computing: Storage Systems, Programming Platforms.

Cloud Applications: Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.

UNIT-V: Cloud Platform in Industry and Cloud Applications:

Cloud Platforms in Industry: Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

TEXTBOOKS:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud Computing McGraw Hill Education.

REFERENCES:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.
3. Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan Kaufmann, 2013.

B. TECH VII SEMESTER	OEC	L	T	P	C
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20IT7T14 BUSINESS INTELLIGENCE (OPEN ELECTIVE –IV)

Course Objectives:

- Introduce the concepts and components of Business Intelligence (BI)
- Evaluate the technologies that make up BI (data warehousing, OLAP)
- Identify the technological architecture that makes up BI systems

Course Outcomes:

CO1: Understand concepts and components of Business Intelligence.

CO2: Explain the complete life cycle of BI development.

CO3: Illustrate technology and processes associated with Business Intelligence framework.

CO4: Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

CO5: Ability to design expert system using AI tools.

SYLLABUS

UNIT-I:

Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence

Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

UNIT-II:

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics. **Getting started with business intelligence:** Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

UNIT-III:

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete BI professional, Popular BI tools.

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart,OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

UNIT-IV:

Business Intelligence Applications:

Marketing models: Relational marketing, Sales force management,

Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.

Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices

UNIT-V:

Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management

Artificial Intelligence and Expert Systems:

Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems

TEXT BOOKS:

1. Fundamental of Business Intelligence" Grossmann W, Rinderle-Ma Springer, 2015
2. "Fundamentals of Business Analytics" – By R N Prasad and SeemaAcharya, Publishers: Wiley India.

REFERENCE BOOKS:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : TheCompleteProject Lifecycle for Decision Support Applications, Addison WesleyInformation Technology
2. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann.

B. Tech VII Semester **OEC**

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20HS7T02 POLYMER CHEMISTRY (OPEN ELECTIVE –IV)

PREREQUISITES: Chemistry I and Chemistry II of AICTE syllabus

Course Outcomes

CO1: After studying this course, the learners are expected to: Relate polymer properties to their structure and conformation

CO2: Analyse different mechanisms of polymer formation and use this information in the synthesis of different polymers.

CO3: Distinguish between enthalpic and entropic contributions to polymerisation/crystallization.

CO4: Distinguish between absolute and relative methods for molecular weight determination.

CO5: Determine the flow properties of polymer melts and solutions.

CO6: Interpret experimental data and determine parameters such as polymerization ratesand copolymer composition.

CO7: Estimate the solubility of a given polymer in various solvents and blends.

CO8: Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.

CO9: Assess the effect of synthetic polymers on the environment.

SYLLABUS

Unit 1. Definitions, origin, nomenclature, classification and types of macromolecules; molecular weight (MW) and its distribution; Determination of molecular weight – methods for measuring number average, weight average, viscosity average MW; gel permeation chromatography; spectroscopic techniques to determine chemical composition and molecular microstructure, thermal transitions; melting temperature and glass transition temperature. Colligative properties, osmotic pressure, light scattering, refractive index, viscosity, small angle X-ray scattering (6)

Unit 2tep-Growth Polymerization: Reactivity of functional groups; kinetics; molecular weight in open and closed system cyclization vs. linear polymerization, cross-linking and gel point; process condition; step-copolymerization, examples of step polymers (3)

Unit 3. Free radical Polymerization: Nature of chain polymerization and its comparison with step polymerization; radical vs. ionic polymerizations; structural arrangements of monomer units; kinetics of chain polymerization; molecular weight and its distribution; chaintransfer, inhibition, retardation, auto-acceleration; energetic characteristics; techniques of radical polymerization – bulk, solution, emulsion, suspension polymerization; examples of polymers made by radical chain polymerization (4)**.** Ionic Polymerization: Propagation and termination of cationic polymerization, anionic and ring opening polymerization, active polycarbanions (2)

Unit 4. Copolymerization: types of copolymers, copolymer compositions, reactivity ratio; radical and ionic co-polymerizations; Block and Graft copolymer synthesis, examples (2). Thermodynamics of polymer solutions; Flory-Huggins theory, theta conditions; solubility parameters; fractionation of macromolecules, osmotic pressure, lower criticalsolution temperature (3)

Unit 5. Naturally occurring polymers, biodegradability, biosynthesis, polymers frombio/renewable resources (2)

Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography, Electron beam, X-ray and ion sensitive resists, Conducting polymers, types, properties and applications, electroluminescence, molecular basis of electrical conductivity, Photonic applications and non-linear optics, optical information storage (3)

Text Books:

1. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur
2. Polymer chemistry and Physics of Modern Materials, 2nd edn, J. M. G. Cowie, Stanley Thornes, UK, 1998
3. Contemporary Polymer Chemistry, 3rd edn. H. R. Allcock, F. W. Lampe and J. E.Mark, Pearson
4. Polymers: Chemistry and Physics of Modern Materials, J.M.G. Cowie, CRC Press
5. Introduction to Physical Polymer Science, L. H. Sperling, Wiley
6. Introduction to Soft matter, I. W. Hamley, John Wiley and Sons, 2007
7. Polymer Chemistry, 2nd edn, P. C. Hiemenz and T. P. Lodge, CRC Press (2007)

B. TECH VII SEMESTER	OEC	L	T	P	C
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20MB7T03 TOTAL ENGINEERING QUALITY MANAGEMENT (OPEN ELECTIVE –IV)

Course Objective

To understand the Engineering and Management aspects of Planning, Designing, Controlling and Improving Quality in Manufactured products.

Course Outcome

1. To understand the fundamentals of quality
2. To understand the role of TQM tools and techniques in elimination of wastages and reduction of defects
3. To develop quality as a passion and habit
4. To Facilitate the understanding of Quality Management principles and process.
5. The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

SYLLABUS

UNIT I

Quality Gurus And TQM Kitemarks: Definition, Need & Evolution of TQM – Contributions of Quality Guru's – Edward Deming – Joseph Juran – Philip Crosby – Genichi Taguchi – Walter Shewart – Criteria for Deming's Prize.

UNIT II

Product Design & Analysis : Dimensions of product and service quality, Basic Design Concepts and TQM – Design Assurance – Design Validation –Failure Mode Effect Analysis – Fault Tree Analysis – Design for Robustness – Value Analysis.

UNIT III

Process Improvement & Modern Production Management Tools

Control Charts – Process Capability, -Bench Marking, Six Sigma Approach – Total Productive Maintenance – Just-In-Time – Lean Manufacturing Paradigms.

UNIT IV

Quality Improvement Tools & Continuous Improvement

Traditional Q-7Tools, New Q-7 Tools, Quality Function Deployment (QFD), Kaizen 5S, Poka-Yoke, Failure Mode and Effects Analysis(FMEA) – Stages, Types, Taguchi Quality Loss Function(QFD) – Total Productive Maintenance (TPM).

UNIT V

Quality Management Systems ISO 9000, ISO 9001: 2008, QS 9000, ISO 14000, TS16949:2002 and EMS14001 certifications of quality systems- Elements, Documentation, Quality Auditing — Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.

TEXT BOOKS

1. Total Engineering Quality Management, Sunil Sharma, 1st Edition, MacMillan India Limited.
2. Total Quality Management, Poornima M. Charantimath, 2nd Edition, Pearson Education.
3. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint 2006.

REFERENCES

1. "Quality and Performance Excellence", James R Evans, Edition, 7th Edition, Cengage Learning.
2. "Quality Management", Howard S Gitlow, Alan J Oppenheim, Rosa Oppenheim, David M Levine,3rd Edition , Tata McGraw Hill Limited.
3. "Fundamentals of Quality Control & Improvement", Amitava Mitra, 3rd Edition, Wiley Publications, 2012.
4. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.

B. TECH VII SEMESTER **OEC**

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20MB7T04 STRESS MANAGEMENT (OPEN ELECTIVE –IV)

OBJECTIVES

This course examines different sources from where individuals experience a stress response. Through diligent individual and group study, students will be able to learn to apply stress management principles in order to achieve high levels of performance and understand the role of relationships to the management of stress and health.

Course Outcomes

1. Understand the physiological systems that are affected by stressors and the long-term effects and illnesses that can result from stressors.
2. Understand the specific applications of stress as it relates to the workplace and different target groups.
3. Create effective stress management plans for individual clients and for workplace environments. Enhancing significance of training and development, performance evaluation

SYLLABUS

UNIT I: UNDERSTANDING STRESS

Meaning – Symptoms – Work Related Stress – Individual Stress – Reducing Stress - Sources of stress –Consequence of stress-Burnout-symptoms of Burnout- Stress vs Burnout-Model of stress-strategies for coping stress (individual and organizational strategies)

UNIT II: TIME MANAGEMENT

Techniques – Importance of Planning the day –developing concentration – Prioritizing, Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say "No."

UNIT III:CAREER PLATEAU

Career plateau – Identifying Career plateaus – Structural and Content - Plateauing – Making a fresh start – Importance of Sabbaticals – Counseling out – Executive leasing – Sustaining a marketable Career.

UNIT IV:CRISIS MANAGEMENT

Implications – People issues – Structure issues – Environmental issues –Learning to keep calm - Preventing interruptions – Controlling crisis – Pushing new ideas – Empowerment – Work place Humour, Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit.

UNIT V: SELF DEVELOPMENT

Improving personality – Leading with Integrity – Enhancing Creativity – Effective Decision Making – Sensible Communication – The Listening Game – Managing Self – Mediation for peace – Yoga for Life

TEXT BOOKS

1. Bhatia R.L., The Executive Track: An Action Plan for Self Development Wheeler Publishing, New Delhi

2. Charavathy. S.K, "Human Values for Manager", McGraw Hill/Henely Management Series

REFERENCES

1. Jeffr Davison, Managing Stress, Prentice Hall of India, New Delhi

2. Jerrold S Greenberg, Comprehensive Stress Management, Jain Books, 2009

B. TECH VII SEMESTER	OEC	L	T	P	C
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20AD7T11 NATURAL LANGUAGE PROCESSING (OPEN ELECTIVE –IV)

Pre-requisite: Nil

Course Educational Objective: The Objective of the course is to make learn the basic elements of C programming, control structures, derived data types, Modular programming, user defined structures, basics of files and its I/O operations.

Course Outcomes: At the end of this course, the student will be able to

CO1: Familiar with the basic components of NLP.

CO2: Applying N-gram models to predict a sequence of text.

CO3: Build a basic language understanding system using preliminary concepts of NLTK library.

CO4: Exposure on advanced techniques for understanding patterns in text

CO5: Understand the semantics of linguistic components in a natural dialogue

Syllabus

UNIT – I:

Introduction

Knowledge in Speech and Language Processing; Ambiguity; Models and Algorithms; Language, Thought and Understanding; History Regular Expressions Regular Expression; Words; Corpora; Text Normalization; Minimum Edit Distance

UNIT – II

N-gram Language Models

N-Grams; Evaluating Language Models, Generalization and Zeros, Smoothing: Laplace Smoothing; Add-k Smoothing; Backoff and Interpolation; Kneser-Ney Smoothing

UNIT – III

Natural language processing tools in Python (NLTK Package)

Part-I: Introduction to NLTK; Tokenizing; Filtering Stop words; Stemming; Tagging parts of speech; Lemmatizing; Chunking; Chinking

Part-II: Using Named Entity Recognition (NER); Getting Text to Analyze; Using a Concordance; Making a Dispersion Plot;

UNIT – IV

Information Extraction:

Relation Extraction Algorithms; Using Patterns to extract relations; Relation extraction via supervised learning; Semi supervised relation extraction via

bootstrapping; Distant Supervision for Relation Extraction; Evaluation of Relation Extraction; Extracting Times; Extracting Events and their Times; Template Filling

UNIT – V

Word Senses and WordNet

• Defining Word Senses; How many senses do words have?

• Relations between senses

WordNet: Sense relations in WordNet; Word Sense Disambiguation; Alternate WSD algorithms and Tasks

Text Books:

1. Daniel Jurafsky, James H. Martin ,"Speech and Language Processing" , Third Edition, PHI, 2020.
2. https://realpython.com/nltk-nlp-python/#getting-text-to-analyze

Reference Books:

1. Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, 2011
2. Applied Text Analysis with Python: Enabling Language-Aware Data Products with Machine Learning, Benjamin Bengfort, Rebecca Bilbro, 2018
3. Speech and Language Processing, 2nd Edition, Daniel Jurafsky, James H. Martin, 2009

B. TECH VII SEMESTER	OEC	L	T	P	C
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20AM7T11 **DEEP LEARNING**
(OPEN ELECTIVE –IV)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains understanding basics of deep neural networks, CNN architectures of deep neural networks, concepts of Artificial Neural Networks, basics of Data science in Deep learning, applications of deep learning in AI and Data Science

Course Outcomes: At the end of the course, student will be able to

CO1: Explain the basics in deep neural networks

CO2: Apply Convolution Neural Network for image processing

CO3: Explain the basics of Artificial Intelligence using deep learning

CO4: Apply deep learning algorithms for data science

CO5: Apply deep learning algorithms for variety applications

SYLLABUS

Unit-1:

DEEP NETWORKS BASICS

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization – Machine Learning Basics: Capacity – Over fitting and under fitting – Hyper parameters and validation sets -- Estimators -- Bias and variance -- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization -- Optimization .

Unit-2:

CONVOLUTIONAL NEURAL NETWORKS

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.

Unit-3:

DEEP LEARNING ALGORITHMS FOR AI

Artificial Neural Networks – Linear Associative Networks – Perceptrons -The Back propagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Auto encoders - Deep Backprop Networks- Auto encoders

Unit-4:

DATA SCIENCE AND DEEP LEARNING

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

Unit-5:

APPLICATIONS OF DEEP LEARNING

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion -NLP tasks - dimensionality estimation - time series forecasting - building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016

2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019

3. Vance, William, Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science (Hardcover - 2020), Joiningthedotstv Limited

4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022

5. Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018.

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20CEMN01 BUILDING MATERIALS AND CONSTRUCTION

(Minor Engineering Course)

Course Objectives:

- To learn about the nature, properties, classification and manufacturing process of building materials and familiarize with various methods of masonry construction.
- To understand the knowledge of building components, finishings.

Course Outcomes: Upon the successful completion of the course, the student should be able to

CO1: identify different building materials and their importance in building construction.

CO2: differentiate brick masonry, stone masonry

CO3: construction and use of lime and cement in various constructions.

CO4: learnt the importance of building components and finishings.

CO5: know the classification of aggregates, sieve analysis and moisture content.

SYLLABUS

UNIT-I: Stones, Bricks and Masonry Stones and Bricks

Properties of building stones, Relation to their structural requirements; Classification of stones, Stone quarrying, Precautions in blasting; Dressing of stone; Composition of good brick earth, various methods of manufacture of bricks; Comparison between clamp burning and kiln burning; Qualities of a good brick.

Masonry: Types of Masonry, Rubble and Ashlar masonry; English Bond, Flemish Bond and Rat Trap Bond; Cavity walls and Partition walls.

UNIT-II: Wood, Lime and Cement

Wood: Classification of various types of wood used in buildings, Structure of wood, Properties - Seasoning and Defects in timber.

Lime and Cement: Various ingredients of lime, Constituents of lime, Classification of lime.

Cement: composition, cement manufacturing process, various types of cements, their properties and uses; Various field and laboratory tests for Cement.

UNIT-III: Aggregates

Classification of aggregate, Coarse and Fine aggregates; Particle shape and Texture, Bond and Strength of Aggregate; Specific gravity; Bulk density

Porosity and Absorption, Moisture content of Aggregate– Bulking of sand.

UNIT-IV: Building Components

Lintels, Arches, Vaults, Types of Stair cases; Different types of floors - Concrete, Mosaic and Terrazzo floors. Pitched, Flat and curved Roofs, Lean-to-Roof; Coupled roofs, Trussed roofs- King and Queen Post Trusses, RCC flat and Shell roofs.

UNIT-V: Finishings

Damp proofing and Water proofing- materials used; Plastering, Pointing, Whitewashing and Distempering; Painting – Constituents of paints – Types of paints; Painting of new/ old Wood Surface – Varnish – Form work and scaffolding.

Text Books:

1. Building Materials, S K Duggal, third Edition – New Age International Publishers.
2. Building Construction, B.C.Punmia, Ashok Kumar Jain and Arun KumarJain, third Edition – Laxmi Publications (P) ltd., New Delhi.

Reference Books:

1. Construction Technology, R. Chudly – Volumes I and II 2nd Edition, Longman,UK, 1987.
2. Engineering Materials, S. C. Rangwala, Fourth Edition, Charotar Publications.
3. Building Construction, P. C. Varghese, Second Edition, Prentice – Hall of India private Ltd,New Delhi.
4. The Text Book of Building Construction, S. P. Arora and S.P.Bindra, Dhanapati Rai, second Edition Publishers.
5. SP-7:2016 National Building Code of India 2016 (NBC 2016).

		L T P C
B.TECH MINOR	**MN**	**4 0 0 4**

20CEMN02 CONCRETE TECHNOLOGY

(Minor Engineering Course)

Course Objectives: Lot of advantages are taking place in the concrete technology as par with development taking place in the engineering. The present day industry needs the knowledge of concrete technology thoroughly. The subject is designed to give the basic knowledge as well as latest developments in concrete technology.

Course Outcomes: After the completion of the course student should be able to

CO1: Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.

CO2: Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties

CO3: Use advanced laboratory techniques to characterize cement-based materials.

CO4: Perform mix design

CO5: know engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete.

SYLLABUS

UNIT-I:

CEMENT: Portland cement – chemical composition – Types of Cements– Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

UNIT-II:

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity- Bulk density, porosity, adsorption & moisture content of aggregate.

Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT–III:

FRESH CONCRETE: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT-IV:

HARDENED CONCRETE: Water / Cement ratio – Abram's Law – Gelspaoe ratio -Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests – Tension tests- Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT

ELASTICITY, CREEP &SHRINKAGE: Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep –Effects of creep – Shrinkage – types of shrinkage.

UNIT–V:

MIX DESIGN: Factors in the choice of mix proportions – Durability of concrete- Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

SPECIAL CONCRETES: Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

Text Books:

1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition
2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004

Reference Books:

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.
2. Concrete Technology by A. R. Santha Kumar, Oxford university Press, New Delhi
3. Concrete: Micro structure, Properties and Materials – P. K. Mehta and J.M. Monteiro, Mc-Graw Hill Publishers

B.TECH MINOR	**MN**	**L T P C**
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20CEMN03 SURVEYING

(Minor Engineering Course)

Course Objectives: The first step in engineering practice is surveying and the soundness of the any civil engineering work is dependent on the reliability and accuracy of the surveying.

There ore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

Course Outcomes: after the completion of the course student should be able to

CO1: Gain a broad understanding of Land Survey

CO2: Get accustoms with the angular and linear measurements.

CO3: Trained with recording the field information and necessary plot

CO4: Contemporary issues and developments.

SYLLABUS

UNIT-I: Introduction and Basic Concepts

Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip.

UNIT-II: Leveling and Contouring

Leveling- Basics definitions, types of levels and leveling staves, temporary adjustments, methods of leveling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Plane Table Surveying: Introduction of Plane table surveying- Area by the method of radiation and intersection – Two point problem

UNIT-III: Theodolite Surveying

Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.

Traversing

Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT-IV: Tacheometric Surveying

Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves

Types of curves and their necessity, elements of simple curve, setting out of simple Curves, Introduction to compound curves.

UNIT-V: Modern Surveying Methods

Total Station and Global Positioning System. : Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working, E.D.M. method and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

Text Books:

1. Chandra A M, "Plane Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
2. Duggal S K, "Surveying (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co.Ltd. New Delhi, 2004.

Reference Books:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying,
   McGraw Hill – 2000
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004

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B.TECH MINOR	**MN**				
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20CEMN04 TRAFFIC ENGINEERING
(Minor Engineering Course)

Course Objectives:

To provide engineering techniques to achiev the safe and efficient movement of people and goods on roadways.

Course Outcomes: At the end of the course the student will be able to

- **CO1:** Know the Traffic Volume, Speed and Density.
- **CO2:** Gain Knowledge on Parking Studies
- **CO3:** Know the concept of Traffic Capacity
- **CO4:** Design Traffic Signals
- **CO5:** Get knowledge on Transportation Management.

SYLLABUS

UNIT-I:

Traffic Studies (Part- I) : Basic principles of Traffic, Volume, Speed and Density; Definitions and their interrelationships; Traffic Volume studies - Objectives, Methods of Volume counts, Presentation of Volume Data; Speed studies- Types of Speeds, Objectives, Methods of speed studies, Statistical Methods for speed data Analysis, Presentation of speed data. Delay Studies; Head ways and Gap Studies - Headway and Gap acceptance, Origin and Destination Studies.

UNIT-II:

Traffic Studies (Part-II) : Parking Studies: parameters of parking, definitions, Parking inventory study, Parking survey by Patrolling method; Analysis of Parking Survey data; Accident studies- Causative factors of Road accidents, Accident data collection: Accident analysis and modeling;, Road Safety Auditing, Measures to increase Road safety.

UNIT-III:

Capacity and LOS Analysis: Introduction to Traffic capacity, Analysis concepts, Level of Service, Basic definitions, Factors affecting Capacity and LOS, Capacity of Urban/Rural Highway, With or without access control, Basic freeway segments - Service flow rate of LOS, Lane width or Lateral clearance adjustment; Heavy vehicle adjustment; Driver population adjustment.

UNIT-IV:

Signal Designing – Fixed Time signals, Determination of Optimum Cycle length and Signal setting for Fixed Time signals, Warrants for Signals, Time Plan Design for Pre-Timed Control- Lane group analysis, Saturation flow rate, and Adjustment factors, Uniform and Incremental Delay, Vehicle Actuated Signals, Signal Coordination.

UNIT-V:

Transportation System Management - Measures for Improving vehicular flow – one way Streets, Signal Improvement, Transit Stop Relocation, Parking Management, Reversible lanes- Reducing Peak Period Traffic - Strategies for working hours, Congestion Pricing, Differential Toll Policies.

Text Books:

1. Traffic Engineering: Theory and Practice, Pignataro LJ., Prentice hall, Inc
2. Traffic and Transport planning, Kadiyali L.R., Khanna Publishers

Reference Books:

1. Traffic Engineering Hand Book, Institute of Transportation Engineers, 4 Ed.,Prentice Hall
2. Traffic Engineering, Mc Shane, WR and RP Roess, Prentice Hall
3. Highway Traffic analysis and design, Salter RJ and NB Hounsell, 3rd ed., Macmillan
4. Traffic Planning and Engineering, Hobbs FD., Pergamon press
5. Traffic flow fundamentals, May, A.D., Prentice Hall.

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COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE

B. TECH I SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CS1T01	BSC	Linear Algebra and Differential Equations	3	-	-	3	3
2	20CS1T02	BSC	Applied Chemistry	3	-	-	3	3
3	20CS1T03	HSMC	English	3	-	-	3	3
4	20CS1L04	ESC	Computer Engineering Workshop	1	-	4	3	3
5	20CS1T05	ESC	Problem Solving through C	3	-	-	3	3
6	20CS1L06	HSMC	English Communication Skills Lab	-	-	3	3	1.5
7	20CS1L07	BSC	Applied Chemistry Lab	-	-	3	3	1.5
8	20CS1L08	ESC	Problem Solving through C Lab	-	-	3	3	1.5
9	20CS1M09	MC	Environmental Science	2	-	-	2	-
							Total Credits	**19.5**

B. TECH II SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CS2T01	BSC	Transform Techniques	3	-	-	3	3
2	20CS2T02	BSC	Applied Physics	3	-	-	3	3
3	20CS2T03	ESC	Digital Logic Design	3	-	-	3	3
4	20CS2T04	ESC	Data Structures	3	-	-	3	3
5	20CS2T05	ESC	Python Programming	3	-	-	3	3
6	20CS2L06	BSC	Applied Physics Lab	-	-	3	3	1.5
7	20CS2L07	ESC	Data Structures Lab	-	-	3	3	1.5
8	20CS2L08	ESC	Python Programming Lab	-	-	3	3	1.5
							Total Credits	**19.5**

B. TECH III SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CS3T01	BSC	Numerical Methods and Vector Calculus	3	0	0	3	3
2	20CS3T02	PCC	Object Oriented Programming through Java	3	0	0	3	3
3	20CS3T03	PCC	Data Base Management Systems	3	0	0	3	3
4	20CS3T04	PCC	Software Engineering	3	0	0	3	3
5	20CS3T05	PCC	Computer Organization	3	0	0	3	3
6	20CS3L06	PCC	Object Oriented Programming through Java Lab	0	0	3	3	1.5
7	20CS3L07	PCC	Data Base Management Systems Lab	0	0	3	3	1.5
8	20CS3L08	PCC	Software Engineering Lab	0	0	3	3	1.5
9	20CS3S09	SC	Python NumPy & Pandas	0	0	4	4	2
11	20CS3M10	MC	Constitution of India	2	0	0	2	-
Total number of credits								**21.5**

B. TECH IV SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CS4T01	BSC	Probability and Statistics	3	0	0	3	3
2	20CS4T02	ESC	Discrete Mathematical Structures	3	0	0	3	3
3	20CS4T03	PCC	Operating Systems	3	0	0	3	3
4	20CS4T04	PCC	Advanced Data Structures	3	0	0	3	3
5	20CS4T05	HSMC	Managerial Economics and Financial Analysis	3	0	0	3	3
7	20CS4L06	ESC	R Programming Lab	0	0	3	3	1.5
6	20CS4L07	PCC	Operating Systems Lab	0	0	3	3	1.5
8	20CS4L08	PCC	Advanced Data Structures Lab	0	0	3	3	1.5
9	20CS4S09	SC	Basic Web Programming	0	0	4	4	2
Total number of credits								**21.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH V SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CS5T01	PCC	Formal Languages & Automata Theory	3	0	0	3	3
2	20CS5T02	PCC	Data Warehousing & Data Mining	3	0	0	3	3
3	20CS5T03	PCC	Design and Analysis of Algorithms	3	0	0	3	3
Professional Elective-I				3	0	0	3	3
4	20CS5T04	PEC-I	Object Oriented Analysis and Design					
5	20CS5T05		Advanced Computer Architecture					
6	20CS5T06		Artificial Intelligence					
7	**Open Elective-I**			3	0	0	3	3
8	20CS5L10	PCC	Data Warehousing and Mining Lab Through Python	0	0	3	3	1.5
9	20CS5L11	PCC	Design and Analysis of Algorithms Lab	0	0	3	3	1.5
10	20CS5S12	SC	Mobile Application Development	0	0	4	4	2
11	20CS5M13	MC	Disaster Management	2	0	0	2	-
12	20CS5I14	I	Summer Internship	0	0	3	1.5	1.5
Total number of credits								**21.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VI SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CS6T01	PCC	Machine Learning	3	0	0	3	3
2	20CS6T02	PCC	Computer Networks	3	0	0	3	3
3	20CS6T03	PCC	Big Data Analytics	3	0	0	3	3
Professional Elective-II				3	0	0	3	3
4	20CS6T04	PEC-II	Software Testing Methodologies					
5	20CS6T05		Mean Stack Technologies					
6	20CS6T06		Compiler Design					
7	**Open Elective-II**			3	0	0	3	3
8	20CS6L10	PCC	Machine Learning Lab	0	0	3	3	1.5
9	20CS6L11	PCC	Computer Networks Lab	0	0	3	3	1.5
10	20CS6L12	PCC	Big Data Analytics Lab	0	0	3	3	1.5
11	20CS6S13	SC	Soft Skills	0	0	4	4	2
12	20CS6M14	MC	Essence of Indian traditional knowledge	2	0	0	2	-
13	20CS6P15	P	Community Service Project	-	-	-	-	4
Total number of credits								**25.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
Professional Elective-III				3	0	0	3	3
1	20CS7T01	PEC-III	Software Project Management					
2	20CS7T02		Cloud Computing					
3	20CS7T03		Cryptography & Network Security					
Professional Elective-IV				3	0	0	3	3
4	20CS7T04	PEC-IV	Human Computer Interaction					
5	20CS7T05		Mobile Computing					
6	20CS7T06		High-Performance Computing					
Professional Elective-V				3	0	0	3	3
7	20CS7T07	PEC-V	Software Architecture and Design Patterns					
8	20CS7T08		Adhoc & Sensor Networks					
9	20CS7T09		Social Network Analysis					
10	**Open Elective-III**			3	0	0	3	3
11	**Open Elective-IV**			3	0	0	3	3
8	20CS5L16	HSMC	Universal Human Values 2: Understanding Harmony	0	0	3	3	3
10	20CS5S17	SC	Data Visualization using Tableau	0	0	4	4	2
11	20CS5I18	I	Industrial Internship	-	-	-	-	3
Total number of credits								**23**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VIII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
2	20CS8P01	P	Project	0	0	24	24	8
Total number of credits								**8**

OPEN ELECTIVE –I:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE5T04	Architecture and Town Planning	3	0	0	3	CE
2	20CE5T05	Elements of Civil Engineering	3	0	0	3	CE
3	20EE5T04	Basics of Control Systems	3	0	0	3	EEE
4	20EE5T05	Special Electrical Machines	3	0	0	3	EEE
5	20ME5T04	Design Thinking & Product Innovation	3	0	0	3	ME
6	20ME5T05	Nanotechnology	3	0	0	3	ME
7	20EC5T04	Linear System Analysis	3	0	0	3	ECE
8	20EC5T05	Digital Logic Design	3	0	0	3	ECE
9	20EC5T06	Solid State Devices	3	0	0	3	ECE
10	20CS5T07	Introduction to Artificial Intelligence	3	0	0	3	CSE
11	20CS5T08	Operating System	3	0	0	3	CSE
12	20CS5T09	Software Engineering	3	0	0	3	CSE
13	20IT5T07	Computer Networks	3	0	0	3	IT
14	20IT5T08	Computer Graphics	3	0	0	3	IT
15	20HS5T02	Operations Research	3	0	0	3	BED
16	20MB5T01	Principles of Management	3	0	0	3	DMS
17	20MB5T02	Technology Management	3	0	0	3	DMS
18	20AD5T07	Foundations of Data Science	3	0	0	3	AIDS
19	20AM5T07	Introduction to Machine Learning	3	0	0	3	AIML

OPEN ELECTIVE –II:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE6T05	Remote Sensing and GIS	3	0	0	3	CE
2	20CE6T06	Environmental Impact Assessment	3	0	0	3	CE
3	20EE6T08	Renewable Energy Sources	3	0	0	3	EEE
4	20EE6T09	Energy Auditing Conservation and Management	3	0	0	3	EEE
5	20ME6T07	Industrial Robotics	3	0	0	3	ME
6	20ME6T08	Additive manufacturing	3	0	0	3	ME
7	20EC6T07	Electronic Circuits and Networks	3	0	0	3	ECE

8	20EC6T08	Principles of Communications	3	0	0	3	ECE
9	20EC6T09	Microcontrollers & its Applications	3	0	0	3	ECE
10	20CS6T07	Introduction to Machine Learning	3	0	0	3	CSE
11	20CS6T08	Information Security	3	0	0	3	CSE
12	20CS6T09	Agile Technologies	3	0	0	3	CSE
13	20IT6T07	Fundamentals of Machine Learning	3	0	0	3	IT
14	20IT6T08	Database Management Systems	3	0	0	3	IT
15	20HS6T02	Quantitative Aptitude and Reasoning	3	0	0	3	BED
16	20MB6T01	Organizational Behaviour	3	0	0	3	DMS
17	20MB6T02	Project Management	3	0	0	3	DMS
18	20AD6T07	Visual Analytics	3	0	0	3	AIDS
19	20AM6T07	Big data Analytics	3	0	0	3	AIML

OPEN ELECTIVE –III:

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CE7T04	Construction Technology and Management	3	0	0	3	CE
2	20CE7T05	Green Buildings	3	0	0	3	CE
3	20EE7T13	Concept of Power System Engineering	3	0	0	3	EEE
4	20EE7T14	Instrumentation	3	0	0	3	EEE
5	20ME7T10	Green Engineering Systems	3	0	0	3	ME
6	20ME7T11	Hybrid Electric Vehicles	3	0	0	3	ME
7	20EC7T10	Data Communications	3	0	0	3	ECE
8	20EC7T11	Mechatronics	3	0	0	3	ECE
9	20EC7T12	Bio Medical Instrumentation	3	0	0	3	ECE
10	20CS7T10	Artificial Neural Networks	3	0	0	3	CSE
11	20CS7T11	Cyber Security	3	0	0	3	CSE
12	20CS7T12	Software Testing Methodologies	3	0	0	3	CSE
13	20IT7T10	Internet of Things	3	0	0	3	IT
14	20IT7T11	Computer Vision	3	0	0	3	IT
15	20HS7T01	Fuzzy sets	3	0	0	3	BED
16	20MB7T01	Digital Media management	3	0	0	3	DMS

17	20MB7T02	Entrepreneurship Development	3	0	0	3	DMS
18	20AD7T10	Data Analysis and Visualization with Python	3	0	0	3	AIDS
19	20AM7T10	NOSQL Databases	3	0	0	3	AIML

OPEN ELECTIVE –IV:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE7T06	Waste water treatment	3	0	0	3	CE
2	20CE7T07	Repair and Rehabilitation of Concrete Structures	3	0	0	3	CE
3	20EE7T15	Power Quality	3	0	0	3	EEE
4	20EE7T16	Electric Vehicles	3	0	0	3	EEE
5	20ME7T12	Micro-Electro- Mechanical Systems	3	0	0	3	ME
6	20ME7T13	Solar Energy Systems	3	0	0	3	ME
7	20EC7T13	Introduction to Embedded Systems	3	0	0	3	ECE
8	20EC7T14	Internet of Things	3	0	0	3	ECE
9	20EC7T15	Analog and Digital IC applications	3	0	0	3	ECE
10	20CS7T13	Data Analytics	3	0	0	3	CSE
11	20CS7T14	Block Chain Technology	3	0	0	3	CSE
12	20CS7T15	Software Project Management	3	0	0	3	CSE
13	20IT7T13	Cloud Computing	3	0	0	3	IT
14	20IT7T14	Business Intelligence	3	0	0	3	IT
15	20HS7T02	Polymer Chemistry	3	0	0	3	BED
16	20MB7T03	Total Engineering Quality Management	3	0	0	3	DMS
17	20MB7T04	Stress Management	3	0	0	3	DMS
18	20AD7T11	Natural Language Processing	3	0	0	3	AIDS
19	20AM7T11	Deep Learning	3	0	0	3	AIML

HONORS/MINOR COURSES OFFERED BY THE DEPARTMENT

Honors/ Minor Course Fulfillments:

- The 20 additional credits need to be acquired, 16 credits can be earned by undergoing specified courses, with each carrying 4 credits.
- The remaining 4 credits must be acquired through two online MOOCs (SWAYAM /NPTEL), which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of Studies.
- Minor Engineering subjects are offered to other branches by CSE Department (except for CSE Students).
- Honors engineering subjects are offered to CSE Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (SWAYAM/NPTEL).

HONORS COURSES

S.No.	Course code	Course Name	L	T	P	C
1	20CSHN01	Unix and Shell Programming	3	1	0	4
2	20CSHN02	NOSQL databases	3	1	0	4
3	20CSHN03	Artificial Neural Networks	3	1	0	4
4	20CSHN04	Cyber Security	3	1	0	4
5	20CSHN05	MOOC-1	-	-	-	2
6	20CSHN06	MOOC-2	-	-	-	2

***MOOC Courses shall be identified by the departmental committee.**

MINOR COURSES

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CSMN01	Database Management Systems	3	1	0	4	CSE
2	20CSMN02	Software Engineering	3	1	0	4	CSE
3	20CSMN03	Data Mining	3	1	0	4	CSE
4	20CSMN04	Artificial Intelligence	3	1	0	4	CSE
5	20CSMN05	MOOC-1	-	-	-	2	CSE
6	20CSMN06	MOOC-2	-	-	-	2	CSE

***MOOC Courses shall be identified by the departmental committee.**

B.TECH I SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CS1T01 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

Pre-requisite: Basic knowledge about matrices, differentiation and integration

Course Objective: Objective of the course is to impart

- Basic understanding of mathematical methods to solve simultaneous linear systems
- Understanding of formation and solutions of ordinary differential equations
- Knowing the mathematical methods to solve applications of differential equations

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the knowledge to solve a system of homogeneous and non homogeneous linear equations

CO2: Illustrate the methods of computing eigen values and eigen vectors

CO3: Able to analyze the real life situations, formulate the differential equations and then applying the methods

CO4: Determine the solutions of linear differential equations

CO5: Optimize functions of several variables and able to find extreme values of constrained functions

SYLLABUS

UNIT-I: Linear systems of equations:

Rank of a matrix, Echelon form, Normal form, PAQ is in normal form, linear dependence and independence of vectors, Consistency of linear system of equations, System of linear homogeneous equations, Gauss-elimination and Gauss -Jordan methods.

UNIT-II: Eigen values & Eigen vectors:

Eigen values, Eigen vectors, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), finding inverse and powers of a matrix using C-H theorem, Reduction to diagonal form, reduction of quadratic form to canonical form using orthogonal reduction, nature of quadratic forms.

UNIT-III: Ordinary Differential Equations of first order:

Linear equations, Bernoulli's equation, Exact differential equations. Equations reducible

to exact equations, **Applications:** Orthogonal Trajectories, Newton's Law of cooling, Rate of decay & growth, R-L series circuits.

UNIT-IV: Linear Differential Equations higher order:

Definitions, Complete solution (without proof), Operator D, Rules to find complementary function, Inverse operator, Rules to find the particular integral(nonhomogeneous term of the form e^{ax} , sin(ax+b), cos(ax+b), polynomials in x^m, e^{ax} V(x), any other function), Method of variation of parameters.

UNIT-V: Partial Differentiation:

Functions of two variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Jacobian and functional dependence, Taylor's theorem for functions of two variables. **Applications:** Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL**,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH I SEMESTER	BSC	L	T	P	C
		3	0	0	3

20CS1T02 APPLIED CHEMISTRY

Pre-requisite: Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the availableresources

Course Objective: Objective of the course is to impart

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of green chemistry and molecular switches

Course Outcomes: At the end of the course, student will be able to

CO1: Analyze the different types of composite plastic materials and interpret the mechanism ofconduction in conducting polymers.

CO2: Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning newengineering products and categorize the reasons for corrosion and study methods to control corrosion.

CO3: Synthesize nanomaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystalsand superconductors.

CO4: Design models for energy by different natural sources.
Analyze the principles of different analytical instruments and their applications.

CO5: Obtain the knowledge of green chemistry and molecular machines

SYLLABUS

UNIT-I: Polymer Technology

Polymerisation: Introduction, methods of polymerization (addition and Condensation), Physical and mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers: Natural rubber-Drawbacks-vulcanization, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics – GFRP and Aramid FRP

Conducting polymers: Intrinsic and extrinsic conducting polymers

Biodegradable polymers: preparation and applications

UNIT-II: Electrochemical Cells And Corrosion

Part I: ELECTROCHEMICAL CELLS: Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode,calomel electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Part II: Corrosion: Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings (cathodic coatings, anodic coatings, electroplating and electroless plating)

UNIT-III: Material Chemistry

Part I: Non-elemental semiconducting materials: Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling technique) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Super conductors:-Type –I, Type II-characteristics and applications

Part II: Nano materials: Introduction, sol-gel method, characterization by (Brunauer Emmet Teller[BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]),applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals: Introduction-types-applications.

UNIT-IV: Non-Conventional Energy Sources & Spectroscopy

Part I: NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Part II: **SPECTROSCOPY**

UV spectroscopy- Basic principle-Instrumentation-Applications

IR spectroscopy- Basic principle-Instrumentation-Applications

NMR spectroscopy- Basic principle-Instrumentation-Applications

UNIT-V: Advanced Concepts/Topics In Chemistry

Part-I: Green chemistry: Introduction, Principles of green chemistry, Green synthesis-Aquaeous Phase method-Microwave method-Phase transfer catalysis method, R4M4 principles (Econoburette).

PART-II: Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid- base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor.

Text Books:

1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi,(Latest edition).
2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi,(2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

References:

1. K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited,(2009).
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology",University press (latest edition)

		L	T	P	C
B.TECH I SEMESTER	**HSMC**	**3**	**0**	**0**	**3**

20CS1T03 ENGLISH

Pre-requisite:

Course Objective:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: At the end of the course, student will be able to

CO1	understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
CO2	ask and answer general questions on familiar topics
CO3	employ suitable strategies to master the art of letter writing and email writing
CO4	recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
CO5	form sentences using proper grammatical structures and correct word forms

SYLLABUS

UNIT-I	A Drawer full of happiness (Detailed Study) Deliverance (Non-detailed Study)
UNIT-II	Nehru's letter to his daughter Indira on her birthday(Detailed Study) Bosom Friend (Non-detailed Study)
UNIT-III	Stephen Hawking-Positivity 'Benchmark' (Detailed Study) Shakespeare's Sister(Non-detailed Study)
UNIT-IV	Liking a Tree, Unbowed: Wangari Maathai-biography (Detailed Study)

Telephone Conversation(Non-detailed Study)

UNIT-V Stay Hungry-Stay foolish (Detailed Study)
Still I Rise(Non-detailed Study)

Text Books

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The Individual Society", Pearson Publications.(Non-detailed)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

B.TECH I SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		1	**0**	**4**	**3**

20CS1L04 COMPUTER ENGIENERING WORKSHOP

Course Objectives:

Skills and knowledge provided by this subject are the following:

- **PC Hardware:** Identification of basic peripherals, Assembling a PC, Installation of system software like MS Windows, device drivers, etc. Troubleshooting of PC Hardware and Software issues.
- **Internet & World Wide Web:** Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber attacks.
- **Productivity Tools:** Understanding and practical approach of professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite office tools.

Course Outcomes:

CO1: Identify, assemble and update the components of a computer

CO2: Configure, evaluate and select hardware platforms for the implementation and execution of computer applications, services and systems

CO3: Make use of tools for converting pdf to word and vice versa

CO4: Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, HTML, LaTex

LIST OF EXERCISES

Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.

Task 2: Practicing disassembling and assembling components of a PC

Task 3: Installation of Device Drivers, MS Windows, Linux Operating systems and Disk Partitioning, dual boating with Windows and Linux.

Task 4: Introduction to Memory and Storage Devices, I/O Port, Assemblers, Compilers, Interpreters, Linkers and Loaders.

Task 5: Demonstration of Hardware and Software Troubleshooting

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DSL, and Dialup Connection.

Task 7: Surfing the Web using Web Browsers, Awareness of various threats on the Internet and its solutions, Search engines and usage of various search engines, Need of anti-virus, Installation of anti-virus, configuring personal firewall and windows update.

(Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and popup blockers)

Productivity Tools:

Task 8: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Task 9: Demonstration and Practice of various features of Microsoft Word

Assignment:

1. Create a project certificate.

2. Creating a news letter

Features to be covered:-Formatting Fonts, Paragraphs, Text effects, Spacing, Borders and Colors, Header and Footer, Date and Time option, tables, Images, Bullets and Numbering, Table of Content, Newspaper columns, Drawing toolbar and Word Art and Mail Merge in word etc.,

Task 10: Demonstration and Practice of various features Microsoft Excel

Assignment: 1. Creating a scheduler

2. Calculating GPA

3. Calculating Total, average of marks in various subjects and ranks of students

based on marks

Features to be covered:Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel, Charts, Renaming and Inserting worksheets, etc.,

Task 11: Demonstration and Practice of various features Microsoft Power Point

Features to be covered:Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks Tables and Charts, Master Layouts, Types of views, Inserting – Background, textures, Design Templates, etc.,

Task 12: Demonstration and Practice of various features LaTeX – document preparation, presentation (Features covered in Task 9 and Task 11 need to be explored in LaTex)

Task 13: Tools for converting word to pdf and pdf to word

Task 14: Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Reference Books:

1. Computer Fundamentals, Anita Goel, Pearson India Education, 2017

2. PC Hardware Trouble Shooting Made Easy, TMH

3. Introduction to Information Technology, ITL Education Solutions Limited, 2nd Edition, Pearson, 2020

4. Upgrading and Repairing PCs, 18th Edition, Scott Mueller, QUE, Pearson, 2008

5. LaTeX Companion – Leslie Lamport, PHI/Pearson

6. Introducing HTML5, Bruce Lawson, Remy Sharp, 2nd Edition, Pearson, 2012

7. Teach yourself HTML in 24 hours, By Techmedia

8. HTML 5 and CSS 3.0 to the Real World by Alexis Goldstein, Sitepoint publication.

9. Internet of Things, Technologies, Applications, Challenges and Solutions, B K Tripathy, J Anuradha, CRC Press

10. Comdex Information Technology Course Tool Kit, Vikas Gupta, Wiley Dreamtech.

11. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme, CISCO Press, Pearson Education.

12. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N. B. Venkateswarlu, S. Chand Publishers

		L	T	P	C
B.TECH I SEMESTER	**ESC**	**3**	**0**	**0**	**3**

20CS1T05 PROBLEM SOLVING THROUGH C

Pre-requisite:

Course Objective:

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor. To assimilate about File I/O and significance of functions

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of programming

CO2: Understand and Apply loop construct for a given problem

CO3: Demonstrate the use pointers

CO4: Understand the use of functions and develop modular reusable code

CO5: Understand File I/O operations

SYLLABUS

UNIT-I:

INTRODUCTION TO COMPUTERS: Functional Components of computer, computer software, categories of memory, types of programming languages, Development of algorithms, flow charts, software development process, Computer Numbering system

BASICS OF C PROGRAMMING: Introduction to programming paradigms, Structure of C program, Data Types, C Tokens, Operators: Precedence and Associativity, Expressions Input/output statements, Assignment statements

UNIT-II:

Decision making statements: if, if else, nester if. Multi way decision making statements: else if, Switch statement. **Loop statements**: while, do while, for, Compilation process.

UNIT-III:

Introduction to Arrays: Declaration, Initialization, One dimensional array, Example Programs on one dimensional array, Selection sort, linear and binary search, two

dimensional arrays, Matrix Operations, Multi-dimensional Arrays

Strings: Declaration, String operations: length, compare, concatenate, copy, String handling functions.

UNIT-IV:

FUNCTIONS: Introduction to functions: Function prototype, function definition, function call, Built-in functions, Recursion, Storage classes, Passing Arrays & Strings to the functions, Preprocessor directives

POINTERS: Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers, Parameter passing: Pass by value, Pass by reference, Dynamic Memory Allocation

UNIT-V:

STRUCTURES AND UNIONS: Structure, Nested structures, Pointer and Structures, Array of structures, Example Program using structures and pointers, Self-referential structures, Unions.

FILE PROCESSING: Files, Types of file processing: Sequential access, Random access, Sequential access file, Random access file, Command line arguments

Text Books:

1. Krnighan. B.W and Ritche, D.M, “The C Programming Language”, Second Edition, Pearson Education, 2006

2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.

References:

1. Pradepdey, Manas Ghosh, “Fundamentals of Computing and programming in C”, First Edition, Oxford University Press, 2009.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh Edition, Pearson Publication.
3. E Balagursamy, “Programming in C, Sixth Edition, Tata McGraw Hill.
4. Ajay Mittal, “Programming in C A practical Approach”, Pearson education

		L	T	P	C
B.TECH I SEMESTER	**HSMC**	**0**	**0**	**3**	**1.5**

20CS1L06 ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

- Facilitate effective usage of functional English through role plays
- Focus on vocabulary enhancement
- Foster various nuances of phonetics and accent neutralization

Course Outcomes: At the end of the course, student will be able to

CO1: Acquire basic proficiency in English by learning functional aspects of English language

CO2: Learn the methods of enhancing vocabulary

CO3: Acquaint himself/herself with nuances of Phonetics

LIST OF EXPERIMENTS

1	Greetings and Introductions
2	Requesting Permission & Giving Directions
3	Inviting/Complaining/Congratulating
4	Root Words
5	Phonetics-Sounds and Symbols
6	Pronunciation Rules

References:

1. Strengthen Your Steps, Maruti Publications

2. Interact, Orient Blackswan

3. Word Power Made Easy, Pocket Books

B.TECH I SEMESTER	BSC	L	T	P	C
		0	0	3	1.5

20CS1L07 APPLIED CHEMISTRY LAB

Pre-requisite: Acquire some experimental skills.

Course Objective: Objective of the course is to impart

- The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations.
- A few instrumental methods of chemical analysis.

Course Outcomes:

At the end of the course, student will be able to

CO1: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

LIST OF EXPERIMENTS

1. Determination of HCl using standard Na2CO3 solution.
2. Determination of alkalinity of a sample containing Na2CO3 and NaOH.
3. Determination of Mn+2 using standard oxalic acid solution.
4. Determination of ferrous iron using standard K2Cr2O7 solution.
5. Determination of Cu+2 using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe+3 by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).

12 Determination of Mg^{+2} present in an antacid.

13 Determination of $CaCO_3$ present in an egg shell.

14 Estimation of Vitamin C.

15 Determination of phosphoric content in soft drinks.

16 Adsorption of acetic acid by charcoal.

17 Preparation of nylon-6, 6 and Bakelite (demonstration only).

B.TECH I SEMESTER	ESC	L	T	P	C
		0	0	3	1.5

20CS1L08 PROBLEM SOLVING THROUGH C LAB

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers &functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

- Demonstrate Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.

2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( )function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name
3. Write a program in C to remove a file from the disk.

B.TECH I SEMESTER

	L	T	P	C
MC	2	0	0	--

20CS1M09 ENVIRONMENTAL SCIENCE

Course objective:

To understand the importance of Environment and the importance of biodiversity

Course outcomes:

- The importance of environment, Natural resources and current global environmental challenges for the sustenance of the life on planet earth.
- The concepts of the ecosystem and its function in the environment.
- 3.The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- The various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices.
- The environmental legislations of India and Social issues and the possible means
- Environmental assessment and the stages involved in EIA.

SYLLABUS

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Introduction- Scope of Environmental Studies- Importance of Environmental Studies- Need for public awareness, Environmental ethics- Contemporary Environmentalists- Environmental Global moves: Stockholm conference, Earth summit

Concept of an ecosystem - Structure of an ecosystem- function of an ecosystem- Food chains, food webs- ecological pyramids- Energy flow in the ecosystem- Ecological succession- Nutrient cycling- 1^{o}production& 2^{o}production- Major ecosystems: Forest ecosystem- Grassland ecosystem, Desert ecosystem- Aquatic ecosystem: pond, Lake Ecosystem- Streams, river ecosystem, Oceans

UNIT-II: NATURAL RESOURCES AND CONSERVATION

Introduction and classification of natural resources-Forest resources**:** Use and over-exploitation- Deforestation-Timber extraction-Mining- Conservation-Water resources**:** Use and over utilization of surface and ground water,- Floods, drought, Dams and associated problems- Water conservation, rain water harvesting, water shed management-Energy resources**:** renewable energy sources –solar-wind-hydro-

tidal- Ocean thermal-geo thermal-bio mass-bio gas-bio fuels- Hydrogen.- Non-renewable energy sources-coal-petroleum-natural gas-Nuclear energy

UNIT-III: **BIODIVERSITY AND ITS CONSERVATION**

Definition, classification- Value of biodiversity-Threats to biodiversity: habitat loss, man-wildlife conflicts- Endangered and endemic species of India-Conservation of biodiversity- Biodiversity at national and local levels, Hot-sports of biodiversity

UNIT-IV: ENVIRONMENTAL PROBLEMS

Global warming, Climate change- Acid rain, Ozone depletion- Air pollution- Water pollution- Soil pollution- Noise pollution, Nuclear hazards- Solid Waste Management: Causes, Consequences and Control methods- Solid Waste Management- Population growth and explosion, effects, control measures- Pollution case studies- Role of an individual in prevention of pollution

UNIT-V: ENVIRONMENTALLEGISLATION & MANAGEMENT

Sustainable development- Air (Prevention and Control of Pollution) Act-Drawbacks-Water (Prevention and control of Pollution) Act- Drawbacks- Wildlife Protection Act-Drawbacks- Forest Conservation Act- Drawbacks- Environmental Protection Act-Drawbacks- Environmental Impact Assessment and its significance- Preparation of Environmental Management Plan and Environmental Impact Statement- Ecotourism

TEXT BOOKS:

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age Publications, New Delhi

2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada

3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCES:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Delhi

		L	T	P	C
B.TECH II SEMESTER	**BSC**	**3**	**0**	**0**	**3**

20CS2T01 TRANSFORM TECHNIQUES

Pre-requisite: Linear Algebra and Differential Equations

Course Objective: Objective of the course is to impart

- Learning the techniques of Laplace transforms to solve ordinary differential equations
- knowledge of Fourier series & Fourier transforms for piecewise continuous functions
- knowledge of solving boundary valued problems

Course Outcomes: At the end of the course, student will be able to

CO1: Able to analyze a class of integrals in terms of beta and gamma functions

CO2: Provide the techniques of Laplace transformations and able to solve problems related to digital signal processing

CO3: Analyze the general periodic functions in the form of an infinite convergent sine and cosine series

CO4: Illustrate the methods to solve the boundary value problems

CO5: Determine a solution of a discrete system using Z- transforms

SYLLABUS

UNIT-I: Special functions:

Beta function, Properties & problems, Gamma function, properties & problems, Relation between Beta and Gamma functions, Evaluation of improper integrals.

UNIT-II: Laplace Transforms (all properties without proofs):

Definition, Transforms of elementary functions, properties of Laplace transforms, Transforms of periodic functions, Transforms of derivatives and integrals, Multiplication by t^n, Division by t, Evaluation of improper integrals.
Inverse Laplace transforms–Method of partial fractions, other methods of finding inverse transforms, Convolution theorem (without proof). **Application:** Application to differential equations.

UNIT-III: Fourier Series & Fourier Transforms:

Euler's formulae (without proof), Conditions of Fourier expansion, Functions having points of discontinuity, Change of inerval, Even and odd functions, Half-range series. Fourier Integral theorem (without proof), Fourier cosine & sine integral, complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, properties of Fourier transforms (without proof), Convolution theorem(without proof), finite & infinite Fourier sine & cosine transforms.

UNIT-IV: Partial Differential Equations:

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of Variables, Applications: One-dimensional wave and heat equations, two-dimensional heat equation.

UNIT-V: Z-Transforms: (all properties without proofs)

Introduction, definition, some standard z-transforms, linearity property, damping rule, some standard results, shifting U_n to the right, multiplication by n, initial and final value theorems, Inverse z-transforms, convolution theorem, evaluation of inverse z-transforms by partial fractions, applications to difference equations.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH II SEMESTER **BSC**

L	T	P	C
3	0	0	3

20CS2T02 APPLIED PHYSICS

Pre-requisite: Knowledge of basic concepts of waves, Optics, Electricity and Magnetism

Course Objective: Objective of the course is to impart

- ***Knowledge*** of fundamentals of Physics which helps them in the study of advanced topics of Engineering.
- ***Develop*** analytical capability and understand various Engineering concepts.

Course Outcomes:

At the end of the course, student will be able to

CO1: ***Impart*** knowledge of Physical Optics phenomenon Polarization and identify these phenomenon in natural processes

CO2: ***Gain*** knowledge of applications of lasers and optical fibers in various fields .

CO3: ***Classify*** magnetic and dielectric materials and their Engineering applications.

CO4: ***Understand*** basic quantum mechanics and free electron theories.

CO5: ***Obtain*** the concept of concept of holes and electrons in semiconductors.

SYLLABUS

UNIT-I: Wave Optics:

Interference*:* Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Colors in thin films-Newton's rings-Determination of wave length nd refractive index.

Diffraction: C Introduction- Fresnel and Fraunhofer diffraction - Fraunhofer Diffraction due to Single slit, Double slit, N –slits(Qualitative) - Diffraction Grating – Resolving Power of Grating(Qualitative).

Polarizations: Introduction- Types of polarization-polarization by reflection, refraction and Double refraction-Nicol's prism –Half and Quarter wave plates.

UNIT-II: Lasers and Fiber Optics:

Lasers:: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

***Fiber optics*: ** Introduction –Principle of optical fiber-Construction- - Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes .

UNIT-III: Magnetic and Dielectric Materials:

***Magnetic Materials*:** Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para ferro, anti ferro & ferri – Domain concept of Ferromagnetism(Qualitative) - Hysteresis – soft and hard magnetic materials .

***Dielectric Materials*:** Introduction - Dielectic polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation.

UNIT-IV: Quantum Mechanics,Free Electron Theory:

***Quantum Mechanics*:** Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

***Free Electron Theory*:** Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of States(3D),Fermi energy.

UNIT-V: Band Theory of Solids and Semiconductors:

Band theory of Solids: Introduction- Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - V vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Semiconductors::Introduction– Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Drift and Diffusion currents – Einstein's equation-Hall effect- Hall coefficient - Applications of Hall effect.

Text Books

1. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G. Kshirsagar - S. Chand Publications, 2019.
2. "Engineering Physics" by D.K. Bhattacharya and Poonam Tandon, Oxford press (2015).

3. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference Books

1. Applied Physics by P.K. Palanisamy, Scitech publications (2014).
2. Engineering Physics by M. Arumugam, Anuradha Publication (2014).
3. Physics for Engineers by M.R. Srinivasan, New Age international publishers (2009).

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CS2T03 DIGITAL LOGIC DESIGN

Course Objectives:

- To represent numbers and conversion between different representations.
- To analyze logic processes and implement logical operations.
- To develop the combinational logic circuits.
- To design and analyze the concepts of sequential circuits.
- To understand concept of programmable logic devices like PROM, PLA,PAL.

Course Outcomes

CO1: Understand different number systems and their conversions.
CO2: Analyze the logical operations and Boolean algebra
CO3: Develop combinational circuits and perform logical operations.
CO4: Design the sequential logic functions.
CO5: Know finite state machines and different programmable logic devices.

SYLLABUS

UNIT I

Number Systems: Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r‘s Complement- (r-1)‘s Complement- Subtraction of Unsigned Numbers- Problems- Signed Binary Numbers- Weighted and Non weighted codes.

UNIT II

Logic Gates and Boolean Algebra: Basic Gates- Universal Gates- Ex-Or and Ex-Nor Gates- SOP- POS- Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- K Map Method- Minimization of Boolean Functions.

UNIT III

Combinational Logic Circuits: Design of Half Adder- Full Adder- Half Subtractor- Full Subtractor- Ripple Adder, Carry Look Ahead adder and Subtractors- Design of Decoders- Encoders- Multiplexers- Demultiplexers- Priority Encoder- Code Converters- Magnitude Comparator. Cascading of Decoders & Multiplexers

Introduction to Programmable Logic Devices (PLDs): PLA- PAL- PROM- Realization of Switching Functions Using PROM- Comparison of PLA, PAL and PROM.

UNIT IV

Introduction to Sequential Logic Circuits: Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear).

Registers and Counters: Design of Registers- Control Buffer Registers- Bidirectional Shift Registers- Universal Shift Register- Design of Ripple Counters- Synchronous Counters and Variable Modulus Counters- Ring Counter- Johnson Counter.

UNIT V

Finite state Machine: Analysis of clocked sequential circuits- state diagrams- state tables- design procedures- Realization of circuits using various flip-flops- ASM- Meelay to Moore conversion and vice-versa.

TEXT BOOKS

1. Digital Design, M.Morris Mano, Michael D Ciletti, 4thEdition,PEA,2003.
2. Fundamentals of Logic Design, Roth, 5thEdition,Cengage2004

REFERENCE BOOKS

1. Switching and Finite Automata Theory,Kohavi, 3rd Edition, Jha, Cambridge2005
2. Digital Logic Design, Leach, Malvino, Saha,TMH,2000.

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20CS2T04 DATA STRUCTURES

Course Objectives:

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

CO1: Understand the properties, interfaces, and behaviors of basic abstract data types.

CO2: Understand and apply linked lists

CO3: Apply Stacks and Queue data structures.

CO4: Demonstrate different methods for traversing trees.

CO5: Demonstrate the application of Graphs

SYLLABUS

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal, Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications- Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees sing Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1. Data Structures Using C. 2^{nd}Edition. Reema Thareja, Oxford.
2. Data Structures and algorithm analysis in C, 2^{nd}ed, Mark Allen Weiss.

Reference Books:

1. Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2. Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3. Data Structures with C, Seymour Lipschutz TMH

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CS2T05 PYTHON PROGRAMMING

Course Objectives:

- Identify/characterize/define a problem
- Design a program to solve the problem
- Create executable code
- Read most Python code

Course Outcomes:

CO1: Understand the fundamentals of Python programming language.

CO2: Understand Data Structures

CO3: Understand the use of functions in Python

CO4: Understand the Object-Oriented Programming concepts of Python

CO5: Apply regular expressions for different situations.

SYLLABUS

UNIT – I:

Introduction: History of Python, Need of Python Programming, Applications of Python Programming Variables, Assignment, Keywords, Input-Output, Indentation.
Types, Operators, and Expressions: Types – Integers, Strings, Booleans; Operators-Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while break, continue, pass

UNIT – II:

Data Structures Lists – Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT – III:

Functions – Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function-Global and Local Variables. Modules: Creating modules, import statements, from. The import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT – IV:

Object-Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error, and Exceptions: Difference between an error and Exception, Handling Exception, try except for block, Raising Exceptions, User Defined Exceptions

UNIT – V:

Regular expressions: Power of pattern matching and searching using regex in python, Meta characters and Sequences used in Patterns, Password, email, URL validation using regular expression, Pattern finding programs using regular expression.

Text Books:

1. Learning Python, Mark Lutz, Orielly

2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19- 948017-3, Oxford University Press, 2017.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. "Python in easy steps In Easy Steps", Mike MC Grath, illustrated edition, In easy steps 2013 publishers.
5. Professional Python Frameworks: Web 2.0 Programming, Dana Moore, Raymond Budd, William Wright, Wrox Publication, ISBN: 978-0-470-13809-0, October 2007.

		L	T	P	C
B.TECH II SEMESTER	**BSC**	**0**	**0**	**3**	**1.5**

20CS2L06 APPLIED PHYSICS LAB

Pre-requisite: Fundamental understanding of usage of an instrument with proper care.

Course Objective: Objective of the course is to impart

- Training Engineering graduates to handle instruments and their usage methods to improve the accuracy of measurements.

At the end of the course, student will be able to

CO1: **Outcomes**: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

CO2: Implement the basic principles of Mechanics to measure different physical parameters.

CO3: Enhance the knowledge of Usage of electronic devices in various applications

SYLLABUS

1. Newton's rings –Determination of radius of curvature of Plano Convex Lens.
2. Determination of wavelength of spectral lines -Diffraction Grating
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of wavelength of laser source using diffraction grating
5. Determination of Numerical Aperture and bending loss of a given Optical Fiber.
6. Determination of dispersive power of prism.
7. Determination of Rigidity modulus of a material- Torsional Pendulum.
8. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
9. Determination of Young's modulus by method of single cantilever oscillations
10. Verification of laws of vibrations in stretched strings – Sonometer.

11. Estimation of Planck's Constant using Photo electric Effect
12. Study of I /V Characteristics of Semiconductor diode.
13. I/V characteristics of Zener diode.
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
15. Energy Band gap of a Semiconductor using p - n junction diode

Reference Books

1. A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers, 2017.

		L	T	P	C
B.TECH II SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20CS2L07 DATA STRUCTURES LAB

Course Objectives:

The objective of this lab is to

- Demonstrate the different data structures implementation.

Course Outcomes:

- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

List of Experiments:

Exercise -1 (Searching)

a) Write C program that use both recursive and non-recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non-recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order.

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order.

Exercise -3 (Sorting-II)

a) Write C program that implement radix sort, to sort a given list of integers in ascending order

b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4 (Singly Linked List)

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion operation on a singly linked list

c) Write a C program that uses functions to perform deletion operation on a singly linked list

d) Write a C program to reverse elements of a single linked List.

Exercise -5 (Queue)

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists

Exercise -6 (Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write C program for implementing infix to postfix conversion

d) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7 (Binary Tree)

Write a recursive C program for traversing a binary tree in preorder, in-order and post-order.

Exercise -8 (Binary Search Tree)

a) Write a C program to Create a BST

b) Write a C program to insert a node into a BST.

c) Write a C program to delete a node from a BST.

Exercise-9

Write a program for implementing Heap Sort.

		L	T	P	C
B.TECH II SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20CS2L08 PYTHON PROGRAMMING LAB

Course Objectives:

The objective of this lab is to

- To elucidate problem solving through python programming language.
- To introduce function-oriented programming paradigm through python.
- To train in development of solutions using modular concepts.
- To teach practical Python solution patterns

Course Outcomes

CO1: Develop fundamental programs in python programming language.

CO2: Develop Python programs for numerical and text-based problems.

CO3: Develop Python programs on object-oriented programming and regular expressions.

CO4: Develop python programs on data structures.

LIST OF EXPERIMENTS

1. Write a program to perform various list of operations (eg: Arithmetic, logical, bitwise etc) in python.
2. Write a program to implement control flow statements.
3. Write a program implementing various predefined function of Lists, Sets, Tuples and Dictionaries.
4. Write a program covering various arguments for a function.
5. Write a program to implement various types of functions.
6. Write a program to implement recursion.
7. Write a program to implement command line arguments.
8. Write a program to create a class and its constructors.
9. Write a program to implement inheritance.
10. Write a program for exception handling.
11. Write a program to perform various linear algebra operations like finding eigen values and vectors, determinant and trace for a matrix.

12. Write a program to perform matrix operations like addition, subtraction, multiplication of matrices using Numpy Module.
13. Write a program to use System, math etc., packages.
14. Write a Python program to find the occurrence and position of the substrings within a string.
15. Write a Python program to replace all occurrences of space, comma, or dot with a colon.
16. Write a Python program to match a string that contains only upper and lowercase letters, numbers, and underscores.

B.TECH III SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CS3T01 NUMERICAL METHODS AND VECTOR CALCULUS

Course objectives:

- Understand the basic numerical methods to solve simultaneous linear equations
- Knowledge of numerical methods to solve ordinary differential equations
- The types of integration over the lines, surfaces & volumes

Course Outcomes:

By the end of the course students will be able to

CO1: Determine the solution of transcendental equations by different numerical methods

CO2: Provide the interpolation techniques which analyze the data of an unknown function

CO3: Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries

CO4: Evaluate areas and volumes using double & triple integrals.

CO5: Apply the concepts of calculus to scalar and vector fields and establish the relation between line, surface and volume integrals.

SYLLABUS

UNIT I: Numerical Solution of Equations:

Solution of Algebraic and transcendental equations: Bisection method, Method of false position and Newton-Raphson method. Iterative methods of solution of linear simultaneous equations: Jacobi's and Gauss-Seidel iteration methods.

UNIT II: Interpolation:

Forward and backward, relation between these operators, Differences of a polynomial, Interpolation with unequal intervals: Lagrange's interpolation formula, Newton's forward & backward interpolation formulae & problems.

UNIT III: Numerical Integration & Numerical Solutions of ordinary differential equations with initial conditions:

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rules.

Numerical Solution of ODE: Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method of 4^{th} order.

UNIT IV: Multiple Integrals:

Double integrals in Cartesian & polar coordinates, Change of order of integration, Triple integrals, Change of variables (Cartesian to Polar, Rectangular coordinates to Cylindrical & Rectangular coordinates to Spherical polar coordinate systems).
Applications: Area enclosed by plane curves, Volume of solids.

Unit-V: Vector Differentiation & Vector Integration:

Introduction, Scalar and Vector point functions, Del applied to scalar point functions-Gradient, directional derivatives, Del applied to vector point functions-Div& Curl, physical interpretation of div & curl, Del applied twice to point functions, Del applied to products of point functions (Identities without proofs).

Line integral, Green's theorem in the plane (without proof), Surface integrals, Stoke's theorem (without proof), Volume integral, Gauss Divergence theorem (without proof).

Text Books:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014.
2. **B. V. RAMANA,** Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

3. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
4. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH III SEMESTER	PCC	L	T	P	C
		3	0	0	3

20CS3T02 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- To learn the fundamentals of object-oriented programming.
- To implement object-oriented concepts using Java.
- To understand how to design object-oriented applications using Java.

Course Outcomes:
By the end of the course, the student will be able to

CO1: Understand the concepts of Object-Oriented Programming and Java programming constructs.
CO2: Demonstrate the concepts – Strings, Inheritance and Interfaces.
CO3: Build efficient and error-free codes using exception handling and demonstrate multi-threading.
CO4: Design GUI applications using Event Handling and Abstract Window Toolkit.
CO5: Develop real-time applications using Applets and Swings.

SYLLABUS

UNIT-I:
Introduction to OOP, procedural programming language vs. object-oriented language, principles of OOP, applications of OOP, history of java, java features, JVM. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting.

Control Statements: Introduction, if statement, Nested if statement, if–else statements, Ternary Operator, Switch Statement, **Iteration Statements:** while statement, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

Classes and objects: class declaration, creating objects, methods, method overloading, constructors and constructor overloading, garbage collector.

UNIT-II:

Basic Input-Output Operations. String, String Buffer and String Tokenizer classes.

Inheritance: types of inheritance, super keyword, final keyword, overriding and abstract class.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, importance of static keyword, this keyword, arrays, command line arguments, nested classes.

UNIT-III:

Packages and Java Library: creating and using packages, importance of CLASSPATH and java. Lang package.

Exception handling: importance of try, catch, throw, throws and finally block, user-defined exceptions, Assertions.

Multithreading: Introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. File Handling: Reading data from files and writing data to files, random access file.

UNIT-IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Event Delegation model, handling mouse and key board events, Adapter classes, inner classes.

AWT: Class hierarchy, user- interface components- labels, button, canvas, scrollbars, text components, checkbox, checkbox groups, choices, list panes-scroll pane, dialogs, menu bar, graphics, layout manager- layout manager types- boarder, grid, flow, card and grid bag.

UNIT-V

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swings: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing – J Applet, J Frame and J Component, Icons and Labels, text fields, buttons-The J Button class, Check boxes, Radio Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees and Tables.

TEXT BOOKS:

1. Herbert Schildt —Java The Complete Reference, 11th Edition, McGraw-Hill Education.
2. E Balagurusamy —Programming with Java: A Primer, 4th Ed, Tata McGraw Hill Education Pvt Ltd.

REFERENCE BOOKS:

1. Java Programming, K.Rajkumar. Pearson
2. Core Java, Black Book, R Nageswara rao, Wiley, Dream Tech
3. Core Java for Beginners, Rashmi Kanta Das, vikas.
4. Object Oriented Programming Through java, P. Radha Krishna, Universities Press.
5. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.
6.

		L	T	P	C
B.TECH III SEMESTER	**PCC**	**3**	**0**	**0**	**3**

20CS3T03 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases.

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models.

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS:

Unit – I:

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

Unit – II:

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

Unit – III: SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.
NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL.
Unit-IV: **Schema Refinement (Normalization):** Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.
Unit-V: Transaction Management and Concurrency Control: Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.
Concurrency control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

Text Books:

1. Raghu rama Krishnan, Johannes Gehrke, "Data base Management Systems", 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL" by Shashan k Tiwari, 2011, WROX Press.

Reference Books:

1. Peter Rob & Carlos Coronel, "Data base Systems design, Implementation, and Management", 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, "Data base System Concepts", 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2007.
4. C.J.Date, "Introduction to Database Systems", 7th Edition, Pearson Education, 2002.

B.TECH III SEMESTER	PCC	L	T	P	C
		3	0	0	3

20CS3T04 SOFTWARE ENGINEERING

Course Objectives

- Gain knowledge about software process models.
- Familiarize the basic software engineering methods, practices and its applications.
- Facilitate students in software design.

Course Outcomes

CO1: Understand the software life cycle models.

CO2: Understand the scrum approach to agile project management.

CO3: Analyze the software requirements and generate SRS document.

CO4: Understand some of the different models that may be used to design.

CO5: Understand various software testing approaches and quality control to ensure good quality software.

SYLLABUS

UNIT – I

INTRODUCTION TO SOFTWARE ENGINEERING: Nature of software, Software engineering, The Software Processes, Software Myths.

PROCESS MODELS: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialised Process models, The Unified Process, Personal and Team Process Models.

UNIT – II

REQUIREMENTS ENGINEERING: Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

REQUIREMENTS MODELLING: Requirement Analysis, Scenario-Based Modelling, Data Modelling Concepts, Class-Based Modelling.

UNIT – III

DESIGN CONCEPTS: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

UNIT – IV

Understanding of UML diagrams: Structural diagrams - class diagram, object diagram, component diagram, deployment diagram, Behavioural diagrams - Use-case diagram, activity diagram, sequence diagram, collaboration diagram, state chart diagram.

UNIT – V

IMPLEMENTATION: Structured coding Techniques, Coding Styles-Standards and Guidelines, Implementation Issues.

SOFTWARE TESTING STRATEGIES: A Strategic approach to Software Testing, Strategic Issues and Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing, Software Quality concepts.

TEXT BOOKS:

1. Roger S. Pressman (2010), Software Engineering, A Practitioner's Approach, 7th Edition, McGraw-Hill International Edition, India.
2. Ian Sommerville (2011), Software Engineering, 9th Edition, Pearson education, India.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.Jim ConallenKelli A. Houston," Object-Oriented Analysis and Design with Applications", 3rd edition.

REFERENCES BOOKS:

1. Pankaj Jalote (2010), Software Engineering, A Precise Approach, Wiley India.
2. Waman S. Jawadekar (2008), Software Engineering: A Primer, McGraw-Hill, India.
3. Hans Van Vilet (2008), Software Engineering Principles and Practice, 3rd Edition, John Wiley & Sons Ltd.
4. Rajib Mall (2005), Fundamental of Software Engineering, PHI.
5. Deepak Jain, Software Engineering, Principles and Practices, Oxford, University Press, India.

B.TECH III SEMESTER	PCC	L	T	P	C
		3	0	0	3

20CS3T05 COMPUTER ORGANIZATION

PREREQUISITES: Digital logic design

Course Objectives:

- To understand the design of various functional units and components of computers.
- Emphasizes basic organization, design, and programming of a simple digital computer.
- To explain the function of each element of a memory hierarchy.
- To identify and compare different methods for computer IO.

Course Outcomes:

CO1: Understand the architecture of a modern computer with its various processing units.

CO2: Understand RTL, micro-operations, instruction cycle.

CO3: Understand the features of hardwired and micro programmed control units.

CO4: Analyze the memory hierarchy system and performance improvement by cache memory.

CO5: Analyze the communication methods of I/O devices and standard I/O interfaces.

SYLLABUS:

UNIT I:

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation, Other Binary codes (Gray Code), Other decimal codes (BCD, Weighted code, Excess-3), Error Detection codes.

UNIT II:

Register Transfer and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT III:

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: Stack Organization**,** Instruction formats, Addressing modes, Data Transfer and Manipulation Instructions, Program control Instructions, RISC

UNIT IV:

Computer Arithmetic: Addition and subtraction, Booth multiplication Algorithm.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, virtual Memory, Memory Management hardware.

UNIT V:

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

Input - Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct memory Access, IOP, Serial Communication.

TEXT BOOKS

1. Computer Systems Architecture ― M. Morris Mano, Pearson Education Publishers, 3rdedition.

REFERENCE BOOKS:

1. William Stallings, ― Computer Organization and Architecture, 6th Edition Pearson/ PHI publishers.
2. Andrew S. Tanenbaum, ―Structured Computer Organization, Pearson / PHI publishers,
   4th edition.
3. John D Carpinelli, ― Computer Systems Organization and Architecture ‖, Pearson Education, 1st edition.
4. Carl Hamacher, ZvonkoVranesic, Safwat Zaky, ― Computer Organization, TMH publications, 5th edition.

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20CS3L06 **OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**

Course Objectives:

- Understand fundamentals of Object-Oriented Programming in java including defining classes, invoking methods using class libraries etc.,
- Demonstrate an understanding of graphical user interfaces, multi-threaded programming and event driven programming.

Course Outcomes: By the end of the course student will be able to

CO1: Implement java applications using OOP principles and proper program structuring.

CO2: Develop java programs using packages, inheritance and interfaces.

CO3: Implement error and exception handling techniques.

CO4: Design event driven GUI and real-time web related applications.

LIST OF EXPERIMENTS

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3 (Class, Objects)

Implement java programs using the concept of

a) Class mechanism. Create a class, methods and invoke them inside main method.

b) Constructor.

c) Constructor overloading.

b) Method overloading.

Exercise -4 (Inheritance)

Implement java programs using the concept of

a) Single Inheritance

b) Multilevel Inheritance

c) Abstract class

Exercise - 5 (Inheritance - Continued)

Implement java programs using the concept of

a)"super" keyword. b) Interfaces

Exercise – 6 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

Exercise – 7 (Exception)

Implement the programs by using the concepts of

a. Exception handling mechanism

b. Multiple catch clauses

c. Finally

d. Creating user defined exceptions

Exercise – 8 (Threads)

a) Write a JAVA program that creates threads by extending Thread class. First thread displays "Good Morning" every 1 sec, the second thread displays "Hello" every 2 seconds and the third display "Welcome" every 3 seconds,(Repeat the same by implementing Runnable)

b) Write a program illustrating isAlive and join ()

c) Write a Program illustrating Daemon Threads.

Exercise – 9 (Packages)

a) Create a user defined package and demonstrate different ways of importing packages

Exercise - 10 (Applet)

a) Write a JAVA program to paint like paint brush in applet.

b) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise -11 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.

b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

B.TECH III SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20CS3L07 DATABASE MANAGEMENT SYSTEMS LAB

PREREQUISITES: -

Course Objectives:

- Populate and query a database using SQL - DDL/DML commands.
- Understand various advanced query executions such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.
- Develop solutions using PL/SQL for database applications using procedures, cursors and triggers

COURSE OUTCOMES:

1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation.
3. Develop solutions for database applications using procedures, cursors and triggers
4. Develop solutions using PL/SQL procedures.

LIST OF EXPERIMENTS

1. Introduction to SQL: DDL, DML, DCL, TCL.
2. Queries for Creating Tables with Constraints, Views.
3. Example SQL Queries using select.
4. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN).
5. Queries using Group By, Order By, and Having Clauses and Working with Index, Sequence, Synonym.
6. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.
7. Queries on Joins and Correlated Sub-Queries.
8. Write a PL/SQL Code using Basic Variable, Anchored declarations, and Usage of Assignment Operation.
9. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL.
10. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
11. Write a PL/SQL Code using Cursors, Exceptions and Triggers.
12. Write a PL/SQL Code using Procedures, Functions, and Packages.

Text Books:

1. ORACLE PL/SQL by example, Benjamin Rosen Zweig, Elena Silvestrova,

Pearson.
2. ORACLE database log PL/SQL programming SCOTT URMAN, TMH.
3. SQL and PL/SQL for ORACLE 10g, Black Book, Dr. P.S Deshpande.
4. Data Base Management System, Oracle SQL and PL/SQL, Pranab Kumar Das Gupta, P Radha Krishna, PHI.

B.TECH III SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20CS3L08 SOFTWARE ENGINEERING LAB

COURSE Objectives:

- To provide hands-on experience with different aspects of Software Engineering including requirements identification, implementation, testing, and so on.
- To draw DFD, behavioural and structural design using UML diagrams.

COURSE OUTCOMES:

- Prepare SRS document, design document, test cases and software configuration management and risk management related document.
- Develop function oriented and object-oriented software design using tools like rational rose.
- Design and develop Test Cases for a system
- Track the progress of a project using various tools.

LIST OF EXPERIMENTS

1. Create the problem statement for a specific system of relevance.
2. Perform requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. To carry out the function-oriented diagram: Data Flow Diagram (DFD) and Structured chart.
4. To draw UML diagrams.
5. To illustrate the test cases, test case preparation and perform Manual Tests.
6. Perform Estimation of effort using FP Estimation for chosen system.
7. To prepare time line chart/Gantt Chart/PERT Chart for selected software project

S. No	Case Study
1	Credit Card Processing
2	Stock Maintenance System
3	Online course reservation system
4	Recruitment system
5	Passport automation System
6	Online Exam Registration

Note: Students shall prepare a document related to all the above activities for at least three real time Case Studies listed below.

B.TECH III SEMESTER	SC	L	T	P	C
		0	0	4	2

20CS3S09 **Python NumPy and Pandas (Skill Oriented Course)**

Course Objectives:

- To acquire programming skills in Python package NumPy and perform mathematical and statistical operations.
- To understand the fundamentals of the Pandas library in Python and how it is used to handle data and also develop basic skills in data analysis and visualization

Course Outcomes: By the end of this lab the student is able to

CO1: Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems.

CO2: Understand how to apply some linear algebra operations to n-dimensional arrays.

CO3: Understand how NumPy perform common data wrangling and computational tasks in Python.

CO4: Use Pandas to create and manipulate data structures like Series and DataFrames.

CO5: Work with arrays, queries, and dataframes

NumPy Exercises:

1. NumPy Installation using different scientific python distributions(Anaconda, Python(x,y), WinPython, Pyzo)
2. NumPy Basics (np.array, np.arrange, np.linespace, np.zeros, np.ones, np.random.random, np.empty)
3. Arrays (array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
4. Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
5. Mathematical Operations(np.add, np.substract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations(np.mean, np.median, np.std, array.corrcoef( ))
6. NumPy data types
7. NumPy ndarray
8. NumPy String Operations
9. NumPy Linear Algebra Operations(norm,eigen values and vectors, determinant of a matrix, sum of diagonal elements, inner product, matrix decomposition

etc..)

10. NumPy Functional Programming

Pandas Exercises:

11. Pandas DataSeries:

1. Write a Pandas program to create and display a one-dimensional array-like object
   containing an array of data using Pandas module.
2. Write a Pandas program to convert a Panda module Series to Python list and it's type.
3. Write a Pandas program to add, subtract, multiple and divide two Pandas Series.
4. Write a Pandas program to convert a NumPy array to a Pandas series.

Sample Series:

NumPy array: [10 20 30 40 50]

Converted Pandas series: 0 10
1 20
2 30
3 40
4 50
dtype: int64

12. Pandas DataFrames: Consider Sample Python dictionary data and list labels:

exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'], 'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19], 'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1], 'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}

labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']

1. Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.
2. Write a Pandas program to change the name 'James' to 'Suresh' in name column of the DataFrame.
3. Write a Pandas program to insert a new column in existing DataFrame.
4. Write a Pandas program to get list from DataFrame column headers.
5. Write a Pandas program to get list from DataFrame column headers.

13. Pandas Index:

1. Write a Pandas program to display the default index and set a column as an Index in a given dataframe.
2. Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a given dataframe.

14. Pandas String and Regular Expressions:
    1. Write a Pandas program to convert all the string values to upper, lower cases in a given pandas series. Also find the length of the string values.
    2. Write a Pandas program to remove whitespaces, left sided whitespaces and right sided whitespaces of the string values of a given pandas series.
    3. Write a Pandas program to count of occurrence of a specified substring in a DataFrame column.
    4. Write a Pandas program to swap the cases of a specified character column in a given DataFrame.
15. Pandas Joining and merging DataFrame:
    1. Write a Pandas program to join the two given dataframes along rows and assign all data.
    2. Write a Pandas program to append a list of dictionaries or series to a existing DataFrame and display the combined data.
    3. Write a Pandas program to join the two dataframes with matching records from both sides where available.
16. Pandas Time Series:
    1. Write a Pandas program to create
        a. Datetime object for Jan 15 2012.
        b. Specific date and time of 9:20 pm.
        c. Local date and time.
        d. A date without time.
        e. Current date.
        f. Time from a datetime.
        g. Current local time.
    2. Write a Pandas program to create a date from a given year, month, day and another date from a given string formats.
    3. Write a Pandas program to create a time-series with two index labels and random values. Also print the type of the index.
17. Pandas Grouping Aggregate:

Consider dataset:

School	class	name	date_Of_Birth	age	height	weight	address
S1 s001	V	Alberto Franco	15/05/2002	12	173	35	street1
S2 s002	V	Gino Mcneill	17/05/2002	12	192	32	street2
S3 s003	VI	Ryan Parkes	16/02/1999	13	186	33	street3
S4 s001	VI	Eesha Hinton	25/09/1998	13	167	30	street1

S5 s002	V	Gino Mcneill	11/05/2002	14	151	31	street2
S6 s004	VI	David Parkes	15/09/1997	12	159	32	street4
S1 s001	V	Alberto Franco	15/05/2002	12	173	35	street1

1. Write a Pandas program to split the following dataframe into groups based on school code. Also check the type of GroupBy object.
2. Write a Pandas program to split the following dataframe by school code and get mean, min, and max value of age for each school

18. Pandas Styling:
    1. Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the negative numbers red and positive numbers black.
    2. Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the maximum value in each column.
    3. Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight dataframe's specific columns.
19. Excel:
    1. Write a Pandas program to import excel data into a Pandas dataframe.
    2. Write a Pandas program to find the sum, mean, max, min value of a column of file.
20. Plotting:
    1. Write a Pandas program to create a horizontal stacked bar plot of opening, closing stock prices of any stock dataset between two specific dates.
    2. Write a Pandas program to create a histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates.
    3. Write a Pandas program to create a stacked histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates with more bins.
21. Pandas SQL Query:
    1. Write a Pandas program to display all the records of a student file.
    2. Write a Pandas program to select distinct department id from employees file

References:

1. https://www.w3resource.com/python-exercises/pandas/index.php
2. https://www.w3resource.com/python-exercises/numpy/index.php

		L	T	P	C
B.TECH III SEMESTER	**MC**	**2**	**-**	**-**	**-**

20CS3M10 CONSTITUTION OF INDIA

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand historical background of the constitution making, importance for building a democratic India, features and principles of Indian Constitution.

CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO3: Understand the roles and powers of State Government and its Administration and value of the fundamental rights and duties for becoming good citizen of India.

CO4: Understand and analyze the decentralization of power between Union, State and Local self-Government and local administration.

CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission, UPSC, Welfare commissions for sustaining democracy.

SYLLABUS

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution -Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, CentreState relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, Rajya Sabha, The Supreme

Court and High Court: Powers and Functions;

UNIT III

State Government and its Administration Governor, Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV

A.Local Administration, District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy(Different departments),

Village level, Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V

Election Commission: Election Commission, Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.

2) Subash Kashyap, Indian Constitution, National Book Trust

3) J.A. Siwach, Dynamics of Indian Government & Politics

4) D.C. Gupta, Indian Government and Politics

5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

6) J.C. Johari, Indian Government and Politics Hans

7) J. Raj Indian Government and Politics

8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-sources:

1) nptel.ac.in/courses/109104074/8

2) nptel.ac.in/courses/109104045/

3) nptel.ac.in/courses/101104065/

4) www.hss.iitb.ac.in/en/lecture-details

5)www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

B.TECH IV SEMESTER	BSC	L	T	P	C
		3	0	0	3

20CS4T01 PROBABILITY AND STATISTICS

Course objectives:

- Computation of expectation and variance for probability distributions of a random variable
- Description of sampling, distribution of means, proportions & variances
- Knowledge of different distributions to test statistical hypothesis

Course Outcomes:

By the end of the course students will be able to

CO1: Understand random variables and discrete probability distributions

CO2: Determine probabilities based on practical situations using the normal distributions

CO3: Apply different distributions to compute confidence intervals

CO4: Test the hypothesis concerning means and proportions

CO5: Understand the concept of least square estimation linear regression

Syllabus:

UNIT I: Discrete Random variables and Distributions:

Introduction-Random variables- Discrete Random variable-Distribution function-Expectation-Moment Generating function-Moments and properties. Discrete distributions: Binomial and Poisson distributions.

UNIT II: Continuous Random variable and distributions:

Introduction-Continuous Random variable-Distribution function- Expectation-Moment Generating function-Moments and properties. Continuous distribution: Normal distributions, Normal approximation to Binomial distribution.

UNIT III: Sampling Theory:

Introduction - Population and samples- Sampling distribution of means (s known)-Central limit theorem- t-distribution- Sampling distribution of means (s unknown)-Sampling, distribution of variances, Point estimation- Maximum error of estimate - Interval estimation.

UNIT IV: Tests of Hypothesis:

Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors –Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences- ANOVA for one-way and two-way classified data.

UNIT V: Regression Analysis:

The method of Least squares, Curvilinear Regression, Multiple Regression, Correlation.

Text Books:

1. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition, PHI.
2. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th edition, Cengage.

Reference Books:

3. **ShronL.Myers, Keying Ye, Ronald E Walpole,** Probability and StatisticsEngineers and the Scientists,8th Edition, Pearson 2007.
4. **William Menden Hall, Robert J. Bever and Barbara Bever**, Introduction toprobability and statistics, Cengage learning, 2009.

B.TECH IV SEMESTER	ESC	L	T	P	C
		3	0	0	3

20CS4T02 DISCRETE MATHEMATICAL STRUCTURES

Course objectives:

- The validity or the strength of any particular argument or reasoning
- Knowledge of the theory of relations and functions
- Knowledge of types of graphs to apply in real life problems

Course Outcomes:

By the end of this course the student will be able to

CO1: Apply mathematical logic to design new programming languages

CO2: Illustrate the properties of sets and functions to design a modeling software system

CO3: Explain a structure of an algebra which is useful to understand the theory of sequential machines, formal languages and coding theory.

CO4: Apply the techniques of recursion for representing the data in the analysis of algorithms

CO5: Provide the knowledge of graphs such as trees which is useful in maintaining files and directories by Operating Systems.

SYLLABUS

UNIT-I: Mathematical Logic:

Introduction, Statements and Notation, Connectives and Truth tables, Normal forms, Theory of inference for Statement Calculus, The Predicate Calculus, Inference theory of Predicate calculus.

UNIT-II: Set Theory & Functions:

Introduction, Basic concepts of set theory, Principle of Inclusion and Exclusion, Properties of Binary relations, Relation matrix and Digraph, operations on relations, Partition and covering, Transitive closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, Bijective functions, Inverse functions, Composition of functions, Recursive functions, Pigeonhole principle and its applications.

UNIT-III: Algebraic Structures & Number Theory:

Algebraic systems and examples, general properties, semigroup, monoid, groups and subgroups. Properties of integers, Division algorithm, Greatest common divisor, Euclidean algorithm (without proof), Least common multiple, testing of prime numbers, The fundamental theorem of Arithmetic, Fermat's theorem and Euler's

theorem (without proofs) and its applications.

UNIT-IV

Recurrence Relations: Recurrence relations, solving recurrence relations by substitution, the method of characteristic roots, Solutions of Inhomogeneous recurrence relations.

UNIT -V:

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Coloring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

TEXT BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Mathematical Foundation for Computer science, S. Santha, E.V. Prasad, Cengage publications.

REFERENCE BOOKS:

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H.Rosen, 7th Edition, Tata McGraw Hill.
2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI.

B.TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CS4T03 OPERATING SYSTEMS

Course Objectives

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes

CO1: Understand the importance, functions and structures of operating systems.

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

Syllabus

UNIT-I:

Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication.

UNIT-II:

Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multithreading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT-III:

Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures.

UNIT-IV:

Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock-Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Dead lock

UNIT-V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling.

Text Books

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley, 9th edition.(Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition–2005.(Unit-5)

Reference Books

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley ,Operating Systems: A Design-Oriented Approach, Tata Mc Graw Hill Education,1996

B.TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CS4T04 ADVANCED DATA STRUCTURES

Course Objectives:

- Describe variety of advanced data structures.
- Understand operations on various search trees.

Course Outcomes:

CO1: Illustrate several sorting algorithms.

CO2: Construct Priority queues such as min heap and max heap for the given data.

CO3: Apply various operations on AVL and Red Black trees

CO4: Build Multi-Way Search Trees and perform various operations.

CO5: Demonstrate various operations of Digital Search Structures and Multi-Way Trees.

SYLLABUS

UNIT - I:

Sorting: Medians and order statistics, External Sorting: Introduction, K-way Merging, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs.

Hashing: Introduction, Hash Table, Hash Function, Types of Hashing: Linear Probing, Quadratic Probing, Double Hashing.

UNIT - II:

Priority Queues: Introduction, types of priority queues, implementation methods of priority queues, Applications of Priority queues,

Heaps: Binary heap: min heap and max heap, Applications of heap.

UNIT – III: Advanced and Efficient Binary Search Trees

Optimal Binary Search Trees: Red Black Trees Definition- Representation of a Red- Black Tree- Searching a Red-Black Tree- Inserting into a Red Black Tree- Deletion from a Red-Black Tree- Joining Red-Black Trees, Splitting a Red-Black tree.

Splay and Scapegoat Trees:

Scapegoat Tree-Definition-Insertion and Deletion operations, Splay tree-Definition-Insertion and Deletion operations.

UNIT - IV: Multi-way Trees

M-Way Search Trees: Definition and Properties, Searching an M-Way SearchTree, B-Trees, Definition and Properties, Number of Elements in a B-tree, Insertion into B-Tree, Deletion from a B-Tree, B+-Tree Definition, Searching a B+-Tree, Insertion into B+-tree, Deletion from a B+-Tree.

UNIT - V: Digital Search Trees and Multi - way Trees

Digital Search Trees: Definition, Search, Insert and Delete. Binary Tries, Compressed Binary Tries.

Multi-way Trees: Definition, searching a Tree, sampling strategies, Insertion, Deletion, Height of a Tree. Prefix Search and applications. Suffix Trees.

Text Books:

1. Richard F Gilberg, Behrouz A Forouzan, “Data Structures, a Pseudo code Approach with C”, Cengage Learning. (Unit 1,2,3,4 & 5)
2. Horowitz, Sahni, Anderson-Freed, “Fundamentals of Data Structures in C”, 2nd edition, University Press.

Reference Books:

1. Reema Thareja, S.RamaSree, “Advanced Data Structures“Oxford Higher Education.
2. Mark Allen Weiss, “Data structures and Algorithm Analysis in C”, Pearson, 2nd edition
3. Introduction to Algorithms”, T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.

B.TECH IV SEMESTER	HSMC	L	T	P	C
		3	0	0	3

20CS4T05 **MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

Course Objectives:

- The Learning objectives of this course are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product

CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs

CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units

CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis

CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

SYLLABUS

UNIT I: Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II: Theories of Production and Cost Analyses: Theories of Production function- Law of Variable Proportions - Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III: Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles: Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV: Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V: Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.

2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition

3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.

4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd

5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd

6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

B.TECH IV SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20CS4L06 R PROGRAMMING LAB

Course Outcomes:

CO1: Understand the use of operators in R

CO2: Use Data Structures to implement programs in R

CO3: Implement Mathematical functions in R

CO4: Understand reading and writing files

CO5: Analyze data from various sources

LIST OF EXPERIMENTS

Exercise 1: Implement programs in R to work with different types of operators

Exercise 2: Implement programs in R with data structures

Exercise 3: Implement programs in R using the concept of functions

Exercise 4: Working with simulation in R

Math functions

Calculus

Linear algebraic operations

Set operations

Exercise 5: Reading in your own data

Working with files

Accessing the keyboard and monitor

Exercise 6: Data visualization

Charts and plots

Exercise 7:

a) Program to implement simple and multiple linear regression.

b) Program to implement non- linear regression.

Exercise 8:

a) Program to implement logistic regression.

Exercise 9:

a) Program to perform ANOVA test (one-way, two way)

B.TECH IV SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20CS4L07 OPERATING SYSTEMS LAB

Course Objectives

- To develop the concepts of process and memory management techniques.
- To know the problems of deadlock and study the various handling mechanisms.
- To impart knowledge on developing shell scripts.

Course Outcomes

CO1: Implement CPU and disk scheduling algorithms.

CO2: Demonstrate memory management techniques.

CO3: Demonstrate algorithms for Deadlock Detection and prevention.

CO4: Develop shell scripts in order to perform shell programming.

List of Experiments

1. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF
2. Simulate the following CPU scheduling algorithms
   a) Priority b) Round Robin
3. Simulate MVT and MFT
4. Simulate the following page replacement algorithms
5. Simulate the following page replacement algorithms
6. Implement FIFO page replacement algorithm.
7. Implement LRU page replacement algorithm.
8. Illustrate Dead Lock Avoidance Algorithm
9. Illustrate Dead Lock Detection Algorithm
10. Simulate the following disk scheduling algorithms
    a) FCFS b) SSTF
11. Simulate the following disk scheduling algorithms
    a) SCAN b) CSCAN
12. Illustrate UNIX commands and Vi editor
13. Write a Shell program to check the given number is even or odd
14. Write a shell script to print the factorial of first n natural numbers.
15. Write shell scripts to find the length of a given string and to extract a substring from a given string.
16. Write a shell script that counts the number of lines and words present in a given file.

		L	T	P	C
B.TECH IV SEMESTER	**PCC**	**0**	**0**	**3**	**1.5**

20CS4L08 ADVANCED DATA STRUCTURES LAB

Objectives:

• To make the student learn a object oriented way of solving problems.

• To make the student learn different sorting algorithms.

• To make the student learn different algorithm design techniques.

Course Outcomes

CO1 - Develop programs for sorting.

CO2 - Develop programs for implementing trees and their traversal operations.

CO3 - Implement graph traversal algorithm. .

List of Experiments

1. Construct a Hash Table and illustrate
   a) Linear Probing b) Quadratic Probing c) Double Hashing
2. Write programs for the implementation of Priority Queue.
3. Write a program to implement operations on binary heap.
4. Write a program to perform the following operations
   a) Insertion into an AVL-tree b) Deletion from an AVL-tree
5. Write a program to perform the following operations
   a) Insertion into a B-tree b) Deletion from a B-tree
6. Write a program to perform the following operations
   a) Insertion into Scapegoat tree b) Deletion from an Scapegoat tree
7. Write a program to perform the following operations
   a) Insertion into Splay tree b) Deletion from an Splay tree
8. Write a program to implement Kruskal's algorithm to generate a minimum cost spanning tree.
9. Write a program to implement Prim's algorithm to generate a minimum cost spanning tree.
10. Write a program to implement operations on graph.
    a)vertex insertion b) Vertex deletion c) finding vertex d))Edge addition and deletion
11. Write programs for the implementation of BFS for a given graph.
12. Write programs for the implementation of DFS for a given graph
13. Write a program to implement operations on graph.
    a) Finding vertex b) Edge addition and deletion
14. Write a program to implement Dijkstra's algorithm to find shortest path in the graph.
15. Write a program to implement Bellman-Ford algorithm to find shortest path in the graph

B.TECH IV SEMESTER	SC	L	T	P	C
		0	0	4	2

20CS4S09 **BASIC WEB PROGRAMMING (Skill Oriented Course)**

Course Objectives:

- To acquire skills in developing web pages
- To understand the use of HTML and CSS in designing web pages
- To gain knowledge on Java Script for performing validations

Course Outcomes: By the end of this lab the student is able to

CO1: Understand and use various HTML Tags and apply CSS
CO2: Develop websites that include static pages
CO3: Design Front end for Web Applications

LIST OF EXPERIMENTS

1) Exercises to demonstrate the use of Basic HTML tags.
2) Exercises to demonstrate Tables, Lists and Forms
3) Implement forms using HTML Frames and CSS
4) Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, lines and words in the text entered using an alert message. Words are separated with white space and lines are separated with new line character.
5) Write an HTML page that contains a selection box with a list of 5 countries In the above page when the user selects a country, its capital should be printed next to the list, and add CSS to customize the properties of the font of the capital.
6) Create a website using the HTML and CSS to create your personal portfolio.
7) Create a website using HTML and CSS for a Book Store.
8) Write a JavaScript to design a simple calculator to perform the operations: sum, product, difference and quotient
9) Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in HTML table format.
10) Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.
11) Demonstrate the Login page with userid and password validations.
12) Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:

a. Parameter: A string Output: The position in the string of the left-most vowel

b. Parameter: A number Output: The number with its digits in the reverse order

13) Write an HTML page with Javascript that takes a number from one text field in the range 0-999 and display it in other text field in words. If the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box.

		L	T	P	C
B. TECH V SEMESTER	**PCC**	**3**	**0**	**0**	**3**

20CS5T01 FORMAL LANGUAGES & AUTOMATA THEORY

Course Objectives:

- Introduce the concepts of Theory of computation in computer science.
- To understand the relation between Regular Expression and Finite Automata.
- The students should acquire insights into the relationship among formal languages, formal Grammars and automata.
- To understand the concepts of Context Free Languages, PDA and TM

Course Outcomes:

By the end of the course students shall be able to

CO1: Understand the basic concepts of Automata Theory

CO2: Infer the equivalence of languages described by finite automata and regular expressions.

CO3: Devise regular, context free grammars while recognizing the strings and tokens and able to Normalize grammars.

CO4: Apply Pushdown Automata for problem solving.

CO5: Understand basic properties and compute using Turing Machines.

SYLLABUS

UNIT-I: Finite Automata:

Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automation, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT-II: Regular Expressions:

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closures Properties of regular sets, Regular Grammars

UNIT-III: Context Free Grammars:

Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy

Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Applications of Context Free Grammars.

UNIT-IV: Pushdown Automata:

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata.

UNIT-V: Turning Machine:

Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of TMs, Types of Turing Machines, Decidable and Un-Decidable Problems

TEXT BOOKS:

1. Introduction to Automata Theory, Languages and Computation, J.E. Hopcroft, R. Motwani and J.D. Ullman, 3rd Edition, Pearson, 2008. (Units 1, 2, 3, 4, 5)
2. Theory of Computer Science-Automata, Languages and Computation, K.L.P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007. (Units 1, 2, 3, 4, 5)

REFERENCE:

1. A Text book on Automata Theory, Nasir S F B, P.K Srimani [Delhi] : Foundation Books, 2007
2. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015.
3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013.
4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGrawHill.

B. TECH V SEMESTER	PCC	L	T	P	C
		3	0	0	3

20CS5T02 DATA WAREHOUSING & DATA MINING

Course Objective:

- Understand Warehousing Architectures and tools for systematically organizing large data base and use data to make strategic decisions.
- Understand data mining as a process of knowledge discovery and also about the preprocessing techniques to improve the quality of mining.
- Understand the kinds of patterns that can be discovered by Supervised and Unsupervised learning techniques.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the fundamentals concepts of data warehousing

CO2: Understand KDD Process and data preprocessing**.**

CO3: Discover interesting patterns from large volumes of Data using supervised (classification) learning techniques

CO4: Characterize the kinds of patterns that can be discovered by Association Rule Mining

CO5: Demonstrate unsupervised (clustering) learning techniques

SYLLABUS

Unit-I: Data Warehousing and Online Analytical Processing:

Basic Concepts: What is a Data Warehouse? Differences between Operational Databases system (OLTP) and Data warehouses (OLAP). Data warehousing Architecture, Fundamentals of ETL architecture, A Multidimensional Data Model, Data Marts and Star Schema Design.

Unit-II: Introduction: Fundamentals of data mining:

Kinds of data, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Discretization.

Unit-III: Classification and Prediction:

Basic concepts: What is Classification? General Approach to solving a Classification problem. Decision Tree Induction: Working of Decision Tree, building a Decision Tree, methods for expressing an Attribute test Conditions, measures for selecting the best split, Algorithm for Decision Tree Induction. Bayes Classification Methods:

Bayes' Theorem, Naive Bayesian Classification, Bayesian Belief Networks, K-Nearest-Neighbor Classifiers.

Unit-IV: Association Analysis:

Basic Concepts and Algorithms: Frequent Item Set generation: The Apriority Principle, Frequent Item set Generation in the Apriori Algorithm, Candidate Generation and Pruning, Support counting. Rule generation: Confidence- Based Pruning, Rule Generation in Apriori Algorithm. Compact Representation of Frequent Item sets: Maximal Frequent Item sets, Closed Frequent Item sets. FP-Growth Algorithm: FP Tree Representation, Frequent Itemset Generation in FP-Growth Algorithm.

Unit-V: Cluster Analysis:

What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.

TEXT BOOKS:

1. Jiawei Han Micheline Kamber, "Data mining & Techniques", Morgan Kaufmann Publishers. (Units-1,2,5)
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Publications. (Units-3,4)

REFERENCES:

1. S.N.Sivanandam, S.Sumathi, "Data Mining – Concepts, Tasks and Techniques", Thomson
2. Ralph Kimball, "The Data Warehousing Toolkit", Wiley.
3. Margaret H. Dunham, "Data mining - Introductory and advanced topics", Pearson
   Education.
4. D.Hand, H. Mannila and P.Smyth, "Principles of Data mining", PHI (2001).

		L	T	P	C
B. TECH V SEMESTER	**PCC**	**3**	**0**	**0**	**3**

20CS5T03 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

- To analyze time and space complexities of Algorithms.
- To analyze the Asymptotic performance of Algorithms.
- To apply important Algorithmic design paradigms and methods of analysis.

Course Outcomes:

CO1- Understand the performance Analysis of an Algorithm using Space and Time complexities.

CO2- Understand and Apply the Divide and Conquer strategy.

CO3- Synthesize Efficient Algorithms for common engineering problems using Greedy Method

CO4- Apply and analyze the complexity of dynamic programming strategy.

CO5- Ability to solve complex problems using Back Tracking and Branch & Bound.

SYLLABUS

UNIT - I: Introduction:

Algorithm, Algorithm Specification Pseudo code conventions, Recursive Algorithms, Performance Analysis-Space complexity, Time complexity, Amortized Complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Randomized Algorithms.

UNIT - II: Divide and Conquer Method:

General Method, Defective Chessboard, Binary search, finding the maximum and minimum, Merge sort, Quick sort, Selection sort, Strassen's Matrix Multiplication.

UNIT – III: Greedy Method:

General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning tree (Prim's and Kruskal's Algorithms), Single source shortest paths.

UNIT - IV: Dynamic programming:

General Method, Multistage graphs, All pairs-shortest paths, Optimal Binary Search Tree, String Editing, 0/1 knapsack, Travelling salesman problem.

Back tracking: General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian Cycles.

UNIT - V: Branch and bound:

General Method, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, travelling salesman problem.

Introduction to NP-Hard & NP-Complete Problems – Basic Concepts, Cook's Theorem, NP-Hard Scheduling Problems, Flow shop Scheduling, Job shop Scheduling.

TEXT BOOKS:

1. "Fundamentals of computer algorithms" E. Horowitz S. Sahni, University Press.

REFERENCES:

1. "The Design and Analysis of Computer Algorithms", Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman
2. "Algorithm Design", Jon Kleinberg, Pearson.
3. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein. PHI Learning.

B. TECH V SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS5T04 OBJECT ORIENTED ANALYSIS AND DESIGN
(Professional Elective -I)

Course Objectives:

- To understand how to solve complex problems
- Analyze and design solutions to problems using object oriented approach.
- Study the notations of Unified Modelling Language.

Course Outcomes:

CO1: Understand the necessity of Object Modeling.

CO2: Represent classes, responsibilities and states using UML notation.

CO3: Demonstrate knowledge about the conceptual Model of UML.

CO4: Model the event driven state of object and transform them into implementation specific layouts.

CO5: Identify, Analyze the subsystems, various components and collaborate them interchangeably.

SYLLABUS

UNIT – I: Introduction:

The Inherent Complexity of Software, The Structure of Complex systems, Bringing Order to Chaos, The Evolution of Object Model, Foundation of Object Model, Elements of Object Model, Applying the Object Model.

UNIT – II: Classes and Objects:

Nature of object, Relationships among objects, Nature of a Class, Relationship among Classes, Interplay of Classes and Objects, Identifying Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

UNIT – III: Basic Behavioral Modeling:

Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams, sequence diagram, collaboration diagram, state chart diagram.

UNIT – IV: Advanced Behavioral Modeling:

Events and Signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT – V: Case Studies:

The Unified Library application, ATM System, Weather Monitoring System.

TEXT BOOKS:

1. "Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, 3rd edition, 2013, PEARSON.(Units 1,2)
2. "The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON(Units 3, 4).

REFERENCES:

1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI.
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O‟Reilly.
3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning.
4. "The Unified 8odelling language Reference manual", James Rumbaugh, Ivar Jacobson, Grady Booch, Addison-Wesley.

B. TECH V SEMESTER		**L**	**T**	**P**	**C**
	PEC	**3**	**0**	**0**	**3**

20CS5T05 ADVANCED COMPUTER ARCHITECTURE
(Professional Elective -I)

Course Objectives:

- Understand the idea of Parallelism in hardware and software.
- Understand functionalities of different memory systems and buses.
- Understand the features and functionalities in advanced processor architectures.

Course Outcomes:

CO1: Understand design of a computer and its Instruction Set

CO2: Understand performance of different pipelined processors and memory mapping techniques.

CO3: Acquire in-depth knowledge of high performance instruction level parallelism.

CO4: Explore architectural features of advanced processors like shared memory architectures.

CO5: Analyze design issues of inter connection networks.

SYLLABUS

UNIT-I: Fundamentals of Computer Design:

Fundamentals of Computer design, changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law. Instruction set principles and examples- Introduction, Classifying instruction set-Memory addressing- type and size of operands, Operations in the instruction set.

UNIT–II: Pipelines:

Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, and Reducing pipeline branch penalties.

Memory Hierarchy Design: Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT–III: Instruction Level Parallelism the Hardware Approach:

Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, Limitations in Exploiting Instruction Level Parallelism, Thread Level Parallelism.

ILP Software Approach Basic compiler level techniques, Static branch prediction, LIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues – Hardware versus Software.

UNIT–IV: Multi Processors and Thread Level Parallelism:

Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, and Distributed shared – memory architecture, Synchronization.

UNIT–V: Inter Connection and Networks:

Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

TEXT BOOKS:

1. John L. Hennessy and David A. Patterson, Computer Architecture: A quantitative approach 5th ed, Morgan Kaufmann Elsevier, 2013.

REFERENCES:

1. Computer Architecture and Parallel Processing – Kai Hwang, Faye A. Brigs., MC Graw Hill.
2. Advanced Computer Architecture – A Design Space Approach – Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson Ed.

B. TECH V SEMESTER

	L	T	P	C
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20CS5T06 ARTIFICIAL INTELLIGENCE
(Professional Elective -I)

Course Objectives:

- To gain a historical perspective of Artificial Intelligence and its foundations.
- To familiarize the basic principles of Artificial Intelligence towards problem solving Inference, Perception, Knowledge representation and Learning.
- To understand advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems.

Course Outcomes: At the end of the course, the students will be able to:

CO1: To Understand the history of Artificial Intelligence and its foundations.

CO2: Apply various Artificial Intelligence Techniques for problem solving.

CO3: Formalization of knowledge using the framework of predicate logic.

CO4: Ability to apply knowledge representation and reasoning to real world problems.

CO5: Derive conclusions from uncertain knowledge and quantify the uncertainty in the conclusions obtained.

SYLLABUS

UNIT-1:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT-2: Problem Solving:

State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem Reduction and Game Playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT-3: Logic Concepts:

Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-4: Knowledge representation:

Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT-5: Expert system and applications:

Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning (Units 1,2,3,4,5)

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
4. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

B. TECH V SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20CS5L10 DATA WAREHOUSING AND MINING LAB THROUGH PYTHON

Course Objective:

- Explore on data mining features.
- Create and perform preprocessing on new and existing datasets.
- Generate association rules on transactional data.
- Build the data models by using various classification and clustering algorithms.
- Analyze the data models accuracy by varying the sample size.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand Data Mining concepts and knowledge discovery process

CO2: Explore on data insights and preprocessing techniques

CO3: Extract association rules on frequent items in transaction data

CO4: Build and analyze the classification model using various algorithms

CO5: Perform clustering using partition algorithms

LIST OF EXPERIMENTS

Exercise 1: INTRODUCTION

1. Introduction to Python libraries for Data Mining: NumPy, Pandas, Matplotlib etc.

Exercise 2: UNDERSTANDING DATA

Write Python programs to do the following operations:

1. Loading data from CSV file
2. Compute the basic statistics of given data – shape, no. of columns, mean
3. Splitting a data frame on values of categorical variables
4. Visualize data using Scatter plot

Exercise 3: CORRELATION MATRIX

Write a python programs to load the dataset and understand the input data

1. Load data, describe the given data and identify missing, outlier data items
2. Find correlation among all attributes
3. Visualize correlation matrix

Exercise 4: DATA PREPROCESSING – HANDLING MISSING VALUES

Write a python program to impute missing values with various techniques on given dataset.

1. Remove rows/ attributes
2. Replace with mean or mode
3. Write a python program to perform transformation of data using Discretization (Binning) and normalization (MinMaxScaler or MaxAbsScaler) on given dataset.

Exercise 5: ASSOCIATION RULE MINING- APRIORI

Write a python program to find rules that describe associations by using Apriori algorithm

Exercise 6: CLASSIFICATION – DECISION TREES

Write a python program

1. To build a decision tree classifier to determine the kind of flower by using given dimensions.
2. Training with various split measures (Gini index, Entropy and Information Gain)
3. Compare the accuracy

Exercise 7: CLASSIFICATION – BAYESIAN NETWORK

1. Build Bayesian network model using existing default data
2. Visualize Tree Augmented Naïve Bayes model

Exercise 8: CLUSTERING – K-MEANS

Write a python program

1. To perform preprocessing
2. To perform clustering using k-means algorithm to cluster the records

B. TECH V SEMESTER

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20CS5L11 DESIGN AND ANALYSIS OF ALGORITHMS LAB

Objectives:

- The principle objective of this course is to build solid foundation in algorithms and their applications
- To implement various divide and conquer techniques examples
- To implement various Greedy techniques examples
- To implement various Dynamic Programming techniques examples
- To provide a practical exposure of all algorithms
- To understand the importance of algorithm and its complexities

Course Outcomes:

CO1: Students will be able to sort the given numbers using various sorting algorithms.

CO2: Students will be able to write programs for the problems using Divide and Conquer.

CO3: Students will be able to write programs for the problems using Greedy Method.

CO4: Students will be able to write programs for the problems using Dynamic programming.

CO5: Students will be able to write programs for the problems using Backtracking.

LIST OF EXPERIMENTS

1. Write a program to perform operation count for a given pseudo code.
2. Write a Program to perform the following
   i) Binary Search ii) Merge sort iii) Quick sort iv) Selection sort
3. Write a program to find Maximum and Minimum of the given set of integer values using Divide and Conquer Strategy
4. Write a program to implement Strassen's Matrix Chain Multiplication.
5. Write a program to implement Knapsack using Greedy technique.
6. Write a Program to implement job sequencing with deadlines using greedy method.
7. Write a program to Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

8. Write a program to Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
9. Write a program to implement Knapsack using Dynamic programming.
10. Write a program to implement Travelling salesman problem using Dynamic programming.
11. Write a program to implement n-Queen Problem using backtracking.
12. Write a program to solve Sum of subsets problem for a given set of distinct numbers.

Note: Students shall be encouraged to use online coding platforms like Codechef, Hacker rank etc... to solve the problems

B. TECH V SEMESTER		L	T	P	C
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20CS5S12 MOBILE APPLICATION DEVELOPMENT LAB
(Skill oriented course)

Course Objectives:

- Know the components and structure of mobile application development frameworks
  Android and windows OS based mobiles.
- Understand how to work with various mobile application development frameworks
- Learn the basic and important design concepts and issues of development of mobile applications.
- Understand the capabilities and limitations of mobile devices

Course Outcomes

CO1: Install and configure Android application development tools.

CO2: Design and develop user Interfaces for the Android platform.

CO3: Save state information across important operating system events

CO4: Apply Java programming concepts to Android application development.

LIST OF EXPERIMENTS

1. Installation of Android studio.
2. Development Of Hello World Application.
3. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
4. Create a screen that has input boxes for User Name, Password, Address, Gender(radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the submit Button(Use any layout).
5. Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity.
6. Design an android application Send SMS using Intent.
7. Create an android application using Fragments.
8. Design an android application Using Radio buttons.
9. Design an android application for menu.
10. Create a user registration application that stores the user details in a database table.

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B.TECH V SEMESTER	MC	2	0	0	-

20CS5M13 DISASTER MANAGEMENT

Course Learning Objectives: The objective of this course is to

1. Understand Types of disasters like Earthquake, Landslide, Flood, Drought, Fire
2. Know Panchayati Raj Institutions/ Urban Local Bodies (PRIs/ ULBs), States,Centre, and other stakeholders
3. Understand Climate Change Adaptation - IPCC Scenario and Scenarios in the context of India
4. Understand Role of GIS and Information Technology Components in Preparedness, Risk Assessment
5. Know various case studies

Course Learning Outcomes:

On successful completion of this course, the students will be able to

CO1: Differentiate the types of disasters, causes and their impact on environment and society

CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation.

CO3: Draw the hazard and vulnerability profile of India, Scenarios in the Indian context

CO4: Analyze the Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

CO5: Understand about Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment

SYLLABUS

UNIT-I:

INTRODUCTION TO DISASTERS Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT-II:

APPROACHES TO DISASTER RISK REDUCTION (DRR) Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT-III:

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT-IV:

DISASTER RISK MANAGEMENT IN INDIA Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT-V:

DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Text Books:

1. Singhal J.P.“Disaster Management”, Laxmi Publications, 2010. ISBN-10: ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

Reference Books:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009

B. TECH VI SEMESTER	PCC	L	T	P	C
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20CS6T01 MACHINE LEARNING

Course Objectives:

This course will enable students to,

- Differentiate supervised, unsupervised and reinforcement learning
- Covers the techniques on how to make learning by a model, evaluate it and understand different algorithms to construct a learning model.
- Formulate machine learning problems corresponding to various applications.

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with it.

CO3: Apply effectively neural networks for appropriate applications.

CO4: Apply Bayesian techniques and derive effectively learning rules.

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I: Introduction:

Well posed learning problems, designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II: Decision Tree Learning:

Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Back propagation algorithm.

UNIT-III: Bayesian Learning:

Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, I Bayes classifier, Bayesian belief networks, EM algorithm

Evaluating Hypothesis: Motivation, estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

UNIT-IV: Learning Sets of Rules:

Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning.

UNIT-V: Genetic Algorithms:

Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Reinforcement Learning: Introduction, Learning Task, Q Learning.

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
2. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

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B. TECH VI SEMESTER	**PCC**	**3**	**0**	**0**	**3**

20CS6T02 COMPUTER NETWORKS

Course Objectives:

- Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
- Familiarize the basic taxonomy and terminology of the computer networks.
- Learn various IEEE standards for medium access.
- Recognize different network connecting protocols & devices.

Course Outcomes:

CO1: Independently enumerate the layers of the OSI model and TCP/IP.
CO2: Identify the different types of network topologies and protocols.
CO3: Compare and contrast methods to detect errors and correct them in data link layer.
CO4: Differentiate between various network routing algorithms.
CO5: Understand WWW and HTTP Architectures.

SYLLABUS

UNIT – I: **Introduction**:
OSI overview, TCP/IP and other networks models, Examples of Networks: Arpanet, Internet, Network Topologies Wide Area Networks(WAN), Local Area Networks(LAN), Metropolitan Area Networks(MAN).

UNIT – II: **Physical Layer and overview of PL Switching**:
Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, introduction to switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

UNIT – III: **Data link layer**:
Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction, CRC, Checksum: idea, one’s complement internet checksum, services provided to Network.
Elementary Data Link Layer protocols: Simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel. Sliding window protocol: One bit, Go-back N, Selective Repetitive protocol, Stop and wait protocol.

UNIT – IV: Random Access:

ALOHA, MAC addresses, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access(CDMA).

Network layer: Shortest Path, Distance Vector Routing Algorithm, Hierarchal routing algorithm

UNIT – V: Application layer (WWW and HTTP):

WWWARCHITECTURE: Client (Browser), Server, Uniform Resource Locator, Resource Record, HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Request Message Format, HTTP Response Message Format.

TEXT BOOKS:

1. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH. Units (1,2,4)
2. Computer Networks –Andrew S Tanenbaum, 4th Edition. Pearson Education (Units 1,3,5)

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

B. TECH VI SEMESTER	PCC	L	T	P	C
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20CS6T03 BIG DATA ANALYTICS

Course Objectives:

- Learning Java concepts for developing different Data Models in Big Data.
- Understanding the architectural concepts of HDFS and its Configuring Modes.
- Introducing MapReduce Paradigm.
- Introducing Programming tools PIG & HIVE in Hadoop echo System.

Course Outcomes:

CO1: Applying Java concepts for developing Map Reduce Programs.
CO2: List the components of Hadoop and its eco-system.
CO3: Working with Building Blocks of HDFS and Big Data.
CO4: Building various Map Reduce Programs using Java.
CO5: To introduce programming tools like PIG and HIVE in Hadoop eco-system.

SYLLABUS

UNIT-I: Data structures in Java:

Stacks, Queues, Linked List, Sets, Maps; **Generics:** Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization.

UNIT-II: Working with Big Data:

Google File System, Hadoop Distributed File System (HDFS) –Building blocks of Hadoop (Namenode, Datanode, Secondary Name node, Job Tracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-III: Writing MapReduce Programs:

A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), **Basic Programs of Hadoop MapReduce:** Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner.

UNIT-IV: Hadoop I/O:

The Writable Interface, Writable Comparable and comparators, **Writable Classes:** Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections.

UNIT-V: Pig: Hadoop Programming Made Easier:

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

UNIT-VI: Applying Structure to Hadoop Data with Hive:

Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analysing Data.

TEXT BOOKS:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B. Melnyk, Bruce Brown, Rafael Coss

REFERENCE BOOKS:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne.

SOFTWARE LINKS:

1. Hadoop: http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Pig Latin: http://pig.apache.org/docs/r0.7.0/tutorial.

B. TECH VI SEMESTER		**L**	**T**	**P**	**C**
	PEC	**3**	**0**	**0**	**3**

20CS6T04 SOFTWARE TESTING METHODOLOGIES
(Professional Elective-II)

Course Objectives:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To Understand different levels of Testing
- Apply Black Box and White Box Testing Techniques
- To learn how to plan a test project, design test cases and data, conduct testing operations, and generate a test report.
- To understand software test automation problems and solutions.

Course Outcomes:

CO1: Have an ability to apply software testing knowledge and engineering methods.
CO2: Ability to identify the needs of software test automation, and define a test tool to support test automation.
CO3: Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
CO4: Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.
CO5: Apply techniques and skills to use modern software testing tools to support software testing projects.

SYLLABUS

UNIT-I: Software Testing:
Introduction, Evolution, Dichotomies, Goals & Typical Objectives of Testing, Model for testing, Software Testing Principles, **Software Testing Terminology and Methodology:** Software Testing Terminology, Errors, Defects, Failures, Root Causes and Effects, Software Testing Life Cycle, Software Testing Methodology.
UNIT-II: Verification and Validation:
Verification & Validation Activities, Categories of Test Techniques: Dynamic Testing, **Black Box testing techniques:** Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing,

White-Box Testing: Need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT-III: Static Testing:

Inspections, Structured Walkthroughs, Technical reviews, Benefits of Static Testing, Static Vs Dynamic Testing.

Levels of Testing: Unit testing, Integration Testing,. Function testing, System testing and Acceptance testing.

Regression testing: Progressive Vs Regressive testing, Objectives of regression testing, Regression testing techniques

UNIT-IV: Test Management:

Test Organization, Test Planning, Test Design and Test case specifications, Structure of a Testing Group, Reasons for the growth of a Test suite, Test suite Minimization, Test suite prioritization, Types of test case prioritization, prioritization techniques, Measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models

Debugging: Debugging process, Debugging Techniques, Correcting Bugs, Debuggers

UNIT-V: Automation and Testing Tools:

Need for automation, Testing Tool Considerations, Test Tool Classification, Benefits and Risks of Test automation, Special Considerations for Test execution and Test Management Tools, Principles for tool selection, Testing tools- success factors, Guidelines for automated testing, overview of some commercial testing tools.

Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web **engineering**, testing of web based systems, Testing mobile systems.

TEXT BOOKS:

1. Software testing techniques - Baris Beizer, International Thomson computer press, second edition. (Unit 1)
2. Software Testing, Principles and Practices, Naresh Chauhan, Oxford Publishers(Unit 2,3,4,5)

REFERENCES:

1. Effective Methods for Software testing, Willian E Perry, 3ed, Wiley
2. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
3. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

B. TECH VI SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS6T05 MEAN STACK TECHNOLOGIES
(Professional Elective-II)

Course Objectives:

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- Writing optimized front end code HTML and JavaScript
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
- Design and implementation of Robust and Scalable Front End Applications

Course Outcomes:

CO1: Enumerate the Basic Concepts of Web & Markup Languages
CO2: Develop web Applications using Scripting Languages & Frameworks
CO3: Make use of Express JS and Node JS frameworks
CO4: Illustrate the uses of web services concepts like restful, React JS
CO5: Apply Deployment Techniques & Working with cloud platform

SYLLABUS

UNIT-I: Introduction to Web:

Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT-II: JavaScript:

The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions.

Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

UNIT-III: Node.js:

Introduction, Advantages, Node.js Process Model, Node JS Modules.

Express.js: Introduction to Express Framework, Introduction to Nodejs, What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling, API Handling, Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

UNIT-IV: RESTful Web Services: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests.

React js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, React DOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

UNIT-V: Mongo DB:

Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

TEXT BOOKS:

1. Programming the World Wide Web, Robet W Sebesta, 7ed,Pearson.
2. Web Technologies, Uttam K Roy,Oxford
3. Pro Mean Stack Development, ELadElrom,Apress
4. Restful Web Services Cookbook, SubbuAllamraju,O'Reilly
5. JavaScript & jQuery the missing manual, David sawyer mcfarland,O'Reilly
6. Web Hosting for Dummies, Peter Pollock, John WileyBrand

REFERENCES:

1. Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly(2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, DreamTech
4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, CengageLearning
5. Express.JS Guide, The Comprehensive Book on Express.js, AzatMardan, LeanPublishing.

B. TECH VI SEMESTER

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PEC	3	0	0	3

20CS6T06 COMPILER DESIGN
(Professional Elective-II)

Course Objectives:

- Create an overall view of various types of translators, linkers, loaders, and phases of a compiler.
- Understand the syntax analysis phase; various types of parsers- top down approach, bottom up parsers.
- Various aspects of the run-time environment into which the high-level code is translated.
- To apply the code generation algorithms to get the machine code for the optimized code.

Course Outcomes:

CO1: Acquire knowledge in different phases and passes of Compiler.

CO2: Demonstrate knowledge about scanning of tokens and perform the syntax analysis by using Top-down parsing techniques.

CO3: Perform the syntax analysis by using Bottom Up parsing techniques for more complex grammars.

CO4: Compare different memory management techniques in runtime environment.

CO5: Generate effective code by applying code optimization techniques.

SYLLABUS

UNIT–I:

Language Processors, Phases of Compilation – Lexical Analysis, Regular Grammar and regular expression for common programming language features, pass and Phases of translation, interpretation, bootstrapping.

Lexical Analysis: The role of lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, The lexical analyzer generator - LEX.

UNIT–II: **Syntax Analysis**:

The Role of a parser, Context free Grammars, Writing a grammar, Top down parsing - Backtracking, LL (1) Grammars, Recursive descent parsing, Non – recursive Predictive parsing, Error recovery in Predictive Parsing.

Bottom up parsing: Reductions, Handle Pruning, Shift – Reduce Parsing, Conflicts during Shift – Reduce Parsing.

UNIT –III: Simple LR Parser:

LR Parsing Algorithm, SLR - Parsing Table.

More Powerful LR parser – Constructing Canonical LR1, LALR parsing tables, Using Ambiguous Grammars, Error Recovery in LR parser.

UNIT – IV: Intermediated Code Generation:

Variants of Syntax trees, 3 Address code – Quadruples, Triples.

Runtime Environments: Stack allocation of space, Access to Non Local data on the stack, Heap Management.

UNIT – V: Code Generation:

Issues in design of code generation, the target Language, peephole Optimization, A simple Code Generator. Basic Blocks & Flow Graphs, Optimization of Basic Blocks – DAGs, Local Common sub expression elimination.

Machine independent code optimization:

The principle sources of Optimization: Global Common sub expression elimination - Constant folding - Copy propagation - Dead code elimination – Induction Variable & Strength reduction - Loop optimization - Procedure in-lining.

TEXT BOOKS:

1. Compilers – Principles, Techniques and Tools. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffery D. Ullman, 2nd edition, Pearson - 2007.

REFERENCES:

1. Implementations of Compiler, A New approach to Compilers including the algebraic methods, Yunlinsu, SPRINGER.
2. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3. LEX & YACC – John R. Levine, Tony Mason, Doug Brown, O'reilly.
4. Principles of compiler design, 2nd edition, Nandhini Prasad, Elsevier.

		L	T	P	C
B. TECH VI SEMESTER	**PCC**	**0**	**0**	**3**	**1.5**

20CS6L10 MACHINE LEARNING LAB

Course Objectives:

This course will enable students to,

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes:

After studying this course, the students will be able to

CO1: Understand the implementation procedures for the machine learning algorithms

CO2: Design Java/Python programs for various Learning algorithms.

CO3: Apply appropriate data sets to the Machine Learning algorithms

CO4: Identify and apply Machine Learning algorithms to solve real world problems

LAB EXPERIMENTS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

***Note:* Students shall be advised and encouraged to submit a mini project or a case study demonstrating the concepts learnt.**

B. TECH VI SEMESTER **PCC**

L	T	P	C
0	0	3	1.5

20CS6L11 COMPUTER NETWORKS LAB

Course Outcomes:

- Understand the various Routing Protocols/Algorithms and Internetworking
- Apply the basics of Physical layer in real time applications
- Apply data link layer concepts, design issues, and protocols

LIST OF LAB EXPERIMENTS

1. Implement the data link layer farming methods such as character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
3. Implement Dijkstra's algorithm to compute the Shortest path through a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
5. Take an example subnet of hosts. Obtain broadcast tree for it.
6. Write program to perform sliding window protocol.
7. Design TCP Client and server application to reverse the given input sentence
8. Design UDP Client and server application to reverse the given input sentence
9. Write a C program to develop a DNS client server to resolve the given hostname.
10. Write a program for congestion control using leaky bucket algorithm.

B. TECH VI SEMESTER

PCC	L	T	P	C
	0	0	3	1.5

20CS6L12 Big Data Analytics Lab

Course Outcomes:

- Developing different Data Models in Big Data.
- Building HDFS.
- Building various MapReduce Programs.
- Programming using PIG.
- Working with Hive.

LIST OF LAB EXPERIMENTS

Exercise 1:

1. Implement the following Data structures in Java.
   a) Linked Lists b) Stacks c) Queues d) Set e) Map

Exercise 2:

2. Perform setting up and Installing Hadoop in its three operating modes:
   a) Standalone, b) Pseudo distributed, c) Fully distributed
3. Use web-based tools to monitor your Hadoop setup.

Exercise 3:

4. Implement the following file management tasks in Hadoop:
   a) Adding files and directories b) Retrieving files c) Deleting files.

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Exercise 4:

5. Run a basic Word Count Map Reduce program to understand MapReduce Paradigm.

Exercise 5:

6. Write a Map Reduce program that mines weather data. Weather Sensors collecting data every hour at many locations across the Globe gathers a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi-structured and record oriented.

Exercise 6:

7. Implement Matrix Multiplication with Hadoop Map Reduce.

Exercise 7:

8. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Exercise 8:

9. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

B. TECH VI SEMESTER		**L**	**T**	**P**	**C**
	SC	**0**	**0**	**4**	**2**

20CS6S13 SOFT SKILLS

(Skill Oriented Course)

Course Outcomes

The student will acquaint himself with various nuances of Soft Skills and Personality Development besides aspects related to Campus Recruitment Process.

SYLLABUS

1 Life Skills
2 JAM
3 Presentation Skills
4 Resume Writing
5 Group Discussion
6 Interview Skills

References:

1. ***Interact*,** Orient Blackswan
2. **Communication Skills,** Sanjay Kumar and Pushp Latha.OUP,2011

B. TECH VI SEMESTER	L	T	P	C
	MC 2	-	-	-

20CS6M14 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing.
- Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Understand the significance of Indian Traditional Knowledge
CO2: Classify the Indian Traditional Knowledge
CO3: Compare Modern Science with Indian Traditional Knowledge system.
CO4: Analyze the role of Government in protecting the Traditional Knowledge
CO5: Understand the impact of Philosophical tradition on Indian Knowledge System.

SYLLABUS

Unit I

Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in Global Economy.

Unit II

Basic structure of Indian Knowledge System: Astadash Vidya- 4 Ved - 4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi),6vedanga (Shisha, Kalppa, Nirukha,Vykaran, Jyothisha & Chand),4upanga (Dharmashastra, Meemamsa, purana & Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System: Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge - Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain &Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, Nruthya Yevam Sahithya.

Text Books

1. Traditional Knowledge System in India, by AmitJha, 2009.

2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.

References

1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, BharatiyaVidya

2. Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan

3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.

4. Pramod Chandra, India Arts, Howard Univ. Press, 1983.

5. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html

2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf

3.https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_tex t.pdf

B. TECH VII SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS7T01 SOFTWARE PROJECT MANAGEMENT
(Professional Elective-III)

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

CO1: Apply the process to be followed in the software development life-cycle models.

CO2: Apply the concepts of project management & planning.

CO3: Implement the project plans through managing people, communications and change

CO4: Conduct activities necessary to successfully complete and close the Software projects

CO5: Implement communication, modeling, and construction & deployment practices in software development.

SYLLABUS

UNIT I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

TEXT BOOKS:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

REFERENCES:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH VII SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS7T02 CLOUD COMPUTING
(Professional Elective-III)

Course Objectives:

- Explain the technology and principles involved in building a cloud environment
- To implement Virtualization
- Understand various types of cloud and its services
- Contrast various programming models used in cloud computing

Course Outcomes:

CO1: Describe the principles of parallel and distributed computing and evaluation of cloud computing from existing technologies
CO2: Illustrate Virtualization for Data-Center Automation.
CO3: Explain and characterize different cloud deployment models and service models
CO4: Program data intensive parallel applications in cloud.
CO5: Understand commercial cloud computing technologies such as AWS, AZURE and AppEngine

SYLLABUS

UNIT-I: Introduction:

Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development,Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Microsoft Aneka.

UNIT-II: Virtualization:

Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen, VMware, Microsoft Hyper – V.

UNIT-III: Cloud Computing Architecture:

Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy.

UNIT-IV: Data Intensive Computing: Map-Reduce Programming:

What is Data-Intensive Computing? Characteristics, Challenges, Historical Perspective. Technologies for Data Intensive Computing: Storage Systems, Programming Platforms.

Cloud Applications: Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.

UNIT-V: Cloud Platform in Industry and Cloud Applications:

Cloud Platforms in Industry: Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

TEXTBOOKS:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud Computing McGraw Hill Education.

REFERENCES:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.
3. Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan Kaufmann, 2013.

B. TECH VII SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS7T03 CRYPTOGRAPHY AND NETWORK SECURITY

(Professional Elective-III)

Course Objectives:

- Understand the concepts of classical encryption techniques and concepts of finite fields and number theory
- Understand Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Understand the Design issues and working principles of various authentication protocols, PKI standards
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications.

Course Outcomes:

CO1: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

CO2: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO3: Apply different digital signature algorithms to achieve authentication and create secure applications

CO4: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

CO5: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

SYLLABUS

UNIT - I: Classical Encryption Techniques:

The OSI Security Architecture, Security Attacks, Services & Mechanisms, Symmetric Cipher Model, Substitution Techniques: Caesar Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques: Rail fence, Row Transposition cipher, Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT - II:

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Block Cipher Modes of Operations.

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem

UNIT – III:

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security.

Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution

UNIT - IV:

User Authentication: Remote User Authentication Principles, Kerberos.

Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.

UNIT - V:

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS)

Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration

TEXT BOOKS:

1. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition. [Units 1,2,3,4,5]
2. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition. [Units 1,2,3,4,5]

REFERENCES:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

B. TECH VII SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS7T04 HUMAN COMPUTER INTERACTION

(Professional Elective-IV)

Course Objectives:

- Understand the guidelines, principles, and theories influencing human Computer interaction.
- Understand and apply steps of experimental design, usability and experimental testing and evaluation of Human Computer Interaction systems
- Use the information sources available, and be aware of the methodologies andtechnologies supporting advances in HCI.

Course Outcomes:

CO1: Understand typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.

CO2: Understand the interactive design process and universal design principles to designing HCI systems.

CO3: Understand the importance of Natural Languages in computing interactions.

CO4: Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI Systems.

CO5: Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design.

SYLLABUS

UNIT-I: The User Interface:

Introduction, Importance of the User Interface, Importance and benefits of Good Design History of Human Computer Interface. Characteristics of Graphical and Web User Interface: Graphical User Interface, popularity of graphics, concepts of Direct Manipulation, Graphical System advantages and disadvantages, Characteristics of GUI. Web User Interface, popularity of web, Characteristics of Web Interface, Merging of Graphical Business systems& the Web, Principles of User Interface Design

UNIT-II: The User Interface Design Process:

Obstacles and Pitfall in the development Process, Usability, The Design Team, Human Interaction with Computers, Important Human Characteristics in Design, Human Consideration in Design, Human Interaction Speeds, Performance versus Preference, Methods for Gaining and Understanding of Users

UNIT-III: Understanding Business Functions:

Business Definitions & Requirement analysis, Determining Business Functions, Design standards or Style Guides, System Training and Documentation. Create meaningful Graphics, Icons and Images, Colors-uses, possible problems with colors, choosing colors

UNIT-IV: Principles of Good Screen Design:

Human considerations in screen Design, interface design goals, test for a good design, screen meaning and purpose, Technological considerations in Interface Design System Menus and Navigation Schemes: Structure, Functions, Context, Formatting, Phrasing and Selecting, Navigating of Menus, Kinds of Graphical Menus Windows Interface: Windows characteristic, Components of Window, Windows Presentation Styles, Typesof Windows, Window Management, Web systems

UNIT-V: Device and Screen-Based Control:

Device based controls, Operable Controls, Text entry/read- Only Controls, Section Controls, Combining Entry/Selection Controls, Other Operable Controls and Presentation Controls, Selecting proper controls.

TEXT BOOKS:

1. Wilbert O. Galitz, "The Essential Guide to User Interface Design", Wiley India Edition. (Units 1,2,3,4,5)

REFERENCE BOOKS:

1. Soren Lauesen, "User Interface Design" , Pearson Education.
2. Prece, Rogers, "Sharps Interaction Design", Wiley India.
3. Alan Cooper, Robert Riemann, David Cronin, "Essentials of Interaction Design", Wiley.
4. Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell, Bealg, "Human Computer Interaction", Pearson Education.

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B. TECH VII SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS7T05 MOBILE COMPUTING

(Professional Elective-IV)

Course Objectives:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
- To understand the typical mobile networking infrastructure through a popular GSM protocol.
- To understand the issues and solutions of various layers of mobile networks,
- To understand the database issues in mobile environments & data delivery models.

Course Outcomes:

CO1: Understand the fundamental concepts of Mobile Communication.
CO2: Identify solutions to the technical issues in the mobile communication paradigm.
CO3: Understand the ad hoc network applications and/or algorithms/protocols.
CO4: Understand & develop any existing or new protocol related to mobile environment.
CO5: Understand the platforms and protocols used in mobile environment

SYLLABUS

UNIT-I: Introduction:

Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices. GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

UNIT-II: (Wireless) Medium Access Control (MAC):

Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

UNIT-III: Mobile Network Layer:

IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route

Optimization, DHCP.

UNIT-IV: Mobile Transport Layer:

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks. Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT-V: Data Dissemination and Synchronization:

Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols.

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2009. (Units 1,2,3)
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772 (Units 4,5)

REFERENCE BOOKS:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing, Technology Applications and Service Creation" Second Edition, McGraw Hill.
2. UWE Hansmann, LotherMerk, Martin S. Nocklous, Thomas Stober, "Principles of Mobile Computing," Second Edition, Springer

B. TECH VII SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS7T06 HIGH-PERFORMANCE COMPUTING
(Professional Elective-IV)

Course Objectives:

- To Improve the system performance
- To learn various distributed and parallel computing architecture
- To learn different computing technologies

Course Outcomes:

CO1: Understand the concepts of Modern processors

CO2: Ability to apply optimizes serial code and Data access.

CO3: Understand parallel computers and Parallelism.

CO4: Ability to analyze shared memory and parallel programming with MPI

CO5: Understand Efficient MPI programming

SYLLABUS

UNIT - I:

Modern processors: Stored-program computer architecture, General-purpose cache-based microprocessor architecture, Memory hierarchies, Multicore processors, multithreaded processors, Vector processors

UNIT - II:

Basic optimization techniques for serial code: Scalar profiling, Common sense optimizations, Simple measures, large impact, The role of compilers, C++ optimizations,

Data access optimization: Balance analysis and light speed estimates, Storage order, Algorithm classification and access optimizations.

UNIT – III:

Parallel computers: Taxonomy of parallel computing paradigms, Shared-memory computers, Distributed-memory computers, Networks,

Basics of parallelization: Parallelism, Parallel scalability.

UNIT - IV:

Shared-memory parallel programming with Open MP: Short introduction to Open MP, Case study: Open MP-parallel Jacobi algorithm, Advanced Open MP: Wavefront parallelization, **Efficient Open MP programming:** Profiling OpenMP programs, Performance pitfalls

UNIT - V:

Distributed-memory parallel programming with MPI: Message passing, A short introduction to MPI, Example: MPI parallelization of a Jacobi solver,

Efficient MPI programming: MPI performance tools, Communication parameters, Synchronization, serialization, contention, Reducing communication overhead.

TEXT BOOKS:

1. High Performance. Computing *for.* Scientists *and* Engineers. *Georg* Hager. *Gerhard* Wellein. CRC Press. Taylor *& Francis* Group(Units 1,2,3,4,5)

REFERENCES:

1. R. Buyya, High Performance Cluster Computing: Architectures and Systems, Volume 1, Pearson Education, 2008.
2. (Edited By) I. Foster and C. Kesselman, The Grid: Blueprint for a New Computing Infrastructure, Morgan Kaufmann, Elsevier, 2004.

B. TECH VII SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS7T07 SOFTWARE ARCHITECTURE AND DESIGN PATTERNS
(Professional Elective-V)

Course Objectives:

- To understand interrelationships, principles and guidelines governing architecture and evolution over time.
- To understand various architectural styles, design patterns of software systems.
- To understand implementation of design patterns and providing solutions to real world software design problems.
- To understand patterns with each other and understanding the consequences of combining patterns on the overall quality of a system.

Course Outcomes:

At the end of the course, a student will be able to

CO1: Understand Software Architecture

CO2: Analyze the Software Architectures.

CO3: Classify Design Patterns.

CO4: Describe Behavioral Patterns.

CO5: Discuss usage of Architectural Structures.

SYLLABUS

UNIT-I:

Envisioning Architecture: The Architecture Business Cycle, what is Software Architecture? Architectural patterns, reference models, reference architectures, architectural structures and views.

Creating and Architecture: Quality Attributes, Achieving qualities, Architectural styles and
patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT-II:

Analyzing Architectures: Architecture Evaluation, Architecture design decision making, ATAM, CBAM

Moving from One System to Many: Software Product Lines, Building systems from off the shelf components, Software architecture in future.

UNIT-III:

Patterns: Pattern Description, organizing catalogs, role in solving design problems, Selection and usage.

Creational Patterns: Abstract factory, Builder, Factory method, Prototype, Singleton

UNIT-IV:

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, PROXY.

Behavioral Patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

UNIT-V:

A Case Study (Designing a Document Editor): Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003. (Units 1,2,3,4)
2. Design Patterns, Erich Gamma, Pearson Education, 1995. (Unit 3)

REFERENCE BOOKS:

1. Beyond Software architecture, Luke Hohmann, Addison Wesley, 2003.
2. Software Architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR.
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006

B. TECH VII SEMESTER		**L**	**T**	**P**	**C**
	PEC	**3**	**0**	**0**	**3**

20CS7T08 AD HOC & SENSOR NETWORKS
(Professional Elective-V)

Course Objectives:

At the end of the course, the student will be able to:

- Identify and Distinguish between the notion of Wired and Wireless Networks.
- Analyze the basic concepts for designing a routing Protocol for MANETs.
- Learn the concepts of Security issues for designing a routing protocol for MANETs.
- Learn the Basic concepts of Sensor Networks for Communication in Mobile computing.
- Apply Fundamental principles Characteristics for designing Sensor Networks for Communication

Course Outcome:

On successful completion of this course, the student should be able to:

CO1: Understand the basics of Ad hoc networks and Wireless Sensor Networks
CO2: Apply this knowledge to identify the suitable routing algorithm based on the network and user requirement
CO3: Apply the knowledge to identify appropriate physical and MAC layer protocols
CO4: Understand the transport layer and security issues possible in Ad hoc and sensor networks.
CO5: Understand Hybrid wireless Network concepts.

SYLLABUS

UNIT I:

Ad Hoc Networks – Introduction And Routing Protocols: Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet.

Routing Protocol for Ad Hoc Wireless Networks: Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols, Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols, Ad hoc On–Demand Distance Vector Routing (AODV).

UNIT II:

Sensor Networks – Introduction & Architectures: WSN application examples, Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

Single-Node Architecture: Hardware Components, Energy Consumption of Sensor Nodes, **Network Architecture:** Sensor Network Scenarios, Optimization goals and figures of merit, Design Principles for WSNs.

UNIT III:

WSN Networking Concepts and Protocols:

MAC Protocols: Fundamentals of MAC protocol WSN, Low Duty Cycle Protocols and Wakeup Concepts – S-MAC, The Mediation Device Protocol; Contention based protocols – CSMA, PAMAS; Schedule based protocols – LEACH, SMACS, TRAMA; IEEE 802.15.4 MAC protocol;

Routing Protocols: Many faces of forwarding & routing, Energy Efficient Routing, Broadcast & Multicast, Geographic routing.

UNIT IV:

Transport Layer and QoS: The Transport layer and QoS in WSN, coverage and deployment, Reliable data transport, Single packet delivery, Block delivery, Congestion control and rate control.

Advanced Application support: Advanced in-network processing, Security: Security considerations in wireless sensor networks, DoS attacks; Application specific support.

UNIT V:

Hybrid Wireless Networks: Introduction, Next Generation: Classification of Hybrid Architectures, MCN, MADF, iCAR, HWN, SOPRANO, MuPAC, TWiLL, DWiLL, UCAN

TEXTBOOKS:

1. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 2004.[Unit 1]
2. Protocols and Architectures for Wireless Sensor Networks, Holger Karl, Andreas Willig, John Wiley & Sons, Ltd, 2005.[Units 2,3,4,5]

B. TECH VII SEMESTER		L	T	P	C
	PEC	3	0	0	3

20CS7T09 SOCIAL NETWORK ANALYSIS
(Professional Elective-V)

Course Objectives:

- To understand the concept of semantic web and related applications.
- To understand functionality of various communities in web social networks.
- To understand human behaviour and privacy issues in social web and related communities.

Course Outcomes:

Upon completion of the course, the students should be able to:

CO1: Understand and Develop semantic web related applications.

CO2: Represent knowledge using ontology.

CO3: Understand Web Mining

CO4: Predict human behavior in social web and related communities.

CO5: Interpret data from Social Networks using visualization techniques.

SYLLABUS

UNIT-I: Introduction:

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT-II: Modelling, Aggregating and Knowledge Representation:

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT-III: Extraction and Mining Communities in Web Social Networks:

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.

UNIT-IV: Predicting Human Behavior and Privacy Issues:

Understanding and predicting human behavior for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT-V: Visualization and Applications Of Social Networks:

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TEXT BOOKS:

1. Social Networks and the Semantic Web, Peter Mika, 1st Edition, Springer 2007.
   (Units 1, 2, 3)
2. Handbook of Social Network Technologies and Applications, Borko Furht, 1st Edition, Springer, 2010. (Units 4, 5)

REFERENCES

1. Guandong Xu, Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.

B.TECH VII SEMESTER

HSMC	L	T	P	C
	3	0	0	3

20CS7T16 UNIVERSAL HUMAN VALUES 2
Understanding Harmony

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcome

On completion of this course, the students will be able to

CO1: Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society

CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.

CO3: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society

CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.

CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

SYLLABUS

UNIT- I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I

2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential

Validation- as the process for self-exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority

5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT- II

Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

10. Understanding the characteristics and activities of 'I' and harmony in 'I'

11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT- III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

22. Definitiveness of Ethical Human Conduct

23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

24. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

25. Case studies of typical holistic technologies, management models and production systems

26. Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations

27. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Readings

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj – Pandit Sunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)

13. Gandhi - Romain Rolland (English)

B. TECH VII SEMESTER	SC	L	T	P	C
		0	0	4	2

20CS5S17 DATA VISUALIZATION USING TABLEAU

(Skill Oriented Course)

Course Objectives: At the end of the course, students will be able to:

1 Use Tableau's visualization tools to conduct data analysis, especially exploration of an unfamiliar dataset.

2 Discuss concepts and principles of data visualization particularly related to decision making

3 Use data visualizations, dashboards, and Tableau Stories to support relevant communication for diverse audiences.

Course Outcomes: At the end of the course, students will learn

CO1: To design effective dashboard for decision making at various levels.

CO2: To visualize data using charts, maps, tables, and other visual representations of data.

Experiments:

1) Creating Your First visualization

- Getting started with Tableau Software
- Using Data file formats
- Connecting your Data to Tableau
- Creating basic charts (line, bar charts, Treemaps)
- Using the Show me panel

2) Tableau Calculations

- Overview of SUM, AVR, and Aggregate features
- Creating custom calculations and fields
- Applying new data calculations to your visualization

3) Formatting Visualizations

- Formatting Tools and Menus
- Formatting specific parts of the view
- Editing and Formatting Axes

4) Manipulating Data in Tableau

- Cleaning-up the data with the Data Interpreter
- Structuring your data
- Sorting and filtering Tableau data

- Pivoting Tableau data

5) Advanced Visualization Tools

- Using Filters
- Using the Detail panel
- Using the Size panels
- Customizing filters
- Using and Customizing tooltips
- Formatting your data with colors

6) Creating Dashboards & Stories

- Using Storytelling
- Creating your first dashboard and Story
- Design for different displays
- Adding interactivity to your Dashboard

7) Distributing & Publishing Your Visualization

- Tableau file types
- Publishing to Tableau Online
- Sharing your visualization
- Printing and exporting

References:

1) Pro Tableau - A Step By Step Lab Guide ISBN-13: 978-1484223512, publisher – Apress.
2) Show me the Numbers: Designing Tables and Graphs to Enlighten. by Stephen Few
3) The Data Loom: Weaving Understanding by Thinking Critically and Scientifically with Data. by Stephen Few
4) The Big Book of Dashboards: Visualizing your Data using Real-World Business Scenarios by Steve Wexler, Jeffrey Shaffer, and Andy Cotgreave
5) Tableau 10 Business Intelligence Cookbook: ttps://www.packtpub.com/big-data-and-businessintelligence/tableau-10-business-intelligence-cookbook
6) Tableau Desktop: Students should download and install the free version of Tableau for class use here: http://www.tableau.com/academic/students

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE5T04 ARCHITECTURE AND TOWN PLANNING
(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

- Initiating the students to different architectures of the world.
- Salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization.
- Architectural Design concepts, Principles of Planning and Composition.
- To understand town planning from ancient times to modern times.
- To impart the concepts of town planning standards.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Student should be able to distinguish architectural styles of eastern and Western world.

CO2: Student should understand the importance of Orders of Architecture.

CO3: Should be able to compose spaces of buildings using design concepts, planning principles.

CO4: Student should understand the town planning standards, landscaping features.

SYLLABUS

UNIT-I:

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace – Fort - Tomb.

UNIT-II:

Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT-III:

Principles of Planning: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements,

Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wright, Walter Groping.

UNIT-IV:

Histroical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT-V:

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning-neighbor hood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation planning regulations and limitations.

Text books:

1. 'The great ages of World Architecture' by G.K. Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y. S.Sane.
3. 'Professional Practice' by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, NewDelhi.
4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning'by G.K. Haraskar.

Reference Books:

1. 'Drafting and Design for Architecture' by Hepler, Cengage
2. Learning 'Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.
3. 'Mordern Ideal Homes for India' by R. S. Deshpande.
4. 'Town and County Planning' by A.J. Brown and H.M. Sherrard.
5. 'Town Design' by Federik Glbbard, Architectural press, London.

		L	T	P	C
B.TECH V SEMESTER	**OEC**				
		3	0	0	3

20CE5T05 ELEMENTS OF CIVIL ENGINEERING

(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources, Water Supply, Sanitary, Electrical Works in Building and Highway engineering.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: The student should be able to know the basics of civil engineering and concepts of surveying.

CO2: The student should be able to know various properties of building materials and various types of building.

CO3: The student should be able to know the fundamentals of Water Resources, Water Supply, Sanitary and Electrical Works in Building.

CO4: The student should be able to know the fundamental concepts highway engineering.

SYLLABUS

UNIT-I:

Introduction. Introduction of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on economy of country.

UNIT-II:

Surveying Introduction: Definition of Surveying, Fundamental principles of surveying, Classification of surveying.

Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining and Ranging.

Angular Measurement: Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing local attraction.

Levelling: Objectives and applications-terminology-Instruments, component parts of dumpy level, Types of levelling, levelling staff

UNIT-III:

Building Materials and Construction Materials: Introduction to construction materials - Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen. Construction: Classification of buildings, Building components and their functions.

UNIT-IV:

Water Resources Hydrologic cycle, water use and its conservation, Introduction to dams, barrages and check dams. Water Supply, Sanitary and Electrical Works in Building Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

UNIT–V:

Transportation Engineering, classification of roads, Introduction of flexible and rigid pavements, Introduction to road traffic and traffic control mechanism.

Text Books:

1. Elements of Civil Engineering, Mimi Das Saikia, Bhargab Mohan Dasand Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, Publisher: McGraw Hill Education, India Pvt. Ltd.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, Arun kumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books:

1. Surveying Theory and Practice, James M Anderson and Edward, 7th Edition, M Mikhail Publisher: McGraw Hill Education, India Pvt. Ltd.
2. Surveying and Leveling, R. Subramanian Publisher, Oxford University.
3. Building drawing, M.G. Shah, C.M.Kale and S.Y. Patki Publisher: TataMcGraw Hill.

		L	T	P	C
B.TECH V SEMESTER	**OEC**	**3**	**0**	**0**	**3**

20EE5T04 BASICS OF CONTROL SYSTEMS
(OPEN ELECTIVE-I)

Course Objectives:

- To Enable the student to understand the importance of Modelling of Control systems
- To understand the First order & second order systems
- To understand the transfer function analysis
- To understand the Stability of the systems
- To understand the States Space Analysis

Course Outcomes:

At the end of the course, the student will be able to

CO1: Understand the different Classification of control systems and modelling

CO2: Understand the functioning of Signals & time response analysis

CO3: Understand the concept of Root Locus & Construction of Root Loci

CO4: Understand the concept of Bode plot & Nyquist Plot

CO5: Understand the concept of States Space Analysis of LTI System

SYLLABUS

UNIT – I

Mathematical Modeling of Control Systems: Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems

UNIT-II

Time Response Analysis: Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III

Stability and Root locus Technique: The concept of stability – Routh's stability criterion –limitations of Routh's stability –Root locus concept - construction of root loci

UNIT–IV

Frequency Response Analysis: Introduction to Frequency domain specifications- Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots.

UNIT–V

State Space Analysis of LTI Systems: Concepts of state variables and state model, state space representation of transfer function, Diagonalization- Solving the time invariant state equations.

Text Books:

1. Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2nd Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems, Manik Dhanesh N, Cengage publications.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International
   Publications, 5th Edition.
4. Control Systems Engineering, S.Palani,TataMcGraw Hill Publications.

B.TECH V SEMESTER **OE**

L	T	P	C
3	0	0	3

20EE5T05 SPECIAL ELECTRICAL MACHINES

(OPEN ELECTIVE-I)

Course Objective:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor**.**
- To explain the theory of travelling magnetic field and applications of linear motors.

Course Outcomes:

The student should be able to

CO1: Distinguish between brush dc motor and brush less dc motor**.**

CO2: Explain the performance and control of stepper motors, and their applications.

CO3: Explain theory of operation and control of switched reluctance motor.

CO4: Explain the theory of travelling magnetic field and applications of linear motors.

CO5: Understand the significance of electrical motors for traction drives.

SYLLABUS

Unit I: Stepper Motors: Classification and construction details of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of stepper motors – Applications of stepping motors.

Unit II: Switched Reluctance Motors: Construction – Comparison of conventional and switched reluctance motors –Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

Unit III : Brushless DC Motor: Construction – Principle of operation of BLDM – sensing and logic scheme, basic drive circuit, power converter circuit, transient analysis Theory of brushless DC motor as variable speed synchronous motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency.

UNIT-IV: **Linear motors:** Linear induction motor: Construction– principle of operation– applications. Linear synchronous motor: Construction – principle of operation– applications.

Unit V: Electric Motors for traction drives: AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:

1. Special electrical Machines, K. Venkata Ratnam, University press, 2009, New
2. "Linear Electric Motors: Theory, Design and Practical application" , Naser A and Boldea I, Prentice Hall Inc, New Jersey, 1987.

Reference Books:

1. Generalized Theory of Electrical Machines – PS Bhimbra, Khanna Publishers.
2. "Brushless Permanent Magnet and Reluctance Motor Drives" , Miller T.J.E. Clarendon Press, Oxford, 1989.
3. Electric Machines – Theory, operation, Applications and Control - Charles I. Hubert – Pearson Publications.

B.TECH V SEMESTER		**OEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME5T04	**DESIGN THINKING & PRODUCT INNOVATION (OPEN ELECTIVE-I)**					

Pre-requisite: Managerial Economics and Financial Analysis,

Management Science.

Course Objective: At the end of the course, The student will able to

1. Design and develop the new product
2. Explain the basics of design thinking.
3. Describe the role of reverse engineering in product development.
4. Identify the needs of society and convert into demand.
5. Explain the product planning and product development process

Course Outcomes: At the end of the course, student will be able to

CO1: To bring awareness on innovative design and new product development.

CO2: To explain the basics of design thinking.

CO3: To familiarize the role of reverse engineering in product development.

CO4: To train how to identify the needs of society and convert into demand.

CO5: To introduce product planning and product development process.

SYLLABUS

UNIT-I: SCIENCE TO ENGINEERING:

Job of engineers, engineering units and measurement, elements of engineering analysis, forces and motion, energy, kinematics and motion, conversion of linear motion to rotary and vice versa, motion transmission. Physics to Engineering: Application of Newton laws, Pascal's law, Bouncy, Bernoulli's theorem, Ohm's law, electrical induction in
engineering products.

UNIT-II: HISTORICAL DEVELOPMENT:

Invention wheel, early mechanics in design, mechanical advantages,
industrial revolution, steam and petrol for mobility. Innovations in Electrical and Electronics: Electrical energy generation, electrical bulb, electrical equipment, electronics and automation, computing for early days to present, innovations in communications.

UNIT-III: SYSTEMATIC APPROACH TO PRODUCT DEVELOPMENT:

Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation. Solution finding methods: Conventional, intuitive, discursive, methods for combining solution, decision making for new design.

UNIT-IV: REVERSE ENGINEERING IN PRODUCT DEVELOPMENT:

Reversing engineering methods, identifying the bad features in a product, reduction in size and weight, usage of new materials, 3D printing, study of introducing electrical and electronic controls to the old products, importance of ergonomics in product development, environmental considerations in design, safety considerations in design.

UNIT-V:

Study of Product Development- Agriculture, development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy. Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of electrical vehicles, unmanned vehicles, design principles in drones.

Text Books:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, "Exploring Engineering: An Introduction to Engineering and Design", 4th edition, Elsevier, 2016.
2. David Ralzman, "History of Modern Design", 2nd edition, Laurence King Publishing Ltd., 2010
3. An AVA Book, "Design Thinking", AVA Publishing, 2010.

Reference Books:

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, "Engineering Design: A Systematic Approach", 3rd edition, Springer, 2007.
2. Tom Kelley, Jonathan Littman, "Ten Faces in Innovation", Currency Books, 2006.

B.TECH V SEMESTER		**OEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME5T05	**NANOTECHNOLOGY (OPEN ELECTIVE-I)**					

Pre-requisite: Materials Science

Course Objective:

- To familiarize with principles of quantum mechanics on which nano materials behave
- To elucidate applications of nanotechnology

Course Outcomes:

At the end of the course, student will be able to

CO1: Analyze the concepts and preparation methods of Nano materials

CO2: Understand the nano material properties and their behavior

CO3: Use various techniques for investigating nano material

CO4: Know the importance of Nano Technology for advanced materials processing

CO5: Know the importance of Nano structured Materials for Various Energies.

SYLLABUS

UNIT-I: Introduction to Nano technology:

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects

UNIT-II: Unique Properties of Nanomaterials:

Microstructure and Defects in nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple, and disclinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility, Magnetic Properties: Soft magnetic Nanocrystalline alloy, Permanent magnetic Nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT-III: Synthesis Routes :

Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method ,Self assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

UNIT-IV: Nanomaterials for Energy Conversion Systems:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy, Conversion Systems, Fuel Cells, Principles and nanomaterials design for Proton exchange membrane fuel cells (PEMFC); Direct methanol fuel cells (DMFC).

UNIT-V:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy Storage Systems, Primary and Secondary Batteries (Lithium ion Batteries), Cathode and anode materials, Nanostructured Carbon based materials, Nano-Oxides, Novel hybrid electrode materials, Current status and future trends.

Text books:

1. Electrochemical methods: Fundamentals and Applications, Allen J.Bard and Larry R. Faulkner, 2ndEdition John Wiley & Sons. Inc (2004)
2. D. Linden Ed., Handbook of Batteries, 2nd edition, McGraw-Hill, New York (1995)
3. G.A. Nazri and G. Pistoia, Lithium Batteries: Science and Technology, KulwerAcdemic Publishers, Dordrecht, Netherlands (2004).
4. J. Larmine and A. Dicks, Fuel Cell System Explained, John Wiley, New York (2000).

Reference Books:

1. Science and Technology of Lithium Batteries-Materials Aspects: An Overview, A. Manthiram, Kulwer Academic Publisher (2000).
2. M. S. Whittingham, A. J. Jacobson, Intercalation Chemistry, Academic Press, New York (1982).
3. M. Wakihara, O. Yamamoto, (Eds.) Lithium Ion Batteries: Fundamentals and Performance, Wiley –VCH ,Weinheim (1998).

B. Tech V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC5T04 LINEAR SYSTEM ANALYSIS (OPEN ELECTIVE –I)

Pre-requisite: Basic knowledge about vectors, differentiation and integration

COURSE OBJECTIVES:
The main objectives of this course are given below:

	At the end of the course, student will be able to
1	To understand basics of Signals and Systems required for all Engineering related courses.
2	To understand the behaviour of signal in time and frequency domain.
3	To understand the characteristics of LTI systems.
4	To understand concepts of Signals and Systems and its analysis using different transform techniques.
5	To understand sampling, convolution and correlation.

COURSE OUTCOMES:
At the end of this course the student will able to:

	At the end of the course, student will be able to
CO1:	Differentiate various signal functions.
CO2:	Represent any arbitrary signal in time and frequency domain.
CO3:	Understand the characteristics of linear time invariant systems.
CO4:	Analyse the signals with different transform technique.
CO5:	Understand the concept of sampling.

SYLLABUS

UNIT-I: Signal Analysis

Analogy between Vectors and Signals, Orthogonal Signal Space, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function

UNIT-II: Fourier series & Fourier transforms

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series.Deriving Fourier Transform from Fourier series,

Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform.

UNIT-III: Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Pauley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time.

UNIT-IV: Laplace Transforms & Z–Transforms

Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal.

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms

UNIT-V: Sampling theorem & Correlation

Graphical and analytical proof for Band Limited Signals, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parseval's Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation.

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2nd Ed.

Reference Books:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH

B. TECH V SEMESTER

	L	T	P	C
OEC	3	0	0	3

20EC5T05 DIGITAL LOGIC DESIGN (OPEN ELECTIVE –I)

Course Objectives:

At the end of the course, student will be able to

1 To represent numbers and conversion between different representations.

2 To analyze logic processes and implement logical operations.

3 To develop the combinational logic circuits.

4 To understand concept of programmable logic devices like PROM, PLA, PAL.

5 To design and analyze the concepts of sequential circuits.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand different number systems and their conversions.

CO2: Analyze the logical operations and Boolean algebra

CO3: Develop combinational circuits and perform logical operations.

CO4: Understand different programmable logic devices.

CO5: Design the sequential logic functions.\

SYLLABUS

UNIT-I:

Number Systems: Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r‘s Complement- (r-1)‘s Complement- Subtraction of Unsigned Numbers- Signed Binary Numbers- Problems.

UNIT-II:

Logic Gates and Boolean Algebra: Basic Gates- Universal Gates- Ex-Or and Ex-Nor Gates- SOP- POS- Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- K Map Method- Minimization of Boolean Functions.

UNIT-III: Signal Transmission through Linear Systems

Combinational Logic Circuits: Design of Half Adder- Full Adder- Half Subtractor- Full Subtractor- Ripple Adder and Subtractor- Design of Decoders- Encoders- Multiplexers- Demultiplexers- Magnitude Comparator.

UNIT-IV: Laplace Transforms & Z–Transforms

Introduction to Programmable Logic Devices (PLDs): PLA- PAL- PROM- Realization of Switching Functions Using PROM- Comparison of PLA, PAL and PROM.

UNIT-V: Sampling theorem & Correlation

Introduction to Sequential Logic Circuits: Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear)- Design of Registers- Universal Shift Register- Ring Counter- Johnson Counter.

TEXT BOOKS

1. Digital Design, M.Morris Mano, Michael D Ciletti, 4thEdition, PEA, 2003.

2. Fundamentals of Logic Design, Roth, 5thEdition, Cengage, 2004

REFERENCE BOOKS

1. Switching and Finite Automata Theory, Kohavi, 3rd Edition, Jha, Cambridge, 2005

2. Digital Logic Design, Leach, Malvino, Saha, TMH, 2000.

B. TECH V SEMESTER **OEC**

L	T	P	C
3	0	0	3

SOLID STATE DEVICES
20EC5T06 (OPEN ELECTIVE –I)

Course Objectives: Students undergoing this course, are expected to

1. Familiarize with the fundamentals of Semiconductor physics
2. Familiarize with various diodes and characteristics.
3. Familiarize with the transistors and their configurations.
4. Disseminate Amplifications with transistors
5. Understand the operation and working of Oscillators

Course Outcomes:

After undergoing the course, students will be able to

CO1: Understand importance of semiconductors.

CO2: Analyze Diode characteristics.

CO3: Differentiate various Transistor BJT configurations.

CO4: Design amplifiers at different applications using transistor.

CO5: Analyze different Feedback amplifiers & oscillators design

SYLLABUS.

Unit I: Basics Concepts of Semiconductor Physics, Charged Particles, Field Intensity, Potential, Energy, the eV unit of energy, Energy Band theory of Crystals, Insulators, Semiconductors and metals, Mobility and Conductivity, Electrons and Holes, Donor and Acceptor impurities, Charge Densities in a Semiconductor, Electrical properties of Ge and Si, Hall Effect, Diffusion and Drift Currents, Mass action Law, Fermi-Dirac distribution.

Unit II: Diodes: PN junction diode- Energy band diagram of PN junction Diode- V-I Characteristics –Current components in PN junction Diode- Diode equation- Diode resistance and capacitance, Characteristics of Zener Diode, Varactor Diode- SCR and UJT.

Unit III: Transistors Bipolar Junction Transistor: Transistor current components- Transistor equation- Transistor configurations- Characteristics of a transistor in CB, CC&CE configurations- Transistor as a Switch,Transistor as an amplifier. Field Effect Transistors (FET): Junction Field Effect Transistor construction & operation, characteristics of CS, CD & CG

Unit IV: Small Signal Transistor Amplifier models: Low Frequency Transistor Amplifier Models: Two port network, Transistor hybrid model, determination of h- parameters, generalized analysis of transistor amplifier model using h-parameters

Unit V: Feedback Amplifiers and Oscillators: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and their analysis. Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and their analysis.

Text Books:

1) Millman, Halkias, —Integrated Electronics- Analog and Digital Circuits and Systems, TMH.

2).Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGrawHill,Second Edition.

Reference Books:

1) Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.

2) . Basic Electronic Circuits -V.K.Mehta, S-chand Publications,2008

B. TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

INTRODUCTION TO ARTIFICIAL INTELLIGENCE
20CS5T07 (OPEN ELECTIVE –I)

Course Objectives:

- To gain a historical perspective of Artificial Intelligence and its foundations.
- To familiarize the basic principles of Artificial Intelligence towards problem solving Inference, Perception, Knowledge representation and Learning.
- To understand advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems.

Course Outcomes: At the end of the course, the students will be able to:

CO1: To Understand the history of Artificial Intelligence and its foundations.

CO2: Apply various Artificial Intelligence Techniques for problem solving.

CO3: Formalization of knowledge using the framework of predicate logic.

CO4: Ability to apply knowledge representation and reasoning to real world problems.

CO5: Derive conclusions from uncertain knowledge and quantify the uncertainty in the Conclusions obtained.

SYLLABUS

UNIT-1:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT-2: Problem Solving:

State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem Reduction and Game Playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT-3: Logic Concepts:

Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-4: Knowledge representation:

Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT-5: Expert system and applications:

Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning (Units 1,2,3,4,5)

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
4. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

B. TECH V SEMESTER

OEC	L	T	P	C
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OPERATING SYSTEMS
20CS5T08 (OPEN ELECTIVE –I)

Course Objectives:

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes:

CO1: Understand the importance, functions and structures of operating systems.

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

SYLLABUS

UNIT - I: Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication

UNIT - II: Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multithreading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT – III: Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures

UNIT - IV: Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock- Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Dead lock.

UNIT - V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling

TEXT BOOKS:

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley, 9thedition.(Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition–2005.(Unit-5)

REFERENCES:

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley ,Operating Systems: A Design-Oriented Approach, Tata Mc Graw Hill Education,1996.

B. TECH V SEMESTER

	L	T	P	C
OEC	3	0	0	3

SOFTWARE ENGINEERING
20CS5T09 (OPEN ELECTIVE –I)

Course Objective:

- Gain knowledge about software process models.
- Familiarize the basic software engineering methods, practices and its applications.
- Facilitate students in software design.

Course Outcomes:

CO1: Understand the software life cycle models

CO2: Understand the scrum approach to agile project management**.**

CO3: Analyze the software requirements and generate SRS document

CO4: Understand some of the different models that may be used to design

CO5: Understand various software testing approaches and quality control to ensure good quality software

SYLLABUS

Unit-I:

Introduction to Software Engineering: Nature of software, Software engineering, The Software Processes, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialised Process models, The Unified Process, Personal and Team Process Models.

Unit-II:

Requirements Engineering: Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

Requirements Modelling: Requirement Analysis, Scenario-Based Modelling, Data Modelling Concepts, Class-Based Modelling

Unit-III:

Design Concepts: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Unit-IV:

Understanding of UML diagrams: Structural diagrams - class diagram, object diagram, component diagram, deployment diagram, Behavioural diagrams - Use-case diagram, activity diagram, sequence diagram, collaboration diagram, state chart diagram.

Unit-V:

Implementation: Structured coding Techniques, Coding Styles-Standards and Guidelines, Implementation Issues.

Software Testing Strategies: A Strategic approach to Software Testing, Strategic Issues and Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing, Software Quality concepts.

TEXT BOOKS:

1. Roger S. Pressman (2010), Software Engineering, A Practitioner's Approach, 7th Edition, McGraw-Hill International Edition, India.
2. Ian Sommerville (2011), Software Engineering, 9th Edition, Pearson education, India.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.Jim ConallenKelli A. Houston," Object-Oriented Analysis and Design with Applications", 3rd edition.

REFERENCES:

1. Pankaj Jalote (2010), Software Engineering, A Precise Approach, Wiley India.
2. Waman S. Jawadekar (2008), Software Engineering: A Primer, McGraw-Hill, India.
3. Hans Van Vilet (2008), Software Engineering Principles and Practice, 3rd Edition, John Wiley & Sons Ltd.
4. Rajib Mall (2005), Fundamental of Software Engineering, PHI.
5. Deepak Jain, Software Engineering, Principles and Practices, Oxford, University Press, India.

B. TECH V SEMESTER

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OEC	3	0	0	3

COMPUTER NETWORKS
20IT5T07 (OPEN ELECTIVE –I)

Course Objectives:

- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the students to basic principles of networking using the goals like protocol layering and top down approach.
- Build an understanding of the basics of the internetworking and routing used in the computer networks.
- To provide guidelines in developing network applications

Course Outcomes:

At the end of the course, student will be able to

CO1- Independently enumerate the layers of the OSI model and TCP/IP.

CO2- Identify the different types of network topologies and protocols.

CO3- Compare and contrast methods to identify Errors and correct them

CO4- Differentiate between various network routing algorithms.

CO5- Understand WWW and HTTP Architectures.

SYLLABUS

UNIT - I: Introduction:

OSI overview, TCP/IP and other networks models, Examples of Networks: Arpanet, Internet, Network Topologies Wide Area Networks(WAN), Local Area Networks(LAN), Metropolitan Area Networks(MAN).

UNIT - II: Physical Layer and overview of PL Switching:

Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, introduction to switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT – III: Data link layer:

Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction, CRC, Checksum: idea, one's complement internet checksum, services provided to Network.

Elementary Data Link Layer protocols: Simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.

Sliding window protocol: One bit, Go-back N, Selective Repetitive protocol, Stop and wait protocol.

UNIT - IV: Random Access:

ALOHA, MAC addresses, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access(CDMA).

Network layer: Shortest Path, Distance Vector Routing Algorithm, Hierarchal routing algorithm.

UNIT - V: Application layer (WWW and HTTP):

WWWARCHITECTURE: Client (Browser), Server, Uniform Resource Locator, Resource Record, HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Request Message Format, HTTP Response Message Format

TEXT BOOKS:

1. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH. (Units 1,2,4,5)
2. Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education(Units 1, 3, 4)

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

COMPUTER GRAPHICS
20IT5T08 (OPEN ELECTIVE –I)

Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

Course Outcomes:

After learning the course, the student will be able:

CO1: Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations.

CO2: Apply projections and visible surface detection techniques for display of 3D scene on 2D screen.

CO3: Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics.

CO4: Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).

CO5: Know and be able to discuss hardware system architecture for computer graphics. This Includes, but is not limited to: graphics pipeline, frame buffers, and graphic accelerators/co-processors.

SYLLABUS

UNIT - I: Introduction to Graphics:

Application area of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT - II: 3D Concepts:

Parallel and Perspective projections, Three dimensional object representation-Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT – III: Graphics Programming:

Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Key frame. Graphics programming using OPENGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes

UNIT – IV: Rendering:

Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadow of objects, Building a camera in a program, Creating shaded objects

UNIT - V: Overview of Ray Tracing:

Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics– C Version, second edition, Pearson Education, 2004

REFERENCES:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

OPERATIONS RESEARCH
20HS5T02 (OPEN ELECTIVE –I)

Course Objectives:

1) Identify and develop operational research models from the verbal description of the real system.
2) Understand the mathematical tools that are needed to solve optimization problems.
3) Use mathematical software to solve the proposed models.
4) Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

Course Outcomes:

CO1: Understand the methodology of Operations Research& concepts of linear programming

CO2: Formulate the solutions to transportation problems

CO3: Explain the solutions for various sequencing problems

CO4: Illustrate the solutions to different replacement policies

CO5: Apply game theory to solve real world problems

SYLLABUS

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

UNIT-II

Transportation Problem. Formulation, Solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.

UNIT-III

Assignment model. Formulation. Hungarian Method for optimal solution. Solving Unbalanced problem. Sequencing Models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines Processing n Jobs through m Machines.

UNIT-IV

Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

UNIT-V

Game Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

Inventory models. Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

TEXT BOOKS:

1) P. SankaraIyer,"Operations Research", Tata McGraw-Hill, 2008.
2) A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

REFERENCES:

1) J K Sharma. "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2) P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.

B. TECH V SEMESTER	OEC	L	T	P	C
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PRINCIPLES OF MANAGEMENT
20MB5T01 (OPEN ELECTIVE –I)

COURSE OBJECTIVE

This course ensures that the students understand

1. Management Concepts
2. Applications of Concepts in Practical aspects of business and Development of Managerial Skills.
3. Managers manage business organizations in the dynamic global environment and maintain competitive advantage.
4. Business decisions are made using various tools and techniques to remain competitive
5. Managers use problem-solving strategies, critical thinking skills in real-life situations and implement successful planning.

COURSE OUTCOME

After learning the contents of this course, the student would be able to know

CO1: What are the circumstances that lead to management evolution and how it will affect future managers.

CO2: Analyze and evaluate the influence of historical forces on the current practice of management

CO3: Develop the process of management's functions: Planning and Organizing.

CO4: Evaluate leadership styles to anticipate the consequences of each leadership style and directing.

CO5: Identify the areas to control and selecting the appropriate controlling methods/techniques.

SYLLABUS

UNIT I

Introduction to Management: Definition, Functions, Process, Scope and Significance of Management.

Nature of Management, Functions of Management, Managerial Roles, Levels Managerial Skills and Activities, Difference between Management and Administration, Significance of Values and Ethics in Management.

Challenges of Management

UNIT II

Evolution of Management Thought: Approaches to Management - Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT III

Planning and Organizing: Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing.

UNIT IV

Directing: Effective Directing, Supervision, Motivation, Different Theories of Motivation-Maslow, Herzberg, McClelland, Vroom, Porter and Lawler, Job Satisfaction. Concept of Leadership- Theories and Styles. Communication Process, Channels and Barriers, Effective Communication.

UNIT V

Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

TEXT BOOKS

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Management-Tasks, Responsibilities & Practices, Drucker, F. Peter
4. Principles of Management, Terry and Franklin

REFERENCES

1. Essentials of Management, Koontz Weihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

NPTEL WEB COURSE:

nptel.ac.in/courses/122108038/

NPTEL VIDEO COURSE:

nptel.ac.in/courses/122108038/#

B. TECH V SEMESTER	OEC	L	T	P	C
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TECHNOLOGY MANAGEMENT
20MB5T02 (OPEN ELECTIVE –I)

Course Objective

- The course aims at providing an overview of various issues connected with Management of Technology in organizations.

Course Outcomes

CO1: To understand the importance of technology and innovation management

CO2: To understand the technology absorption, incremental innovation, research and development, technovation and technology fusion that dominate the contemporary world industry.

CO3: To understand the nature, significance, dimensions requirements, concepts, issues, themes, policies and structure of the management of technology and technovation.

SYLLABUS

UNIT-I

Evolution of Technology-Effects of New Technology- Technology Innovation.-Invention-Innovation- Diffusion- Revolutionary and Evolutionary Innovation- Product and Process Innovation- Strategic Implications of Technology- Technology – Strategy Alliance -Convergent and Divergent Cycle- The Balanced Approach.

UNIT-II

Technology Assessment- Technology Choice- Technological Leadership and Followership- Technology Acquisition- Technological Forecasting- Exploratory, Intuitive, Extrapolation, Growth Curves, Technology Monitoring- Normative: Relevance Tree, Morphological Analysis, Mission Flow Diagram.

UNIT-III

Diffusion of Technology- Rate of Diffusion; Innovation Time and Innovation CostSpeed of Diffusion- Technology Indicators- Various Indicators- Organizational Implications of Technology- Relationship between Technical Structure and Organizational Infrastructure- Flexible Manufacturing Management System (FMMS).

UNIT-IV

Financial Aspects in Technology Management- Improving Traditional Cost - Management System- Barriers to the Evaluation of New Technology- Social Issues in Technology Management- Technological Change and Industrial Relations- Technology Assessment and Environmental Impact Analysis.

UNIT-V

Human Aspects in Technology Management- Integration of People and Technology Organizational and Psychological Factors- Organizational Outcome- Technology Transfer-Technology Management Scenario in India.

Text Books

1. Sharif Nawaz: Management of Technology Transfer & Development, APCFT, Bangalore, 1983.
2. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,New Delhi.

References

1. Betz Fredrick: Managing Technology, Prentice Hall, New Jersey.
2. Gaynor: Handbook of Technology Management, McGraw Hill.
3. Tarek Khalil: Management of Technology, McGraw Hill International, 2000.
4. “Managing Technology and Innovation”, Robert & Roland, 1st Edition, Routledge.

B. TECH V SEMESTER

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

FOUNDATIONS OF DATA SCIENCE
20AD5T07 (OPEN ELECTIVE –I)

Course Objective: *This* ***course*** explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

UNIT-1: Data science in a big data world: Benefits and uses of data science and big data, Facets of data, The data science process, The big data eco system and data science, An introductory working example of Hadoop.

UNIT-2:

The data science process: Overview of the data science process, Step 1: Defining research goals and creating a project charter, Step 2: Retrieving data, Step 3: Cleansing, integrating, and transforming data, Step 4: Exploratory data analysis, Step 5: Build the models, Step 6: Presenting findings and building applications on top of them. Machine learning: What is machine learning and why should you care about it?, The modeling process, Types of machine learning, Semi-supervised learning.

UNIT-3:

Handling large data on a single computer: The problems you face when handling large data, General techniques for handling large volumes of data, General programming tips for dealing with large data sets, Case study 1: Predicting malicious URLs, Case study 2: Building a recommender system inside a database.

UNIT-4: First steps in big data: Distributing data storage and processing with frameworks, Case study: Assessing risk when loaning money, Join the NoSQL movement: Introduction to NoSQL, ACID: the core principle of relational databases,

CAP Theorem: the problem with DBs on many nodes, The BASE principles of NoSQL databases, NoSQL database types, Case study: What disease is that?

UNIT-5: The rise of graph databases: Introducing connected data and graph databases , Introducing Neo4j: a graph database, Connected data example: a recipe recommendation engine, Text mining and text analytics: Text mining in the real world, Text mining techniques, Case study: Classifying Reddit posts.

Text Book:

Introducing Data Science by Davy Cielen, Arno D. B. Meysman, and Mohamed Ali

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

20AM5T07 INTRODUCTION TO MACHINE LEARNING (OPEN ELECTIVE –I)

Pre-requisite: Probability and Statistics, Linear Algebra

Course Objective: *This* ***course*** explains basic concepts of Machine Learning and teaches you to use recent machine learning software for solving problems and understanding supervised and unsupervised learning methods

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the characteristics of machine learning.

CO2: Summarize the Model building and evaluation approaches.

CO3: Apply Bayesian learning and regression algorithms for real-world Problems.

CO4: Apply supervised learning algorithms to solve the real-world Problems.

CO5: Apply unsupervised learning algorithms for the real world data.

SYLLABUS

Unit-1: Introduction to Machine Learning and Preparing to Model:

Introduction to Machine Learning- Introduction, What is Human Learning? Types of Human Learning, What is Machine Learning? Types of Machine Learning, Problems Not To Be Solved Using Machine Learning, Applications of Machine Learning.

Preparing to Model- Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

Modeling & Evaluation, Basics of Feature Engineering:

Modeling & Evaluation - Introduction, Selecting a Model, Training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model.

Basics of Feature Engineering - Introduction, Feature Transformation, Feature Subset Selection.

Unit-2: Bayesian Concept Learning and Regression:

Bayesian Concept Learning - Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network.

Regression: Introduction, Regression Algorithms - Simple linear regression, Multiple linear regression, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

Unit-3: Supervised Learning: Classification, Ensemble Learning: Classification- Introduction, Example of Supervised Learning, Classification Model, Classification

Learning Steps, Common Classification Algorithms - k-Nearest Neighbour (KNN), Decision tree, Random forest model, Support vector machines.

Ensemble Learning- Boosting, Bagging

Unit-4: Basics of Neural Network

Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network, Learning Process in ANN, Backpropagation, Deep Learning

Unit-5: Unsupervised Learning:

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning.

Principle Component Analysis: Introduction, Probabilistic PCA- Maximum Likelihood PCA, EM Algorithm for PCA, Bayesian PCA, Factor Analysis; Kernel PCA

Clustering: Clustering as a Machine Learning task, Different types of clustering techniques, Partitioning methods, Hierarchical clustering, Density-based methods: DBSCAN.

Finding Pattern using Association Rule - Definition of common terms, Association rule, Apriori algorithm.

Text Books:

1. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, “Machine Learning”, Pearson Education India ,1st edition.
2. Christopher M. Bishop, “Pattern Recognition and Machine Learning”. New York :Springer, 2006.

Reference Books:

1. Tom M. Mitchell, “Machine Learning’, MGH, 1997.
2. Shai Shalev-Shwartz, ShaiBen David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge.
3. Peter Harington, “Machine Learning in Action” , Cengage, 1st edition, 2012.

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20CE6T08 REMOTE SENSING AND GIS (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Learn various types of sensors and platforms
- learn concepts of visual and digital image analyses
- Understand the principles of spatial analysis
- Appreciate application of RS and GIS to Civil engineering

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Be familiar with ground, air and satellite based sensor platforms.

CO2: Interpret the aerial photographs and satellite imageries

CO3: Create and input spatial data for GIS application

CO4: Apply RS and GIS concepts in water resources engineering

SYLLABUS

UNIT–I:

Introduction to remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems. Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

UNIT–II:

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT–III:

Geographic Information System: Introduction, key components, application areas of GIS, map projections. Data entry and preparation: spatial data input, raster data models, vector data Models.

UNIT – IV:

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT–V:

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications. Application to Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management.

Text Books:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

Reference Books:

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A KW Yeung, Prentice Hall (India), 2006
3. 'Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. 'Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE6T09 ENVIRONMENTAL IMPACT ASSESSMENT
(OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- impart knowledge on different concepts of Environmental Impact Assessment
- know procedures of risk assessment
- learn the EIA methodologies and the criterion for selection of EIA methods
- pre-requisites for ISO 14001 certification
- know the procedures for environmental clearances and audit
- appreciate the importance of stakeholder participation in EIA

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Prepare EMP, EIS, and EIA report

CO2: Identify the risks and impacts of a project

CO3: Selection of an appropriate EIA methodology

CO4: Evaluation the EIA report

CO5: Estimate the cost benefit ratio of a project

CO6: Know the role of stakeholder and public hearing in the preparation of EIA

SYLLABUS

UNIT–I:

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA.

UNIT–II:

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP.

UNIT-III:

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV:

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with

reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT–V:

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment- advantages of Environmental Risk Assessment. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

Reference Books:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE6T08 RENEWABLE ENERGY SOURCES (OPEN ELECTIVE-II)

Course Objective:

- To give sufficient knowledge about the promising new and renewable sources of energy
- Explain the concept of various forms of renewable energy
- Learn the present energy scenario
- Analyse the environmental aspects of renewable energy resources.

Course Outcomes:

CO1: Know the need of various renewable energy systems

CO2: understand the concepts of bio-energy,

CO3: Acquire the knowledge of OTEC, tidal,

CO4: Acquire the knowledge of geothermal and Alternative energy sources

SYLLABUS

UNIT-I

Introduction: Introduction to energy sources, reserves and estimates, global energy scenario, renewable energy -environment implications, global warming and climate change, limitations of conventional energy sources, classification of non-conventional energy sources - solar energy, wind energy, bio-energy, Ocean Thermal Energy Conversion (OTEC), tidal, geothermal and hydro.

UNIT-II

Bio-energy: Biomass and its sources, energy plantation, production of fuel wood, bio-conversion processes, bio-gas, bio-diesel and ethanol production and utilization, thermo-chemical processes, biomass gasification, process, types of reactors, utilization of producer gas for thermal and electricity generation.

UNIT-III

Ocean thermal energy conversion, tidal, geothermal: Tidal energy, wave energy, data, technology options; open and closed *Ocean thermal energy conversion* cycles, geothermal energy sources, power plant and environmental issues.

UNIT-IV

Fuel Cells: Hydrogen generation-storage, transport and utilization, applications, power generation. Fuel cells-Technologies, types, economics and power generation.

UNIT-V

Solar Energy Storage and Applications:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2006
2. Renewable Energy Resources – Twidell&Wier, CRC Press(Taylor & Francis), 2012
3. *Y. W. B. Charles*, *B.H. Essel*, *—Biomass Conversion and Technology‖*, John Wiley, Latest Edition

Reference Books:

1. Renewable energy resources by G. N. Tiwari, M. K. Ghosal, Alpha Science International, 2005.
2. Renewable Energy Technologies by R. Ramesh, K. Uday Kumar, M. Anandakrishnan, Narosa Publishing House, 1997
3. Non-Conventional Energy Systems by K Mittal, A. H. Wheeler Publishing Company Limited, 01-Jan-1999.
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, P.H.I.
5. Godfrey Boyle, —Renewable Energy- Power for a Sustainable Future‖, Oxford University Press, U.K.,
6. Twidell, J.W. & Weir, A., —Renewable Energy Sources‖, E.F.N Spon Ltd., UK.

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE6T09 ENERGY AUDIT, CONSERVATION AND MANAGEMENT (OPEN ELECTIVE-II)

Course Objective:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Course Outcomes:
At the end of the course student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

SYLLABUS

UNIT-I

Basic Principles of Energy Audit and management: Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Piecharts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions –Language – Questionnaire – Check list for top management.

UNIT-II

Lighting: Modification of existing systems – Replacement of existing systems – Priorities**:** Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level –Illumination of inclined surface to beam – Luminance or brightness – Types of lamps –Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT-III

Power Factor and energy instruments: Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters– Tong testers – Power analyzer.

UNIT-IV

Space Heating and Ventilation: Ventilation – Air–Conditioning (HVAC) and Water Heating**:** Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning –Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

UNIT-V

Economic Aspects and Financial Analysis: Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems.

Computation of Economic Aspects

Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment –Numerical examples.

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill

2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd– 2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevierpublications. 2012

2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.

3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.

4. Energy management hand book by W.C.Turner, John wiley and sons.

5. Energy management and conservation –k v

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME6T07 INDUSTRIAL ROBOTICS (OPEN ELECTIVE-II)

Pre-requisite: Kinematics and Mathematics

Course Objective:

1. The student will be exposed to the concepts of automation and fundamentals of robotics
2. The students will be exposed to the concepts of transformations and robot kinematics,
3. The students will understand the functioning of sensors and actuators
4. The students will be exposed to robot programming languages and Programming.
5. The student will be exposed to the applications of robotics in manufacturing.

Course Outcomes: At the end of the course, student will be able to

CO1	Understand various applications of robotics and classification of coordinate system and control systems.
CO2	Build the concepts of components of industrial robotics.
CO3	Apply kinematic analysis with D-H notation, forward and inverse kinematics and Solve dynamic analysis with Lagrange – Euler and Newton – Euler formulations.
CO4	Model trajectory planning for a manipulator by avoiding obstacles.
CO5	Understand different types of actuators and applications of robots in manufacturing.

SYLLABUS

UNIT-I:

Introduction: Automation and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT-II: MOTION ANALYSIS AND CONTROL:

Motion Analysis: Basic Rotation Matrices, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT-III:

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion straight line motion.

UNIT-IV:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools.

UNIT-V:

Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.

Text Book(s)

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson, 3rd edition.

References

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
4. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley

5. Introduction to Robotics by SK Saha, The McGrah Hill Company, 6th, 2012
6. Robotics and Control / Mittal R K &Nagrath I J / TMH

B.TECH VI SEMESTER		**OEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME6T08	**3D PRINTING (OPEN ELECTIVE-II)**					

Pre-requisite: Manufacturing Process

Course Objective:

The course aims at the importance of Additive Manufacturing, Classifications, models, specifications of various Additive Manufacturing Techniques. To learn the different tools, soft-wares required and the applications of Additive Manufacturing

Course Outcomes: At the end of the course, student will be able to

CO1:	Understand the working principle and process parameters of AM processes
CO2:	Explore the applications of AM processes in various fields
CO3:	Apply the suitable process and material for fabricating a given product
CO4:	Use the suitable post process based on product application
CO5:	Design and develop a product for AM Process

SYLLABUS

UNIT-I:

Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT-II:

Machines for Rapid Prototyping: Overview of Polymerization: Stereolithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT-III:

Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive Manufactured Tools, Indirect Rapid

UNIT-IV:

Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture of Metal Components

UNIT-V:

Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2015, 2nd Edition.
2. 3D Printing and Additive Manufacturing: Principles & Applications, Chua Chee Kai, Leong Kah Fai, World Scientific, 2015, 4th Edition.

References:

1. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venuvinod and Weiyin Ma, Springer, 2004.
2. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.
3. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006.

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20EC6T07 ELECTRONIC CIRCUITS AND NETWORKS (OPEN ELECTIVE-II)

Course Objectives:

At the end of the course, student will be able to

1. To understand the Differentiator and Integrator circuits
2. To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
3. To Introduce to Time-base Generators and Principles of Synchronization and Frequency division.
4. To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.
5. To understand and Design gates using various logic families.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand the basic concepts of Optoelectronic Devices

CO2: Design linear wave shaping circuits.

CO3: Design Non- linear wave shaping circuits.

CO4: Design Different Time Base Generators

CO5: understand the concepts of one port networks

SYLLABUS

UNIT-I: Optoelectronic Devices

Introduction, Photo sensors, Photoconductors, Photodiodes, Phototransistors, Light-Emitting Diodes, Liquid Crystal Displays, Cathode Ray Tube Displays, Emerging Display Technologies, Opto couplers.

UNIT-II: LINEAR WAVE SHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT-III: NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of

voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT-IV: VOLTAGE TIME BASE GENERATORS

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator.

UNIT-V: Synthesis of one port networks

Synthesis of one port networks
Synthesis of reactive one-ports by Foster's and Cauer methods (forms I and II) - Synthesis of LC, RC and RL driving-point functions.

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.

2. K. S. Suresh Kumar, ―Electric Circuit Analysis‖, Pearson Publications, 2013.

Reference Books:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC6T08 PRINCIPLES OF COMMUNICATIONS (OPEN ELECTIVE – II)

Course Objectives:

At the end of the course, student will be able to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Familiarize with the fundamentals of digital communication systems
4. Familiarize with various techniques for digital modulation and demodulation of signals
5. Distinguish the figure of merits of various analog modulation methods

Course Outcomes:

At the end of this course the student will able to:

CO1: Differentiate various Analog modulation schemes

CO2: Analyze demodulation schemes and their spectral characteristics

CO3: Analyze demodulation schemes and their spectral characteristics

CO4: Analyze demodulation schemes and their spectral characteristics

CO5: Analyze noise characteristics of various analog modulation methods

SYLLABUS

UNIT-I: Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver

UNIT-II: Angle Modulation, Frequency and Phase modulation, frequency deviation, Bandwidth, FM Modulators and Demodulators, Narrow band and wide band FM, FM Broadcasting.

UNIT-III: Pulse digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Generation and Demodulation, Frequency Division Multiplexing, Time Division Multiplexing

UNIT-IV: Digital Representation of Analog Signals, Pulse Code Modulation (PCM), Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Mathematical Representation of Noise.

UNIT-V: Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops.

Text Book:

1. Herbert Taub and Donald L. Schilling, ―Principles of Communication Systems., Tata McGrawHill.

2. Rishabh Anand, Communication Systems, Khanna Publishers

Reference Books:

1. B.P.Lathi,―Modern Digital and Analog communication Systems, 3rd Edition, Oxford University Press.

2. Simon Haykin, ―Communication Systems, 4th Edition, Wiley India

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20EC6T09 MICROCONTROLLERS & ITS APPLICATIONS (OPEN ELECTIVE-II)

Course Objectives:

At the end of the course, student will be able to

1. To understand the basics of 8051 Microcontroller and its functionalities
2. To understand the 8051 family instruction set
3. To develop machine language programming in microprocessors.
4. Todesign and develop microcontroller based interfacing for real time applications using low level language like ALP.
5. To understand the basics of ARM architectures and its functionalities.

Course Outcomes:

At the end of this course the student will able to:

CO1: To be able to understand the overview of 8051 Micro controller in general.

CO2: To be able to understand the instruction set of 8051 microcontroller

CO3: To be able to understand the Assembly Language Programming in microcontrollers.

CO4: To be able to understand the microcontroller is interfacing with I/O devices, memory, and serial communication using ALP.

CO5: To be able to understand the overview of ARM Architecture in general.

SYLLABUS

UNIT-I: Introduction to 8051 Microcontrollers

Overview of 8051 microcontrollers, Architecture, I/O ports, Memory organization, Addressing modes, SFRs, Counters and timers, Synchronous serial-cum, Asynchronous serial communication, Interrupts and priorities.

UNIT-II: 8051 FAMILY MICROCONTROLLERS INSTRUCTION SET

Basic assembly language programming, Data transfer instructions, Data and bit- manipulation instructions, Arithmetic instructions, Instructions for logical operations on the test among the registers, Program flow control instructions, Interrupt control flow.

UNIT-III: 8051 REAL TIME CONTROL

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the serial communication Interrupts, programming Timers and Counters, serial port and its programming,

UNIT-IV: I/O and Memory Interface and Serial Communication and Bus Interface

I/O and Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer, USART, External Communication Interfaces-RS232,USB

UNIT-V: ARM Architecture:

ARM processor fundamentals, ARM Architecture –Register, exceptions and interrupts, interrupt vector table, ARM instruction set- Data processing, Branch, load and store instructions; Software instructions, Program status register instructions loading constants

TEXTBOOKS:

1. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System
   Design, 2/e, Pearson Education, 2005.
2. Kenneth. J. Ayala, The 8051 Microcontroller, 3/e, Cengage Learning, 2004.

REFERENCE:

1. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems, 2/e, Pearson Education, 2007
2. ARM system Developers guide, Andrew N Sloss, Dominic Symes, Chris Wright, Elsevier,2012

B. TECH VI SEMESTER

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INTRODUCTION TO MACHINE LEARNING
20CS6T07 (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

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INFORMATION SECURITY

20CS6T08 (OPEN ELECTIVE –II)

Course Objectives:

- Understand the concepts of classical encryption techniques and concepts of finite fields and number theory
- Understand Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Understand the Design issues and working principles of various authentication protocols, PKI standards
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications.

Course Outcomes:

CO1: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

CO2: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO3: Apply different digital signature algorithms to achieve authentication and create secure applications

CO4: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

CO5: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

SYLLABUS

UNIT - I: Classical Encryption Techniques:

The OSI Security Architecture, Security Attacks, Services & Mechanisms, Symmetric Cipher Model, Substitution Techniques: Caesar Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques: Rail fence, Row Transposition cipher, Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT - II:

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Block Cipher Modes of Operations.

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem

UNIT – III:

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security.

Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution

UNIT - IV:

User Authentication: Remote User Authentication Principles, Kerberos.

Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.

UNIT - V:

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS)

Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration

TEXT BOOKS:

1. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition. [Units 1,2,3,4,5]
2. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition. [Units 1,2,3,4,5]

REFERENCES:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

B. TECH VI SEMESTER

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AGILE TECHNOLOGIES
20CS6T09 (OPEN ELECTIVE –II)

COURSE OBJECTIVES:

1. To have an understanding of the Agile Manifesto and Principles
2. To Apply Agile based techniques in each of the development phases.

COURSE OUTCOMES:

CO1: Understand the Agile Manifesto and Principles.
CO2: Apply agile software development practices to create high-quality software.
CO3: Acquire Knowledge on software design, set of software technologies and APIs.
CO4: Examine and demonstrate knowledge of Agile development
CO5: Demonstrate the Agile Approach to estimate project variables, control and Risk Management

SYLLABUS

UNIT-I

Agile Software Development: Genesis of Agile, Introduction and Background, Traditional Model Vs Agile Model, Values of Agile, Agile Manifesto and Principles, Stakeholders, Challenges.

UNIT-II

Lean Approach: Waste Management, Kaizen and Kanban, Add process and products add Value, Roles related to life cycle, Differences between Agile and Traditional Plans, Differences at different life cycle phases, Key techniques, Principles, Understand as a means of assessing the initial status of the project, How agile helps to build quality.

UNIT-III

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, **Agile Requirements:** User story definition, Characteristics and contents of user stories, Acceptance tests and verifying stories, Product Velocity, Burn down chart, Sprint planning and retrospective, Daily Scrum, Scrum roles- Product Owner, Scrum Master, Scrum Team, Scrum Case Study, Tools for Agile Project Management.

UNIT-IV

Agile Software Design and Development: Agile Design practices, Role of design principles including Single Responsibility principle, Open Closed Principle, Liskov Substitution principle, Interface Segregation principles, Dependency Inversion principle in Agile Design, Refactoring- Need and significance, Refactoring techniques, Continuous Integration, Automated Build tools, Version Control.

UNIT-V

Agile Testing and Review: Agile Testing Techniques, Test Driven Development, User Acceptance Test, Agile Metrics and Measurements, The Agile Approach to estimate project variables, Agile control- The 7 control parameters, Agile Approach to Risk, Agile approach to Configuration Management, Atern Principles and Philosophy, Best practices to manage Scrum.

TEXT BOOKS:

1. Robort C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013(Units 1, 3, 5)

2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson(Units 3,4)

3. Mike Cohn, Succeeding with Agile: Software Development Using Scrum, Addison Wesley Series.(Units 3, 4)

REFERENCES:

1. David J. Anderson and Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer,.

3. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley.

4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and management, Butterworth-Heinemann.

B. TECH VI SEMESTER

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OEC	3	0	0	3

20IT6T07 FUNDAMENTALS OF MACHINE LEARNING (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
4. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

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20IT6T08 DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE –II)

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases

Course Outcomes:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT-I: Database System Applications:

A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT-II: Introduction to the Relational Model:

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III: SQL:

QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL.

UNIT-IV: Schema Refinement (Normalization):

Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.

UNIT-V: Transaction Management and Concurrency Control:

Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL” by Shashan k Tiwari, 2011, WROX Press.

REFERENCE:

1. Peter Rob & Carlos Coronel, “Data base Systems design, Implementation, and Management”, 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, “Data base System Concepts”, 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
4. C.J.Date, “Introduction to Database Systems”, 7th Edition, Pearson Education, 2002

B. TECH VI SEMESTER **OEC**

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20HS6T02 QUANTITATIVE APTITUDE AND REASONING (OPEN ELECTIVE –II)

SYLLABUS

Unit-I: Divisibility and remainder rules of numbers, Unit digit , square root, cube root and simplification of numbers, HCF and LCM of numbers, Averages and Percentages, Alphabetical and miscellaneous series, Coding and decoding and Blood Relations

Unit-II: Profit & loss, Simple interest and Compound interest, Direction, Order and Ranking, Sitting arrangement and Puzzle

Unit-III: Ratio & proportions, Partnership, Alligation and mixtures and Ages.
Data sufficiency, Inequalities and Decision making.

Unit-IV: Time and work, Pipes & cisterns and Time and distance.
Syllogism, Statement and course of action and Statement and Assumption.

Unit-V: Boats and streams, Areas, Volume and surface areas.
Statement and argument, Cause and effect and Drawing inference.

Text Books:

1. "Objective Arithmetic" by R.S. Agarwal, S. Chand Publications.
2. Verbal and non-verbal Reasoning, R.S. Agarwal, S. Chand Publications

Reference Books:

1. Quantitative Aptitude by Dinesh Khattar, Pearson Education.
2. Quantitative Aptitude by Abhjit Guha.
3. Fast Track objective Arithmetic, Rajesh Verma, Arihant publications.

B. TECH VI SEMESTER

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20MB6T01 ORGANIZATIONAL BEHAVIOUR (OPEN ELECTIVE –II)

Course Objectives

1. To understand the fundamentals of Organizational Behaviour.
2. For the understanding and balancing of Values and Emotions at work place.
3. To improve the student's Personality and Attitude.
4. To understand and improve the skill of perception and Group Behaviour.
5. Understanding and managing organizational culture, leadership and conflict.

Course Outcomes

Learning Organizational Behavior enables engineers:

CO1: To understand the psychology of workers and other members in the organization.

CO2: To be equipped with the right knowledge and skills regarding organizational processes, group behavior, organizational structure and culture.

CO3: To build up strategies for development at their work place.

CO4: To motivate and control employees.

CO5: To resolve organizational conflict effectively.

SYLLABUS

UNIT I

Fundamentals of OB: Definition, Scope and Importance of OB, Relationship between OB and the individual, Evolution of OB, Models of OB (Autocratic, Custodial, Supportive, Collegial & SOBC), Limitations of OB.

Unit II

Values, Attitudes and Emotions: Introduction, Values, Attitudes, Definition and Concept of Emotions, Emotional Intelligence - Fundamentals of Emotional Intelligence, The Emotional Competence Framework, Benefits of Emotional Intelligence, difference between EQ and IQ. Stress at workplace: Work Stressors – Prevention and Management of stress – Balancing work and Life, Workplace spirituality.

Unit III

Personality & Attitude: Definition Personality, importance of personality in Performance, The Myers-Briggs Type Indicator and The Big Five personality model, Johari Window, Transaction Analysis. Attitude – Definition, Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude.

Unit IV

Perception: Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). Motivation:

Definition & Concept of Motive & Motivation. Group and Team Dynamics: Meaning Group Dynamics, Types of Groups, Group Development, Team Effectiveness & Team Building.

Unit V

Organizational Culture: Types of Culture, Creating and Maintaining Organization Culture, Managing Cultural Diversity. Organizational Change: Types of Organizational change, Forces that acts as stimulants to change, overcome the Resistance to Change, Developing a Learning Organization. Leadership: Introduction, Managers V/s Leaders. Overview of Leadership- Traits and Types. Conflict Management: Sources of Conflict, Types of Conflict, Conflict Management Approaches.

Text Books

1. Pareek Udai: "Understanding Organizational Behavior", Oxford University Press, New Delhi, 2007.

1. K.Aswathappa: "Organizational Behavior-Text, Cases and Games", Himalaya Publishing House, New Delhi,2008.

2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "Organizational Behavior", Tata McGraw Hill Education, New Delhi, 2008.

References

1. Jerald Greenberg and Robert A Baron: "Behavior in Organizations", PHI Learning Pvt Ltd, New Delhi, 2009.

2. Robbins, Stephen P. Organizational behavior, 14/E. Pearson Education India, 2001.

B. TECH VI SEMESTER

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20MB6T02 PROJECT MANAGEMENT (OPEN ELECTIVE –II)

Course Objectives

The objective of this course is to enable the students to gain basic knowledge about the concept of project, project management, project life-cycle, project appraisal; to acquaint the students about various issues of project management.

SYLLABUS

Unit -I

Basics of Project Management –Concept– Project environment – Types of Projects – Project life cycle – Project proposals – Monitoring project progress – Project appraisal and Project selection – Causes of delay in Project commissioning– Remedies to avoid overruns. Identification of Investment opportunities – Sources of new project ideas, preliminary screening of projects – Components for project feasibility studies.

Unit- II

Market feasibility -Market survey – Categories of Market survey – steps involved in conducting market survey– Demand forecasting techniques, sales projections.

Unit- III

Technical and Legal feasibility: Production technology, materials and inputs, plant capacity, site selection, plant layout, Managerial Feasibility Project organization and responsibilities. Legalities – Basic legal provisions. Development of Programme Evaluation & Review Technique (PERT) –Construction of PERT (Project duration and valuation, slack and critical activities, critical path interpretation) – Critical Path Method (CPM)

Unit- IV

Financial feasibility – Capital Expenditure – Criteria and Investment strategies – Capital Investment Appraisal Techniques (Non DCF and DCF) – Risk analysis – Cost and financial feasibility – Cost of project and means of financing — Estimation of cash flows – Estimation of Capital costs and operating costs; Revenue estimation – Income – Determinants – Forecasting income –Operational feasibility - Breakeven point – Economics of working.

Unit -V

Project Implementation and Review: Forms of project organization – project planning – project control – human aspects of project management – prerequisites for successful project implementation – project review – performance evaluation – abandonment analysis.

Text Books

1. Prasanna Chandra, ―Projects, Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill Company Pvt. Ltd., New Delhi 1998.

2. Gido: Effective Project Management, 2e, Thomson, 2007.

References

1. Singh M.K, ―Project Evaluation and Management‖.

2. Vasanth Desai, Project Management, 4th edition, Himalaya Publications 2018.

3. Clifford F. Gray, Erik W. Larson, ―Project Management, the Managerial Emphasis, McGraw Hill, 2000.

B. TECH VI SEMESTER

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20AM6T07 BIG DATA ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: Data Base Management System

Course objectives:

In this course student will learn about

1. To understand the need of Big Data, challenges and different analytical architectures
2. Installation and understanding of Hadoop Architecture and its ecosystems
3. Processing of Big Data with Advanced architectures like Spark.
4. Describe graphs and streaming data in Spark.

Course Outcomes: At the end of the course, student will be able to

CO1: Discuss the challenges and their solutions in Big Data

CO2: Understand and work on Hadoop Framework and eco systems.

CO3: Explain and Analyze the Big Data using Map-reduce programming in Both Hadoop and Spark framework.

CO4: Demonstrate spark programming with different programming languages.

CO5: Demonstrate the graph algorithms and live streaming data in Spark.

SYLLABUS

Unit-I:

Introduction to big data: Data, Types of digital data, Evolution and Definition of big data, Challenges of big data, Characteristics and Need of big data.

Introduction to Hadoop: Introducing Hadoop, need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Hadoop Distributors.

HDFS (Hadoop Distributed File System): HDFS Daemons, Anatomy of file read, Anatomy of file write, working with HDFS commands.

Unit-II:

Introduction to MAPREDUCE Programming: Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Mapper, Reducer, Combiner, Partitioner, Searching, Sorting , Compression, Hadoop EcoSystem.

Unit-III:

Introduction to Pig: Key Features of pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, Relational Operators.

Introduction to HIVE: HIVE features, HIVE architecture, HIVE datatypes, HIVE File Formats, HIVE Query Language.

Unit-IV:

NoSQL: Introduction to NOSQL, Types of NoSQL Databases, and Advantages of NoSQL databases, CAP Theorem, BASE, SQL versus NoSql.

NoSQL databases: Introduction to MongoDB, Data types in MongoDB, MongoDB query language.

Unit-V:

Spark: Introduction to data analytics with Spark, Spark Stack, Programming with RDDS, Working with key/value pairs, Spark SQL, Schema RDDs,

Sparking Streaming: High level architecture of Spark Streaming, DStreams, Transformations on DStreams, Different Types of Transformations on DStreams.

Text Books:

[1].SeemaAcharya, SubhashiniChellappan, Big Data and Analytics, Wiley Publishers

[2].Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia, "Learning Spark: Lightning-Fast Big Data Analysis", O'Reilly Media, Inc.

Reference Books:

[1]. TomWhite, Hadoop,“TheDefinitiveGuide”,3rdEdition,O’ReillyPublications, 2012.

[2].David Loshin, "BigDataAnalytics: From Strategic Planning to Enterprise IntegrationwithTools,Techniques,NoSQL,andGraph”,MorganKaufmannPublishers, 2013

[3].Hadoopin PracticebyAlexHolmes, MANNING

[4].Hadoop in Action byChuckLam, MANNING

[5] Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , “Understanding Big Data Analytics for Enterprise ClassHadoopandStreamingData”, 1st Edition, TMH,2012.

[6] HienLuu, Beginning Apache Spark 2

E-resources and Other digital materials:

[1].Big Data Use cases for Beginners | Real Life Case Studies | Success Stories https://www.youtube.com/watch?v=HHR0-iJp2sM

[2]. Alexey Grishchenko, Hadoopvs MPP, https://0x0fff.com/hadoop-vs-mpp/

[3]. Random notes on bigdata- SlideShare: Available www.slideshare.net/yiranpang/random-notes-on-big-data-26439474

B. TECH VI SEMESTER

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20AD6T07 VISUAL ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: There is no prerequisite to learn this course.

Course Objective: *This* ***course*** explains apply the fundamentals of Tableau tool, Use all the basic functionality to visualize their data, Connect to various data sources, Build a variety of basic charts, Combine insights into a useable dashboard, Share and publish visualizations.

Course Outcomes: At the end of the course, student will be able to

CO1: Examine, navigate, and learn to use the various features of Tableau

CO2: Create and design visualizations and dashboards for your intended audience

CO3: apply predicative analytics to improve business decision making

CO4: Assess the quality of the data and perform exploratory analysis

CO5: Combine the data to and follow the best practices to present your story

SYLLABUS

UNIT-1:

Introduction: Tableau Application Suite, Installing and Activating Tableau Desktop, Data Preparation, Finding the Dataset, Understanding the Data, The Tableau Workspace, Saving, Opening, and Sharing Your Workbooks, Setting Up a Data Connector, Adding a Table to a Data Model, Data Extracts and Live Connections, Data Protection and Data Governance, Data Types, Data Collection with IFTTT and Google Sheets, Website Analysis with Google Analytics, Performance Optimization.

UNIT-2:

Data Visualizations and Aggregate Functions: Chart Types, Scatter Plots, Bar Charts, Legends, Filters, and Hierarchies, Line Charts, Straight Lines, Step Charts, Continuous Date Fields, Highlight Tables, Heat maps, Bullet Charts, Aggregate Functions, Calculated Fields, Aggregations in Calculated Fields, Text Operators, Splits, Date Fields, and Formats, Working with NULL Values, Parameters

UNIT-3:

Table Calculations and Maps: Different Types of Calculations, Quick Table Calculations, Customized Table Calculations, Bump Charts, Dual Axis Charts, Keywords and Syntax, Cohort Analysis, Regional Averages, Different Types of Maps, Map Layers, Maps with Pie Charts: Creating a Pie Chart Map, Dual Axis Map Embedding the Chart in Tooltips, Mapbox Maps, Mapbox in Tableau, Using the Background Map, Spatial Data.

UNIT-4:

Advanced Analytics and Interactive Dashboards: Overview of the Tableau Analytics Pane, Constant, Average, and Reference Lines, Trend Lines, Forecasts, Model Description, Cluster Analysis, Clustering in Tableau, Python, R, and MATLAB Integration, Connecting Tableau with TabPy, Security, The Dashboard Pane, Placing Charts on the Dashboard, Dashboard Actions, Filter Actions, Adding Web Content via URL Actions, Design Tips for Creating a Dashboard

UNIT-5:

Data Preparation with Tableau: Connecting to Data, Wildcard Unions, Inspecting the Data, Removing Unneeded Fields, Data Cleaning and Formatting, Cleaning Steps and Built-in Cleaning Features, Unions, Joins, Splits Grouping, Running the Flow and Outputting the Data, Saving Flows.

Text Book:

Alexander Loth, "**Visual Analytics with Tableau**", ISBN: 978-1-119-56020-3, Wiley 2019

Reference Books:

1. "**Visual Thinking for Design**" by Colin Ware
2. "**Storytelling With Data: A Data Visualization Guide for Business Professionals**" by Cole Nussbaumer Knaflic
3. "**Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics**" by Nathan Yau

B.TECH VII SEMESTER **OEC**

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20CE7T13 CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE-III)

Course Objectives:

- To introduce to the student the concept of project management including network drawing and monitoring
- To introduce various equipments like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
- to introduce the importance of safety in construction projects

Course Outcomes:

CO1: appreciate the importance of construction planning

CO2: understand the functioning of various earth moving equipment

CO3: the methods of production of aggregate products and concreting and usage of machinery required for the works.

CO4: apply the gained knowledge to project management and construction techniques

SYLLABUS

UNIT-I:

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts– critical Path Method – Applications

UNIT-II:

Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT-III:

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types

UNIT–IV:

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers –graders – scrapers– draglines - clamshell buckets

UNIT –V:

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers– selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality

control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder, Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

Reference Books:

1. Construction Project Management - An Integrated Approach, Peter Fewings, Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

B.TECH VII SEMESTER **OEC**

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20CE7T14 GREEN BUILDINGS (OPEN ELECTIVE-III)

Course Objectives:

- To introduce the different concepts of green building techniques and how they may be synthesized to best fit a construction.
- To Know the importance of Green buildings
- To know and implement energy conservation and renewable resources
- To understand the knowledge of ECBC, LEED, GRIHA etc.

Course Outcomes:

CO1: Able to describe the importance and necessity of green building.

CO2: Able to suggest materials and technologies to improve energy efficiency of building.

CO3: Able to assess a building on the norms available for green building.

SYLLABUS

UNIT-I:

Introduction of Green Buildings, Salient features of green buildings, Advantages of Green Buildings- Sustainable site selection and planning of buildings to improve comfort, day lighting, ventilation, planning for drainage.

UNIT-II:

ENERGY EFFICIENT BUILDINGS Passive cooling and day lighting – Active solar and photovoltaic, building energy analysis methods, Lighting system design, Lighting economics and aesthetics, Impacts of lighting efficiency, Technological options for energy management.

UNIT-III:

ENERGY CONSERVATION Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings, waste to energy management in residential complexes or gated communities.

UNIT-IV:

RENEWABLE ENERGY RESOURCES Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar, windand hydro power appliances, success case studies of fully solar, wind and hydro power energies.

UNIT-V:

ENERGY REQUIREMENT AND GREEN BUILDING RATING SYSTEMS Energy

Conservation Building Code (ECBC) requirement for green buildings, Requirement for green rating systems - Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment (GRIHA), Building automation and building management systems.

Text Books:

1. ‘Handbook on Green Practices published by Indian Society of Heating Refrigerating and Airconditioning Engineers’, 2009
2. ‘Alternative building materials and technologies’ by K.S. Jagadish, B.V. Venkatarama Reddyand K.S. Nanjunda Rao.
3. ‘Green Building Handbook’ by Tomwoolley and Samkimings, 2009

Reference Books:

1. ‘Complete Guide to Green Buildings’ by Trish riley.
2. ‘Non-Conventional Energy Resources’ by G. D. Rai, Khanna Publishers.
3. ‘Standard for the design for High Performance Green Buildings’ by Kent Peterson, 2009
4. Ganesan T P, “Energy Conservation in Buildings”, ISTE Professional Center, Chennai, 1999.

B.TECH VII SEMESTER **OEC**

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20EE7T13 CONCEPT OF POWER SYSTEM ENGINEERING (OPEN ELECTIVE-III)

Course Objective: To develop problem solving skills and understanding of Power System concepts through the application of techniques and principles of electrical Power Generation methods.

Course Outcomes: At the end of the course, student will be able to

CO1: Various electrical Power System Components, Supply systems

CO2: Thermal Power Station working procedure, each module path directions

CO3: Hydro Power Station working procedure, classifications

CO4: Nuclear Power Station working procedure, Chain Reaction

CO5: Solar power generation & Wind Power Generation, Applications

SYLLABUS

UNIT-I: **Power System Components**

Single line Diagram of Power system, Different kinds of supply system, conventional and Non-conventional energy sources, Applications.

UNIT-II: Thermal Power Stations

Choice of site Selection, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super, heaters, Economizers, electrostatic precipitators

UNIT-III: Hydro & Nuclear Power Stations

Choice of site, arrangement of hydroelectric installations, Hydrology. Mass curve, flow duration curve, classification of Hydro Power Plants, Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components

UNIT-IV: Solar power generation & Wind Power Generation

Solar radiation spectrum. Radiation measurement. Applications of solar thermal systems Solar Photovoltaic (SPV) systems, Introduction to wind energy, basic principles of wind energy conversion.

UNIT-V: Transmission & Distribution

Transmission structure, classifications, types of conductors, primary & secondary distribution, Substation Equipments , layout.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagarand, A Chakrabarti, DhanpatRai& Co. Pvt. Ltd.

2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers
3. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
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20EE7T14 INSTRUMENTATION (OPEN ELECTIVE-III)

Course Objectives:

1. To study the basics of measuring system.
2. To study various Electrical transducers and to measure the various types of Non–electrical quantities
3. To study various types of digital voltmeters
4. To study the working principles of various types of oscilloscopes and their applications.
5. To study various types of signal analyzers

Course Outcomes:

CO1: Able to study the basics of measuring system.

CO2: Acquire proper knowledge to use various types of Transducers and able to monitor and measure various parameters such as strain, Fow, temperature and pressure

CO3: Acquire proper knowledge and working principle of various types of digital voltmeters.

CO4: Able to measure various parameters like phase and frequency of a signal with the help of CRO.

CO5: Acquire proper knowledge and able to handle various types of signal analyzers.

SYLLABUS

UNIT-I

Basics of Measuring System: Measuring Systems, Performance Characteristics – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors and Random Errors, Statistical analysis of random errors.

UNIT-II

Transducer Basics and Applications: Definition of transducers – Classification of transducers – Advantages of Electrical transducers –Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers. Measurement of Temperature, Pressure, Strain and Flow.

UNIT-III

Digital Voltmeters: Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type DVM, digital frequency meter – Digital phase angle meter.

UNIT-IV

Oscilloscope: Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns – Sampling oscilloscope, data logger, Transient recorder.

UNIT-V

Signal Analyzers: Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co

Reference Books:

1. Measurement and Instrumentation theory and application, Alan S.Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doeblin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson/Prentice Hall ofIndia
4. Modern Electronic Instrumentation and Measurement techniques – by A.D HelfrickandW.D.Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T10 GREEN ENGINEERING SYSTEMS (OPEN ELECTIVE -III)

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: The course aims to highlight the significance of alternative sources of energy, green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

Course Outcomes: At the end of the course, student will be able to

CO1: Evaluate the impact of technology on environment

CO2: Compare biological ecology to industrial ecology

CO3: Design eco-friendly product

CO4: Create sustainable products, facilities, processes and infrastructure

CO5: Asses the life cycle of a product to evaluate its impact on energy and materials use. Determine the effects of air and water quality

SYLLABUS

UNIT-I:

INTRODUCTION: SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT-III:

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV: ENERGY EFFICIENT SYSTEMS:

(A) ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V: ENERGY EFFICIENT PROCESSES:

Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/ TMH
2. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3. Green Manufacturing Processes and Systems, Edited / J. Paulo Davim/Springer 2013

References:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international

2. Principles of Solar Engineering / D.YogiGoswami, Frank Krieth& John F Kreider / Taylor & Francis
3. Non-Conventional Energy / Ashok V Desai /New Age International (P) Ltd
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Non conventional Energy Source/ G.D Roy/Standard Publishers
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd
7. Fuel Cell Technology –Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
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20ME7T11 HYBRID ELECTRIC VEHICLES (OPEN ELECTIVE -III)

Pre-requisite: Internal-Combustion engines.

Course Objective:

The main objective of this course is to provide the knowledge on architecture of Hybrid Electric Vehicles, Fuel cells and their sub-systems. The focus is as well on explaining the requirements of hybrid electric vehicles and Fuel-cells for automobile applications. At the same time, various design considerations in fuel cell vehicles and electric vehicles will be explained.

Course Outcomes: At the end of the course, student will be able to

CO1:	Compare and contrast the working of Conventional and Electric Vehicles.
CO2:	Comprehend the use of Series and Hybrid Electric vehicle drive trains
CO3:	Apply the fundamentals of to develop the propulsion and storage systems for Hybrid Electric Vehicles.
CO4:	Perform a case study on Hybrid Electric vehicle drive trains for different parameters
CO5:	Describe the working principle of various types of fuel-cells.

SYLLABUS

UNIT-I:

ELECTRIC VEHICLES: Introduction, Electric Vehicle Principle- Components of Electric Vehicle Constituents of a conventional vehicle-Drive cycles and Drive Terrain, Operating principle of Fuel Cell, Differences between conventional battery and Electric battery, Transmission differences between conventional and Electric Vehicles, Differences between conventional lighting system and Electric vehicle lighting system.

UNIT-II:

HYBRID ELECTRIC VEHICLES: Introduction, A Brief history of Hybrid Electric vehicles (HEVs),Basics of Hybrid Electric Vehicles (HEVs), Architecture of HEVs-Series HEVs, Parallel HEVs, Series-Parallel HEVs.

HYBRID ELECTRIC VEHICLE DRIVE TRAINS: Parallel Hybrid Drive trains with Torque coupling, Parallel Hybrid Drive trains with both Speed coupling, Parallel Hybrid Drive trains with both speed Torque coupling.

UNIT-III:

ELECTRIC PROPULSION SYSTEMS: DC Motors- Operating principle and control of DC motors, Induction Motor Drives: Operating principle and Control Mechanisms, Brushless Motor Drives-Principle and Construction, Switched Reluctance Motor (SRM) Drives- Basic structure, Drive Convertor, Modes of Operation.

ENERGY STORAGE SYSTEMS: Electrochemical Batteries, Lead-Acid Batteries, Nickel Based Batteries, Lithium Based Batteries, Ultra Capacitors- Basic Principles and Performance, Ultrahigh-speed flywheels- Basic Principle and Power Capacity, Fly Wheel technologies.

UNIT-IV:

DESIGN OF SERIES HYBRID ELECTRIC VEHICLE DRIVES: Design of Series Hybrid Electric Vehicle Drive- Control Strategies, Sizing of Major Components and Case Study for designing for various parameters.

DESIGN OF PARALLEL HYBRID ELECTRIC VEHICLE DRIVES: Design of Parallel Hybrid Electric Vehicle Drive- Control Strategies of Drive Train and Design of Drive Train Parameters.

UNIT-V:

FUEL CELL ELECTRIC VEHICLES: Operating principles of fuel cells, Fuel and oxidant consumption, Fuel cell system characteristics, Fuel cell technologies- Proton Exchange membrane fuel cells, Alkaline Fuel cells, Phosphoric acid fuel cells, Molten carbonate fuel cells, Solid oxide fuel cells, Fuel supply- Hydrogen storage-Hydrogen production, Ammonia as hydrogen carrier, Non-Hydrogen fuel cells, Fuel Cell Hybrid Vehicle Drive Train.

Text Books:

1) MehrdadEhsani, YiminGao, Ali Emadi, 2nd edition, Modern Electric, Hybrid Electric and Fuel cell vehicles, CRC Press, Taylor and Francis Group, 2010.
2) Chris Mi, M.AbulMasrur and David WenzhongGao, 1st Edition, Hybrid Electric Vehicles, John Wiley & Sons, Ltd, 2011.

B. TECH VII SEMESTER **OEC**

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20EC7T10 DATA COMMUNICATIONS (OPEN ELECTIVE-III)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To focus on information sharing and networks.
2. To Introduce flow of data, categories of network, different topologies.
3. To focus on different coding schemes.
4. To brief the students regarding protocols and standards.
5. To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices, etc.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Know basic knowledge of data Communication
CO2: Know basic knowledge of Analog & Digital Signals
CO3: Understand the basic knowledge of Analog Transmission
CO4: know Different types of transmission media
CO5: Focus on DTE-DCE Interface

SYLLABUS

UNIT-I:

Introduction to data communication and networking: Reason to study data communication, Data Communication, Networks, Protocols and Standards, Standards Organizations. Line Configuration, Topology, Transmission Modes, Categories of Networks Internet works. Study of OSI and TCP/IP protocol suit: The Model, Functions of the layers, TCP/IP Protocol Suites

UNIT-II:

Study of Signals: Analog and Digital, Periodic and Aperiodic Signals, Analog Signals, Time and Frequency Domains, Composite Signals, Digital Signals. Study of Digital transmission: Digital to Digital Conversion, Analog to Digital Conversion.

UNIT-III:

Study of Analog transmission: Digital to Analog Conversion, Analog to Analog Conversion. Study of Multiplexing: Many to one/one to Many, Frequency division Multiplexing, Wage division Multiplexing, Time division Multiplexing, Multiplexing applications.

UNIT-IV:

Types of transmission media: Guided Media, Unguided Media, Transmission Impairments, Performance Wavelength, Shannon Capacity, Media Comparison, PSTN, Switching. Error Detection and Correction: Types of Errors, Detection, Parity Check, Vertical Redundancy Check, Longitudinal Redundancy Check, Cyclic Redundancy Check, Checksum, Error Correction.

UNIT-V:

Study of DTE-DCE in brief: Digital data transmission, DTE-DCE Interface, Modems, 56K Modems, Cable Modems. Introduction to networks and devices: Network classes, Repeaters, Hub, Bridges, Switches, Routers, Gateways Routers, Routing Algorithms, Distance Vector Routing, Link State Routing.

Text Books:

1. Data communication & Networking by Bahrouz Forouzan.
2. Computer Networks by Andrew S. Tanenbaum

Reference Books:

1. Data and Computer Communications by William Stallings
2. Kleinrock, Leonard. Queueing Systems, Vol 1: Theory. New York, NY: Wiley J., 1975. ISBN: 0471491101.

B. Tech VII Semester	OEC	L	T	P	C
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20EC7T11 MECHATRONICS (OPEN ELECTIVE III)

Course Objective: The main objective of this course is

- To introduce the integrative nature of Mechatronics.
- To describe the basic programming, different components and devices of mechatronics systems.

Course Outcomes:
At the end of this course the student will able to:

CO1: Basic concepts of mechatronics

CO2: To design mechatronics system with the help of Microprocessor

CO3: To design PLC and other electrical and Electronics Circuits

CO4: To understand the concept of solid state Devices

CO5: To know Dynamic models & controllers

SYLLABUS

UNIT-I:

Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors.

UNIT-II:

Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontrollers – Block diagram

UNIT-III:

Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC, Basic programming in PLC.

UNIT-IV:

Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning, operational amplifiers, noise reduction, filtering.

UNIT-V:

Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trend

TEXT BOOKS:

1. Bolton, ―Mechatronics‖, Printice Hall, 2000

2. Ramesh S Gaonkar, ―Microprocessor Architecture, Programming, and Applications with the 8085‖, 5th Edition, Prentice Hall, 2008.

REFERENCE BOOKS:

1. Mechatronics System Design / Devdas shetty/Richard/Thomson.

2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

B. TECH VII SEMESTER

OEC	L	T	P	C
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BIOMEDICAL INSTRUMENTATION.
20EC7T12 (OPEN ELECTIVE III)

Course Objectives:

1. To introduce student to basic biomedical engineering technology
2. To understand the anatomy & physiology of major systems of the body in designing equipment for medical treatments.
3. To impart knowledge about the principle and working of different types of bio-medical electronic equipment/devices.

Course- Outcomes:
After going through this course the student will able

CO1.To understand Physiological System of the Body and Bioelectric Potentials.

CO2.To understand Electrodes, Transducer and Sensors used in Biomedical field.

CO3 To understand the problem and identify the necessity of equipment for diagnosis and therapy.

CO4 To understand the importance of electronics engineering in medical field.

CO5 To understand the importance of telemetry in patient care

SYLLABUS

UNIT-1: INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT-II: ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output**.**

UNIT-III: CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV: PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids, Laparoscope, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention,

UNIT-V: DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring.

Text Books:

1. Bio-Medical Instrumentation‖, Cromwell , Wiebell, Pfeiffer
2. Hand Book of Bio-Medical Instrumentation‖, Instrumentation‖, Kandahar. McGraw-Hill

References

1. Introduction to Bio-Medical Equipment Technology‖, 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. “Bio-Medical Electronics and Instrumentation”, Onkar N. Pandey, Rakesh Kumar, Katson Books.

B. TECH VII SEMESTER

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OEC	**3**	**0**	**0**	**3**

ARTIFICIAL NEURAL NETWORKS.
20CS7T10 (OPEN ELECTIVE III)

Course Objectives:

- To deal with the historical developments of artificial intelligence leading to artificial neural networks (ANN).
- To introduce the basic concepts and models of ANN for solving real world problems.

Course Outcomes:

At the end of this course the student will be able to:

CO1- Understand biological neuron & artificial neuron and basic building blocks of ANN.

CO2-Understand different single layer/multiple layer Perceptron learning algorithms.

CO3- Understand and analyze Adaline and Madeline Networks and their applications

CO4- Learning algorithms based on basic gradient descent, backpropagation and their modifications.

CO5- Understand self-organization learning, ART, Radial basis Functions.

SYLLABUS

UNIT - I: Introduction to Artificial Neural Networks:

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT - II: Fundamental Models of Artificial Neural Networks:

Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS)Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.

Perceptron Networks: Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks

UNIT – III: Adaline and Madaline Networks:

Introduction, Adaline, Madaline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

UNIT - IV: Feedback Networks:

Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets.

Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT - V: Self Organizing Feature Map:

Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

Adaptive Resonance Theory: Introduction, ART Fundamentals, ART 1, ART2.

TEXT BOOKS:

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL : 2005.

REFERENCES:

1. “Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

B. TECH VII SEMESTER

OEC	L	T	P	C
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CYBER SECURITY
20CS7T11 (OPEN ELECTIVE III)

Course Objective:

- Understand the importance of Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

Course Outcomes:

CO1: Understand and classify various forms of Cybercrimes

CO2: Interpret the reasons for Cyber offence

CO3: Detect and analyze vulnerabilities in Mobile and Wireless devices

CO4: Analyze tools used to perform cyber crimes

CO5: Understand cyber security Laws

SYLLABUS:

UNIT-I: Introduction, Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes

UNIT-II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT-III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT-IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-V: Cybercrimes and Cyber security:

The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

B. TECH VII SEMESTER

OEC	L	T	P	C
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SOFTWARE TESTING METHODOLOGIES
20CS7T12 (OPEN ELECTIVE III)

Course Objectives:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To Understand different levels of Testing
- Apply Black Box and White Box Testing Techniques
- To learn how to plan a test project, design test cases and data, conduct testing operations, and generate a test report.
- To understand software test automation problems and solutions.

Course Outcomes:

CO1: Have an ability to apply software testing knowledge and engineering methods.

CO2: Ability to identify the needs of software test automation, and define a test tool to support test automation.

CO3: Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

CO4: Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

CO5: Apply techniques and skills to use modern software testing tools to support software testing projects.

SYLLABUS

UNIT-I: Software Testing:

Introduction, Evolution, Dichotomies, Goals & Typical Objectives of Testing, Model for testing, Software Testing Principles, **Software Testing Terminology and Methodology:** Software Testing Terminology, Errors, Defects, Failures, Root Causes and Effects, Software Testing Life Cycle, Software Testing Methodology.

UNIT-II: Verification and Validation:

Verification & Validation Activities, Categories of Test Techniques: Dynamic Testing,

Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing,

White-Box Testing: Need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT-III: Static Testing:

Inspections, Structured Walkthroughs, Technical reviews, Benefits of Static Testing, Static Vs Dynamic Testing.

Levels of Testing: Unit testing, Integration Testing,. Function testing, System testing and Acceptance testing.

Regression testing: Progressive Vs Regressive testing, Objectives of regression testing, Regression testing techniques

UNIT-IV: Test Management:

Test Organization, Test Planning, Test Design and Test case specifications, Structure of a Testing Group, Reasons for the growth of a Test suite, Test suite Minimization, Test suite prioritization, Types of test case prioritization, prioritization techniques, Measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models

Debugging: Debugging process, Debugging Techniques, Correcting Bugs, Debuggers

UNIT-V: Automation and Testing Tools:

Need for automation, Testing Tool Considerations, Test Tool Classification, Benefits and Risks of Test automation, Special Considerations for Test execution and Test Management Tools, Principles for tool selection, Testing tools- success factors, Guidelines for automated testing, overview of some commercial testing tools.

Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web **engineering**, testing of web based systems, Testing mobile systems.

TEXT BOOKS:

1. Software testing techniques - Baris Beizer, International Thomson computer press, second edition. (Unit 1)
2. Software Testing, Principles and Practices, Naresh Chauhan, Oxford Publishers(Unit 2,3,4,5)

REFERENCES:

Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

1. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
2. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

B. TECH VII SEMESTER

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INTERNET OF THINGS
20IT7T10 (OPEN ELECTIVE III)

Course Objectives:

- Understand the architecture of Internet of Things and connected world.
- Explore on use of various hardware, communication and sensing technologies to build IoT applications
- Develop the real time IoT applications to make smart world.
- Understand challenges and future trends in IoT.

Course Outcomes:

CO1: Design and Deployment of IoT.

CO2: Design and comparing M2M with IoT.

CO3: Understand Platform design and modeling of IoT

CO4: Apply IoT in different devices using Python

CO5: Implement IoT and cloud platforms.

SYLLABUS

UNIT-I: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT Enabling Technologies, IoT levels and deployment, domains Specific IoTs.

UNIT-II: IoT and M2M :

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

UNIT-III: IoT Platforms Design Methodology:

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data Structures, control flow, functions, modules, packages, file handling. Raspberry PI with Python, other IoT devices.

UNIT-IV: IoT Protocols:

Messaging Protocols- MQ Telemetry Transport (MQTT), Constrained Application Protocol (CoAP) Transport Protocols-Light Fidelity (Li-Fi), Bluetooth Low Energy (BLE) IoT Protocols: Addressing and Identification: Internet Protocol Version 4 (IPV4), Internet Protocol Version 6(IPV6), Uniform Resource Identifier (URI)

UNIT-V: IoT Physical Servers And Cloud Offerings: Introduction to cloud storage models and communication APIs, WAMP –Auto Bahn for IoT, Xively cloud for IoT, case studies illustrating IoT design –home automation, smart cities, smart environment.

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things: A Hands-on-Approach”, VPT, 1st Edition, 2014. (Units1,2,3,5)
2. Matt Richardson, Shawn Wallace, “Getting Started with Raspberry Pi”, O’Reilly (SPD), 3rd Edition, 2014. (Unit 3)
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram “ Internet of Things” Wiley (Unit 4).

REFERENCE BOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons2014.

B. TECH VII SEMESTER

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COMPUTER VISION
20IT7T11 (OPEN ELECTIVE III)

Course Objectives:

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand motion analysis.
- To study some applications of computer vision algorithms

Course Outcomes:

CO1: Implement fundamental image processing techniques required for computer vision.

CO2: Perform shape analysis.

CO3: Apply Hough Transform for line, circle, and ellipse detections.

CO4: Apply 3D vision techniques.

CO5: Develop applications using computer vision techniques

SYLLABUS

UNIT - I:

IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology –texture.

UNIT - II: SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT – III: HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT - IV: 3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

.**UNIT - V: APPLICATIONS**

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

TEXT BOOKS:

1.D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.

2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.
2. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
3. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
4. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.

B. TECH VII SEMESTER

OEC	L	T	P	C
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FUZZY SETS
20HS7T01 (OPEN ELECTIVE III)

COURSE OBJECTIVES:

1) Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
2) Explain different types operations performed on fuzzy sets.
3) Provide the knowledge of Arithmetic operations on fuzzy numbers.
4) Emphasis on different kinds of crisp and fuzzy relations
5) Enable students to know the validity of arguments by fuzzy logic.

COURSE OUTCOMES:

CO1: Understand basic knowledge of fuzzy sets and fuzzy logic.
CO2: Apply various kinds of operations on fuzzy sets.
CO3: Understand the concepts of fuzzy arithmetic to solve fuzzy equations.
CO4: Illustrate the properties of fuzzy sets to design modeling software system.
CO5: Apply fuzzy logic to solve the problems in neural networks.

SYLLABUS

UNIT-I

Fuzzy Sets(all theorems without proofs): Introduction, Crisp sets, Fuzzy sets: Basic types and basic concepts, additional properties of α-cuts, representations of Fuzzy sets, extension principle for Fuzzy sets.

UNIT-II

Operations on Fuzzy Sets(all theorems without proofs): Types of operations, Fuzzy complements, Fuzzy intersections: t-norms, Fuzzy unions: t-conorms, Combinations of operations, Aggregation operations.

UNIT-III

Fuzzy Arithmetic(all theorems without proofs): Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations.

UNIT-IV

Fuzzy Relations(all theorems without proofs): Crisp versus Fuzzy relations, Projection and cylindrical extensions, Binary Fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations, Fuzzy compatibility relations, Fuzzy ordering relations, Fuzzy morphisms.

UNIT-V

Fuzzy Logic(all theorems without proofs): Classical logic: an over view, multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic hedges, Inference from conditional Fuzzy propositions, Inference from conditional and qualified propositions, Inference from quantified propositions.

TEXT BOOKS:

1. George J. Klir& Bo Yuan, Fuzzy Sets & Fuzzy Logic, Pearson Education, PHI, 1995.
2. H. J. Zimmermann, Fuzzy Set Theory and its Applications, 4th edition, Springer.

REFERENCES:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd edition, Wiley, 2010.
2. John Yen & Reza Langari, Fuzzy Logic, Pearson.

B. TECH VII SEMESTER

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OEC	3	0	0	3

DIGITAL MEDIA MANAGEMENT

20MB7T01 (OPEN ELECTIVE III)

Course Objective

Digital marketing channels that can helps the students to understand the increased business visibility and brand awareness. Moreover, having a professional presence on social media helps them to reach a broader target audience to secure more leads and convert them into loyal customers.

SYLLABUS

Unit – I

Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

Unit – II

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How different segments use Digital Media –

Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

Unit – III

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Writing the Marketing Plan and Implementing the Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget.

Unit – IV

Search Engine Marketing and Online Advertising: Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

Unit – V

Social Media Marketing: Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

TEXT BOOKS

1 Richard Gay, Alan Charles worth and Rita Essen, Online Marketing, Oxford University Press, 2016.

REFERENCES

1. Dave Chaffey, Fiona Ellis-Chadwick, Richard Mayer, Kevin Johnston. Internet Marketing Strategy, Implementation and Practice,3rd Ed .Prentice Hall.

2. Rob Stokes e-Marketing: The essential guide to marketing in a digital world. 5th Ed. Quirk e-Marketing (Pty) Ltd.

B. TECH VII SEMESTER

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20MB7T02 **ENTREPRENEURSHIP DEVELOPMENT (OPEN ELECTIVE III)**

SYLLABUS

UNIT –I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, "Entrepreneurship" New Age International.

2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International

3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.

B. TECH VII SEMESTER

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20AD7T10 **DATA ANALYSIS AND VISUALIZATION WITH PYTHON (OPEN ELECTIVE III)**

Pre-requisite:

Course Objective: *This course* explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

Unit-1:

Preliminaries: What Kinds of Data?, Why Python for Data Analysis?, Python as Glue, Solving the "Two-Language" Problem, Why Not Python?, Essential Python Libraries, Installation and Setup.

Python Language Basics, IPython, and Jupyter Notebooks: The Python Interpreter, IPython Basics, Python Language Basics.

NumPy Basics: Arrays and Vectorized Computation:

The NumPy ndarray: A Multidimensional Array Object, Universal Functions: Fast Element-Wise Array Functions, Array-Oriented Programming with Arrays, File Input and Output with Arrays, Linear Algebra, Pseudorandom Number Generation.

Unit-2:

Introduction to pandas Data Structures: Series, DataFrame, Index Objects

Essential Functionality: Reindexing, Dropping Entries from an Axis, Indexing, Selection, and Filtering, Integer Indexes, Arithmetic and Data Alignment, Function Application and Mapping, Sorting and Ranking, Axis Indexes with Duplicate Labels, Summarizing and Computing Descriptive Statistics: Correlation and Covariance, Unique Values, Value Counts, and Membership.

Unit-3:

Data Loading, Storage, and File Formats Reading and Writing Data in Text Format: Reading Text Files in Pieces, Writing Data to Text Format, Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping

Binary Data Formats: Using HDF5 Format, Reading Microsoft Excel Files

Data Cleaning and Preparation:

Handling Missing Data: Filtering Out Missing Data, Filling In Missing Data

Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, Computing Indicator/Dummy Variables

Unit-4:

Data Wrangling: Join, Combine, and Reshape:

Hierarchical Indexing: Reordering and Sorting Levels, Summary Statistics by Level, Indexing with a DataFrame's columns.

Combining and Merging Datasets: Database-Style DataFrame Joins, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap.

Reshaping and Pivoting: Reshaping with Hierarchical Indexing, Pivoting "Long" to "Wide" Format, Pivoting "Wide" to "Long" Format.

Unit-5:

Plotting and Visualization

A Brief matplotlib API Primer: Figures and Subplots, Colors, Markers, and Line , Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, matplotlib Configuration.

Plotting with pandas and seaborn: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots, Facet Grids and Categorical Data, Other Python Visualization Tools.

Text Book:

"Python for Data Analysis" Data Wrangling With Pandas, Numpy, And Ipython Second Edition by Wes McKinney, Oreilly Publications.

B. TECH VII SEMESTER

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20AM7T10 NoSQL DATABASES (OPEN ELECTIVE III)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains define, compare and use the four types of NoSQL Databases, demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases, explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases, ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the type of NoSQL database to implement based on business requirements

CO2: Apply NoSQL data modeling from application specific queries

CO3: Understand NoSQL Storage Architecture

CO4: Use Atomic Aggregates and denormalization as data modeling techniques to optimize query processing

CO5: Apply indexing and ordering of data sets

SYLLABUS

Unit-1:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented

Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

Unit-2:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

Unit-3:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value

Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

Unit-4:

NoSQL Stores: Similarities between Sql and Mongodb Query Features, Accessing Data

From Column-Oriented Databases like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution in Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

Unit-5:

Indexing and Ordering Data Sets: Essential Concepts behind a Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Reference Books:

1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional,2012.

2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications,2013.

3) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN:978-0-470-94224-6

4) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

B.TECH VII SEMESTER	OEC	L	T	P	C
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20CE7T15 WASTE WATER TREATMENT
(OPEN ELECTIVE-IV)

Course Objectives: To study about waste water treatment

Course Outcomes: Able to provide waste management techniques

SYLLABUS

UNIT–I:

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

UNIT–II:

Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems, Industrial waste water discharges into streams. Lakes and oceans- consequent problems.

UNIT–III:

Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries, Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods. Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT-IV:

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT–V:

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

Text Books:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

Reference Books:

1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

B.TECH VII SEMESTER

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OEC	3	0	0	3

20CE7T16 REPAIR AND REHABILITATION OF CONCRETE STRUCTURES

(OPEN ELECTIVE-IV)

Course Objectives:

- Familiarize Students with deterioration of concrete in structures
- Equip student with concepts of NDT and evaluation
- To evaluate the performance of the materials for repair
- To strategize different repair and rehabilitation of structures.

Course Outcomes:

CO1: Explain deterioration of concrete in structures

CO2: Carryout analysis using NDT and evaluate structures

CO3: Students must gain knowledge on quality of concrete

CO4: Examine how the Concrete repair industry equipped with variety of repair Material s and techniques .

SYLLABUS

UNIT–I:

Maintenance and Repair Strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT-II:

Causes of Damage To Structures Causes of Distress in Structures - Extrinsic and Intrinsic causes for damage of structures; Effect of Chemical and Marine Environment on structures.

UNIT-III:

Semi Destructive Tests for Damage Assessment Core Test, LOK test, CAPO test, Penetration Tests Non-Destructive Tests for Damage Assessment Rebound Hammer Test, Ultrasonic Pulse Velocity test, Resistivity Test, Carbonation Test, Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

UNIT-IV:

Materials for Repair: Criteria for durable concrete repair, selection of repair materials, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete, FRP sheets.

UNIT-V:

Techniques for Repair: Crack repair techniques – Crack Stitching, Mortar and dry pack, vacuum concrete, Shotcreting, Epoxy injection, Mortar repair for cracks Methods of Strengthening: Repairs to overcome low member strength – Jacketing, blanketing

Text Books:

1. 'Maintenance & Repair of Civil Structures' by B.L. Gupta & Amit Gupta.
2. 'Rehabilitation of Concrete Structures' by B. Vidivelli, Standard Publishers.
3. 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation' by V. K. Raina

Reference Books:

1. 'Concrete Structures- protection Repair and Rehabilitation' by R. Doodge Woodson, BH Publishers
2. ShettyM.S., "Concrete Technology – Theory and Practice", S. Chand and Company, 2008.
3. Dov Kominetzky. M. S., "Design and Construction Failures", Galgotia Publications Pvt.Ltd., 2001
4. Ravishankar.K., Krishnamoorthy. T. S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
5. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008,
6. Gambhir. M. L., "Concrete Technology", McGraw Hill, 2013

B.TECH VII SEMESTER **OEC**

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20EE7T15 POWER QUALITY
(OPEN ELECTIVE-IV)

Course Objective:

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

Course Outcome:

At the end of this course the student should be able to

CO1: Differentiate between different types of power quality problems.

CO2: Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.

CO3: Analyze power quality terms and power quality standards.

CO4: Explain the principle of voltage regulation and power factor improvement methods.

CO5: Explain the power quality monitoring concepts and the usage of measuring instruments.

SYLLABUS

Unit-I

Introduction to Power Quality: Terms and definitions of transients, Long Duration Voltage Variations: Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching DC offset; waveform distortion; voltage fluctuation; power frequency variations.

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction-capacitor switching

transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics, measurement of harmonics, THD; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, “Electrical Power System Quality” McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, “Power Quality Enhancement Using Custom Power Devices” Kluwer Academic Publishers
3. Sankaran, “ Power Quality” CRC Press.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis) Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

B.TECH VII SEMESTER **OEC**

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20EE7T16 ELECTRIC VEHICLES

(OPEN ELECTIVE-IV)

Course Objective:

- To study the different drive train configurations of electric vehicles
- To propose the various propulsion and energy storage systems for EHVs
- To know the sizing of propulsion motors and other systems involved in EH vehicles
- To carry out different design case studies of EHv and BEVs

Course Outcomes: At the end of the course, the student will be able to:

CO1: Assess the performance, societal and environmental impact of EHVs having known their past history

CO2: Implement various drive train topologies and control strategies in Electric and Hybrid vehicles

CO3: Recommend, Design/Size and Control different electric propulsion units and other components of EHVs and BEVs

CO4: Appropriately select the energy storage system and strategize its management in EHVs

CO5: Define Ancillary Service Management and explain different ancillary services.

SYLLABUS

UNIT-I INTRODUCTION TO ELECTRIC VEHICLES:

History of electric vehicles (EV) and hybrid electric vehicle (EHV), need and importance of EV and HEV, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Power/energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics.

UNIT-II HYBRID ELECTRIC DRIVE-TRAINS: Basic architecture and concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

UNIT-III ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, and Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV BATTERY ENERGY STORAGE SYSTEMS:

Battery Basics - Lead-Acid Battery -Cell Discharge Operation - Cell Charge Operation-Construction-Battery Parameters - Battery Capacity-Discharge Rate - State of Charge- State of Discharge- Depth of Discharge-Technical Characteristics - Practical Capacity -Battery Energy -Constant Current Discharge -Specific Energy - Battery Power -Specific Power -Batteries for EV applications.

UNIT-V MODELLING OF EV/HEV:

Modelling and analysis of EV/HEV drive train sizing of motor, and design of traction power electronics, various vehicle subsystems.

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2010.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,2009.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

REFERENCES:

1. Jefferson, C.M., Barnard and R.H., Hybrid Vehicle Propulsion, WIT Press, Boston, 2002
2. Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012
3. SerefSoylu “Electric Vehicles - The Benefits and Barriers”, InTech Publishers, Croatia, 2011
4. Jack Erjavec and Jeff Arias, “Alternative Fuel Technology – Electric, Hybrid and Fuel Cell Vehicles”, Cengage Learning Pvt. Ltd., New Delhi, 2007
5. Seth Leitman, “Build Your Own Electric Vehicle” McGraw hill, New York, USA, 2013

B.TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME7T12 **MICRO-ELECTRO- MECHANICAL SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Calculus and Differential Eq., Fundamentals of Physics (Mechanics, Optics, Electricity and magnetism), Fundamentals of Inorganic Chemistry.

Course Objective: The main objective of this course is to introduce the integrative nature of Micro Electro Mechanical systems. To describe the different components and devices of Micro Electro Mechanical systems.

Course Outcomes: At the end of the course, student will be able to

CO1:	Explain MEMS and Principles of sensing and actuation
CO2:	Explain Thermal Sensors and Actuators & Magnetic Sensors and Actuators
CO3:	Explain Micro-Opto-Electro Mechanical Systems
CO4:	Explain Radio Frequency (RF) MEMS & Micro Fluidic Systems
CO5:	Explain Chemical And Bio Medical Micro Systems

SYLLABUS

UNIT-I:

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT-II:

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, magnetic MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT-III: MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS:

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT-IV:

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

UNIT-V: CHEMICAL AND BIO MEDICAL MICRO SYSTEMS:

Sensing mechanism & principle, membrane transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (Enose), mass sensitive chemosensors, fluroscence detection, calorimetric spectroscopy.

Text Books:

1. MEMS, NitaigourPremchandMahalik, TMH Publishing co.

References:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. Bio-MEMS (Micro systems), Gerald Urban, Springer.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T13 **SOLAR ENERGY SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: To impart knowledge on non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

Course Outcomes: At the end of the course, student will be able to

CO1: Significance of renewable energy and describe the principles of solar radiation. Analyze various solar collectors.

CO2: Know the various storage methods and application of solar energy.

CO3: Understand the concept of converting wind energy into electrical energy using both horizontal and vertical axis wind machines.

CO4: Know biomass disasters, functional operation of geothermal systems. Generalize the operation of ocean, tidal and wave energy systems.

CO5: understand the operating principle of direct energy conversion systems .and to recognize the need and ability to engage in lifelong learning for further developments in this field.

SYLLABUS

UNIT-I: FUNDAMENTALS OF SOLAR RADIATION:

Energy conservation principle, Energy scenario (world and India), Solar angles, Solar time, Solar radiation: Outside earth's atmosphere, Earth surface, measurements of solar radiation: Pyrometer, Sunshine recorder, Pyro heliometer.

UNIT-II: ENERGY STORAGE SYSTEMS:

Energy –Environment-Economy Necessity of energy storage, Specifications of energy storage devices, energy storage Methods-Mechanical Energy Storage-Thermal Energy Storage-Sensible Heat Storage-Solid media storage.

UNIT-III: SOLAR COLLECTORS:

Classifications, comparison of concentrating and non-concentrating types – Liquid flat plate collectors, Evacuated tube collectors. Modified flat plate collectors: Compound parabolic concentrator(CPC), Cylindrical parabolic Concentrator, Fixed mirror solar concentrator, Paraboloid Dish Collector.

UNIT-IV: SOLAR THERMAL DEVICES:

Solar water heater, Solar space heating and cooling systems, Solar industrial heating systems, Solar refrigeration and air conditioning systems, Solar Desalination – Solar cooker: domestic, community – Solar pond – Solar drying.

UNIT-V: SOLAR PHOTOVOLTAIC SYSTEMS:

Solar cell fundamentals, Energy band model of semiconductors, Working Principle of photovoltaic cell, solar cell classification, solar cell technologies, solar PV systems-classification. Solar cell –module-array Construction.

Text Books:

1. Goswami D.Y., Kreider, J. F. and Francis., “Principles of Solar Engineering’, Taylor and Francis, 2000.
2. Chetan Singh Solanki, “Solar Photovoltatics – Fundamentals, Technologies and Applications”, PHI Learning Private limited, 2011.
3. Sukhatme S.P., Nayak.J.P, ‘Solar Energy – Principle of Thermal Storage and collection”, Tata McGraw Hill, 2008.
4. Solar Energy International, “Photovoltaic – Design and Installation Manual” – New Society Publishers, 2006.
5. Roger Messenger and Jerry Vnetre, “Photovoltaic Systems Engineering”, CRC Press, 2010.

Reference Books:

1. B.H.Khan “Non – conventional Energy Resources” Tata McGraw Hill education Pvt. Ltd.
2. G.D. Rai, “Non-Conventional Energy Sources”, Dhanpat Rai and Sons .

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

INTRODUCTION TO EMBEDDED SYSTEMS
20EC7T13 (OPEN ELECTIVE –IV)

Course Objectives:
At the end of the course, student will be able to

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained
3. Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed
4. Embedded system implementation and testing tools are introduced and discussed.
   Technology capabilities and limitations of the hardware, software components
5. Design Methodologies

Course Outcomes:
At the end of the course, student will be able to

CO1: Understand the basic concepts of an embedded system and able to know an embedded system design Approach to perform a specific function.
CO2: The various embedded firmware design approaches on embedded environment.
CO3: Identify the unique characteristics of real-time systems
CO4: Design, implement and test an embedded system.
CO5: Define the unique design problems and challenges of real-time systems

SYLLABUS

UNIT-I: Introduction to Embedded systems

What is an embedded system Vs. General Computing system, history, classification, major application areas, and purpose of embedded systems, Core of embedded system, Characteristics and Quality Attributes of Embedded systems

UNIT-II: Embedded Hardware Design

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real-time clock, Application specific and Domain specific embedded systems-Examples

UNIT-III:

Embedded Firmware design approaches, Embedded Firmware Development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA,Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV:

Factors to be considered in selecting a controller, 8051 Architecture, RTOS and Scheduling Operating basics, types, RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Types of multitasking, Non preemptive Scheduling, Preemptive Scheduling.

UNIT-V: Design and Development

Embedded system development Environment – IDE, Simulators, Emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry

Text books:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.

2. Embedded Systems, Rajkamal, TMH, 2009.

References:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE

2. Embedded Systems: A Contemporary Design Tool Paperback by James K. Peckol

B. Tech VII Semester

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

20EC7T14 INTERNET OF THINGS (OPEN ELECTIVE –IV)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1 To introduce the terminology, technology and its applications

2 To introduce the concept of M2M (machine to machine) with necessary protocols

3 To introduce the Python Scripting Language which is used in many IoT devices

4 To introduce the Raspberry PI platform, that is widely used in IoT applications

5 To introduce the implementation of web-based services on IoT devices

COURSE OUTCOMES:

At the end of this course the student will able to:

At the end of the course, student will be able to

CO1: Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.

CO2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on Bwireless, energy, power, and sensing modules

CO3: Market forecast for IoT devices with a focus on sensors

CO4: Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

SYLLABUS

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Sensors, Actuators,
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II: IoT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT-III: IoT Physical Devices and Endpoints

Introduction to Arduino and Raspberry Pi- Installation,
Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT-IV: Controlling Hardware-

Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors

Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

UNIT-V: IoT Physical Servers and Cloud Offerings–

Introduction to Cloud Storage models and
communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

B. TECH VII SEMESTER	OEC	L	T	P	C
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20EC7T15 ANALOG AND DIGITAL IC APPLICATIONS (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1. To understand the analysis & design of different types of active filters using op-amps
2. To learn the internal structure, operation and applications of different analog ICs
3. In this course, students can study Integrated circuits for all digital operational designs like adder, subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM.
4. Design and to develop the internal circuits for different digital operations and simulate them using hardware languages using integrated circuits.
5. Understand the concepts of Latches and Flip-Flops and Design of Counters using Digital ICs, modeling of sequential logic integrated circuits using VHDL

Course Outcomes:

At the end of the course, student will be able to

CO1: Design circuits using operational Amplifier for various applications

CO2: Understand the concept of A/D & D/A Converters

CO3: Analyze and design amplifiers and active filters using Op-amp.

CO4: Understand the concepts of Combinational logic circuits in digital system

CO5: Understand the concepts of sequential logic circuits in digital system

SYLLABUS

UNIT-I: OPERATIONAL AMPLIFIER

The Ideal Operational Amplifier; Operational Amplifier Internal Circuit. Op-Amp parameters & Measurement, DC Characteristics, input & output off set voltages & currents, slew rate, CMRR, PSRR, drift, AC Characteristics and Compensation Techniques.

UNIT-II: OPERATIONAL AMPLIFIER APPLICATIONS

Basic Op-Amp Applications; Inverting and Non-inverting amplifier,. Integrator and differentiator, Difference amplifier, Instrumentation Amplifier; AC Amplifier; V to I and I to V Converters. Op-Amp Circuits using Diodes, Sample and Hold Circuit, Comparator, Regenerative Comparator (Schmitt Trigger).

D-A AND A-D CONVERTERS Introduction; Series Op-Amp Regulator; Basic DAC Techniques Weighted Resistor DAC,R-2R DAC ; AD Converters, Flash ADC and Successive approximation Converter.

UNIT-III: FILTERS USING OP-AMP & 555 TIMERS

Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Description of Functional Diagram of 555 Timer; Monostable Operation; Astable Operation and its Applications and PLL, Applications PLL. VCO and its applications.

UNIT-IV: Digital Design Using HDL

Design flow, program structure, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Objects and Classes, Subprograms, Comparison of VHDL and Verilog HDL.

UNIT-V: Combinational And sequential Logic Design

Combinational Logic Design: Adders & Sub tractors, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Barrel Shifter, Simple Floating-Point Encoder, Dual Priority Encoder.

Sequential Logic Design: Flip-Flops, Counters, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Register. Linear feedback shift register and applications.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGrawHill,4th Edition,2005
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.

REFERENCES:

1. "Fundamentals of Digital logic design with VHDL". Stephen Brown & Zvonko Vranesic, Tata McGraw Hill, 2nd edition.2004
2. Designing with TTL Integrated Circuits: Robert L. / John R. Morris & Miller.

B. TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20CS7T13 DATA ANALYTICS (OPEN ELECTIVE –IV)

Course Objectives:

1. To understand Data Analytics lifecycle and Business Challenges.
2. To understand Analytical Techniques
3. To understand various tools and technologies to handle big data

Course Outcomes:

CO1: Understand big data and data analytics life cycle.
CO2: Explore various supervised learning methods.
CO3: Explore various unsupervised learning methods.
CO4: Understand and apply ARIMA model on time series data.
CO5: Learn various technology and tools in big data analytics.

SYLLABUS

UNIT-I

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the new big data Ecosystem, Examples of Big Data Analytics. Data Analytics Life Cycle: Data Analytics life cycle Overview, Discovery, Data Preparation, Model,Planning, Model Building, Communicate Results, Operationalize, Case Study.

UNIT-II

Supervised Learning: Decision Trees – Overview of Decision Trees, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree. Naive Bayes: Baye's Theorem, Naïve Baye's Classifier, Diagnostics of Classifiers.
Regression –Linear Regression, Logistic Regression.

UNIT-III

Unsupervised Learning: Association Rule Mining–Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules. Cluster Analysis – Overview of Clustering, k-means

UNIT IV

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model
Text Analysis: Text Analysis Steps, Example, Collecting Raw Data, Representing Text, TFIDF, Categorizing Documents by Topics, Determining Sentiments, Gaining Insights.

UNIT-V

Technology and Tools: MapReduce and Hadoop- Analytics for Unstructured Data, The Hadoop Ecosystem In-DataBase Analytics: SQL Essentials, In-Database Text Analysis, Advanced SQL.

TEXT BOOKS:

1. David Dietrich, Barry Hiller, “Data Science and Big Data Analytics”, EMC education services, Wiley publications, 2012.

REFERENCE BOOKS:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with
advanced analytics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O‟
Reilly, 2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

B. Tech VII Semester **OEC**

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20CS7T14 BLOCK CHAIN TECHNOLOGY (OPEN ELECTIVE –IV)

Course Objectives

By the end of the course, students will be able to

- Understand how major block chain systems work.
- To securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

Course Outcomes

CO 1: Understand the design principles of Bitcoin and Ethereum.

CO 2: Understand and apply Nakamoto consensus.

CO 3: Analyze the differences between proof-of-work and proof-of-stake consensus.

CO 4: Understand cryptocurrency

CO 5: Understand cryptocurrency Regulations

SYLLABUS

Unit I: Basics:

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Unit II: Blockchain:

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Unit III: Distributed Consensus:

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV: Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Unit V: Cryptocurrency Regulation:

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.

Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Text Book

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,”Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

B. TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CS7T15 SOFTWARE PROJECT MANAGEMENT (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

CO1: Apply the process to be followed in the software development life-cycle models.

CO2: Apply the concepts of project management & planning.

CO3: Implement the project plans through managing people, communications and change

CO4: Conduct activities necessary to successfully complete and close the Software projects

CO5: Implement communication, modeling, and construction & deployment practices in software development.

SYLLABUS

UNIT I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

TEXT BOOKS:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

REFERENCES:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20IT7T13 CLOUD COMPUTING (OPEN ELECTIVE –IV)

Course Objectives:

- Explain the technology and principles involved in building a cloud environment
- To implement Virtualization
- Understand various types of cloud and its services
- Contrast various programming models used in cloud computing

Course Outcomes:

CO1: Describe the principles of parallel and distributed computing and evaluation of cloud computing from existing technologies

CO2: Illustrate Virtualization for Data-Center Automation.

CO3: Explain and characterize different cloud deployment models and service models

CO4: Program data intensive parallel applications in cloud.

CO5: Understand commercial cloud computing technologies such as AWS, AZURE and AppEngine

SYLLABUS

UNIT-I: Introduction:

Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Microsoft Aneka.

UNIT-II: Virtualization:

Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen, VMware, Microsoft Hyper – V.

UNIT-III: Cloud Computing Architecture:

Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy.

UNIT-IV: Data Intensive Computing: Map-Reduce Programming:

What is Data-Intensive Computing? Characteristics, Challenges, Historical Perspective. Technologies for Data Intensive Computing: Storage Systems, Programming Platforms.

Cloud Applications: Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.

UNIT-V: Cloud Platform in Industry and Cloud Applications:

Cloud Platforms in Industry: Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

TEXTBOOKS:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud Computing McGraw Hill Education.

REFERENCES:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.
3. Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan Kaufmann, 2013.

B. TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20IT7T14 BUSINESS INTELLIGENCE (OPEN ELECTIVE –IV)

Course Objectives:

- Introduce the concepts and components of Business Intelligence (BI)
- Evaluate the technologies that make up BI (data warehousing, OLAP)
- Identify the technological architecture that makes up BI systems

Course Outcomes:

CO1: Understand concepts and components of Business Intelligence.

CO2: Explain the complete life cycle of BI development.

CO3: Illustrate technology and processes associated with Business Intelligence framework.

CO4: Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

CO5: Ability to design expert system using AI tools.

SYLLABUS

UNIT-I:

Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence

Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

UNIT-II:

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics. **Getting started with business intelligence:** Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

UNIT-III:

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete BI professional, Popular BI tools.

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart,OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

UNIT-IV:

Business Intelligence Applications:

Marketing models: Relational marketing, Sales force management,

Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.

Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices

UNIT-V:

Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management

Artificial Intelligence and Expert Systems:

Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems

TEXT BOOKS:

1. Fundamental of Business Intelligence” Grossmann W, Rinderle-Ma Springer, 2015
2. “Fundamentals of Business Analytics” – By R N Prasad and SeemaAcharya, Publishers: Wiley India.

REFERENCE BOOKS:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : TheCompleteProject Lifecycle for Decision Support Applications, Addison WesleyInformation Technology
2. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann.

B. Tech VII Semester **OEC**

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20HS7T02 POLYMER CHEMISTRY (OPEN ELECTIVE –IV)

PREREQUISITES: Chemistry I and Chemistry II of AICTE syllabus

Course Outcomes

CO1: After studying this course, the learners are expected to: Relate polymer properties to their structure and conformation

CO2: Analyse different mechanisms of polymer formation and use this information in the synthesis of different polymers.

CO3: Distinguish between enthalpic and entropic contributions to polymerisation/crystallization.

CO4: Distinguish between absolute and relative methods for molecular weight determination.

CO5: Determine the flow properties of polymer melts and solutions.

CO6: Interpret experimental data and determine parameters such as polymerization ratesand copolymer composition.

CO7: Estimate the solubility of a given polymer in various solvents and blends.

CO8: Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.

CO9: Assess the effect of synthetic polymers on the environment.

SYLLABUS

Unit 1. Definitions, origin, nomenclature, classification and types of macromolecules; molecular weight (MW) and its distribution; Determination of molecular weight – methods for measuring number average, weight average, viscosity average MW; gel permeation chromatography; spectroscopic techniques to determine chemical composition and molecular microstructure, thermal transitions; melting temperature and glass transition temperature. Colligative properties, osmotic pressure, light scattering, refractive index, viscosity, small angle X-ray scattering (6)

Unit 2tep-Growth Polymerization: Reactivity of functional groups; kinetics; molecular weight in open and closed system cyclization vs. linear polymerization, cross-linking and gel point; process condition; step-copolymerization, examples of step polymers (3)

Unit 3. Free radical Polymerization: Nature of chain polymerization and its comparison with step polymerization; radical vs. ionic polymerizations; structural arrangements of monomer units; kinetics of chain polymerization; molecular weight and its distribution; chaintransfer, inhibition, retardation, auto-acceleration; energetic characteristics; techniques of radical polymerization – bulk, solution, emulsion, suspension polymerization; examples of polymers made by radical chain polymerization (4). Ionic Polymerization: Propagation and termination of cationic polymerization, anionic and ring opening polymerization, active polycarbanions (2)

Unit 4. Copolymerization: types of copolymers, copolymer compositions, reactivity ratio; radical and ionic co-polymerizations; Block and Graft copolymer synthesis, examples (2). Thermodynamics of polymer solutions; Flory-Huggins theory, theta conditions; solubility parameters; fractionation of macromolecules, osmotic pressure, lower criticalsolution temperature (3)

Unit 5. Naturally occurring polymers, biodegradability, biosynthesis, polymers frombio/renewable resources (2)

Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography, Electron beam, X-ray and ion sensitive resists, Conducting polymers, types, properties and applications, electroluminescence, molecular basis of electrical conductivity, Photonic applications and non-linear optics, optical information storage (3)

Text Books:

1. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur
2. Polymer chemistry and Physics of Modern Materials, 2nd edn, J. M. G. Cowie, Stanley Thornes, UK, 1998
3. Contemporary Polymer Chemistry, 3rd edn. H. R. Allcock, F. W. Lampe and J. E.Mark, Pearson
4. Polymers: Chemistry and Physics of Modern Materials, J.M.G. Cowie, CRC Press
5. Introduction to Physical Polymer Science, L. H. Sperling, Wiley
6. Introduction to Soft matter, I. W. Hamley, John Wiley and Sons, 2007
7. Polymer Chemistry, 2nd edn, P. C. Hiemenz and T. P. Lodge, CRC Press (2007)

B. TECH VII SEMESTER	OEC	L	T	P	C
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20MB7T03 TOTAL ENGINEERING QUALITY MANAGEMENT (OPEN ELECTIVE –IV)

Course Objective

To understand the Engineering and Management aspects of Planning, Designing, Controlling and Improving Quality in Manufactured products.

Course Outcome

1. To understand the fundamentals of quality
2. To understand the role of TQM tools and techniques in elimination of wastages and reduction of defects
3. To develop quality as a passion and habit
4. To Facilitate the understanding of Quality Management principles and process.
5. The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

SYLLABUS

UNIT I

Quality Gurus And TQM Kitemarks: Definition, Need & Evolution of TQM – Contributions of Quality Guru's – Edward Deming – Joseph Juran – Philip Crosby – Genichi Taguchi – Walter Shewart – Criteria for Deming's Prize.

UNIT II

Product Design & Analysis : Dimensions of product and service quality, Basic Design Concepts and TQM – Design Assurance – Design Validation –Failure Mode Effect Analysis – Fault Tree Analysis – Design for Robustness – Value Analysis.

UNIT III

Process Improvement & Modern Production Management Tools

Control Charts – Process Capability, -Bench Marking, Six Sigma Approach – Total Productive Maintenance – Just-In-Time – Lean Manufacturing Paradigms.

UNIT IV

Quality Improvement Tools & Continuous Improvement

Traditional Q-7Tools, New Q-7 Tools, Quality Function Deployment (QFD), Kaizen 5S, Poka-Yoke, Failure Mode and Effects Analysis(FMEA) – Stages, Types, Taguchi Quality Loss Function(QFD) – Total Productive Maintenance (TPM).

UNIT V

Quality Management Systems ISO 9000, ISO 9001: 2008, QS 9000, ISO 14000, TS16949:2002 and EMS14001 certifications of quality systems- Elements, Documentation, Quality Auditing — Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.

TEXT BOOKS

1. Total Engineering Quality Management, Sunil Sharma, 1st Edition, MacMillan India Limited.
2. Total Quality Management, Poornima M. Charantimath, 2nd Edition, Pearson Education.
3. Dale H. Besterfiled, et at., “Total quality Management”, Pearson Education Asia, Third Edition, Indian Reprint 2006.

REFERENCES

1. “Quality and Performance Excellence”, James R Evans, Edition, 7th Edition, Cengage Learning.
2. “Quality Management”, Howard S Gitlow, Alan J Oppenheim, Rosa Oppenheim, David M Levine,3rd Edition , Tata McGraw Hill Limited.
3. “Fundamentals of Quality Control & Improvement”, Amitava Mitra, 3rd Edition, Wiley Publications, 2012.
4. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 8th Edition, First Indian Edition, Cengage Learning, 2012.

B. TECH VII SEMESTER **OEC**

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20MB7T04 STRESS MANAGEMENT (OPEN ELECTIVE –IV)

OBJECTIVES

This course examines different sources from where individuals experience a stress response. Through diligent individual and group study, students will be able to learn to apply stress management principles in order to achieve high levels of performance and understand the role of relationships to the management of stress and health.

Course Outcomes

1. Understand the physiological systems that are affected by stressors and the long-term effects and illnesses that can result from stressors.
2. Understand the specific applications of stress as it relates to the workplace and different target groups.
3. Create effective stress management plans for individual clients and for workplace environments. Enhancing significance of training and development, performance evaluation

SYLLABUS

UNIT I: UNDERSTANDING STRESS

Meaning – Symptoms – Work Related Stress – Individual Stress – Reducing Stress - Sources of stress –Consequence of stress-Burnout-symptoms of Burnout- Stress vs Burnout-Model of stress-strategies for coping stress (individual and organizational strategies)

UNIT II: TIME MANAGEMENT

Techniques – Importance of Planning the day –developing concentration – Prioritizing, Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say “No.”

UNIT III:CAREER PLATEAU

Career plateau – Identifying Career plateaus – Structural and Content - Plateauing – Making a fresh start – Importance of Sabbaticals – Counseling out – Executive leasing – Sustaining a marketable Career.

UNIT IV:CRISIS MANAGEMENT

Implications – People issues – Structure issues – Environmental issues –Learning to keep calm - Preventing interruptions – Controlling crisis – Pushing new ideas – Empowerment – Work place Humour, Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit.

UNIT V: SELF DEVELOPMENT

Improving personality – Leading with Integrity – Enhancing Creativity – Effective Decision Making – Sensible Communication – The Listening Game – Managing Self – Mediation for peace – Yoga for Life

TEXT BOOKS

1. Bhatia R.L., The Executive Track: An Action Plan for Self Development Wheeler Publishing, New Delhi
2. Charavathy. S.K, "Human Values for Manager", McGraw Hill/Henely Management Series

REFERENCES

1. Jeffr Davison, Managing Stress, Prentice Hall of India, New Delhi
2. Jerrold S Greenberg, Comprehensive Stress Management, Jain Books, 2009

B. TECH VII SEMESTER	OEC	L	T	P	C
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20AD7T11 NATURAL LANGUAGE PROCESSING (OPEN ELECTIVE –IV)

Pre-requisite: Nil

Course Educational Objective: The Objective of the course is to make learn the basic elements of C programming, control structures, derived data types, Modular programming, user defined structures, basics of files and its I/O operations.

Course Outcomes: At the end of this course, the student will be able to

CO1: Familiar with the basic components of NLP.

CO2: Applying N-gram models to predict a sequence of text.

CO3: Build a basic language understanding system using preliminary concepts of NLTK library.

CO4: Exposure on advanced techniques for understanding patterns in text

CO5: Understand the semantics of linguistic components in a natural dialogue

Syllabus

UNIT – I:

Introduction

Knowledge in Speech and Language Processing; Ambiguity; Models and Algorithms; Language, Thought and Understanding; History Regular Expressions Regular Expression; Words; Corpora; Text Normalization; Minimum Edit Distance

UNIT – II

N-gram Language Models

N-Grams; Evaluating Language Models, Generalization and Zeros, Smoothing: Laplace Smoothing; Add-k Smoothing; Backoff and Interpolation; Kneser-Ney Smoothing

UNIT – III

Natural language processing tools in Python (NLTK Package)

Part-I: Introduction to NLTK; Tokenizing; Filtering Stop words; Stemming; Tagging parts of speech; Lemmatizing; Chunking; Chinking

Part-II: Using Named Entity Recognition (NER); Getting Text to Analyze; Using a Concordance; Making a Dispersion Plot;

UNIT – IV

Information Extraction:

Relation Extraction Algorithms; Using Patterns to extract relations; Relation extraction via supervised learning; Semi supervised relation extraction via

bootstrapping; Distant Supervision for Relation Extraction; Evaluation of Relation Extraction; Extracting Times; Extracting Events and their Times; Template Filling

UNIT – V

Word Senses and WordNet

• Defining Word Senses; How many senses do words have?

• Relations between senses

WordNet: Sense relations in WordNet; Word Sense Disambiguation; Alternate WSD algorithms and Tasks

Text Books:

1. Daniel Jurafsky, James H. Martin ,"Speech and Language Processing" , Third Edition, PHI, 2020.
2. https://realpython.com/nltk-nlp-python/#getting-text-to-analyze

Reference Books:

1. Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, 2011
2. Applied Text Analysis with Python: Enabling Language-Aware Data Products with Machine Learning, Benjamin Bengfort, Rebecca Bilbro, 2018
3. Speech and Language Processing, 2nd Edition, Daniel Jurafsky, James H. Martin, 2009

B. TECH VII SEMESTER **OEC**

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20AM7T11 DEEP LEARNING (OPEN ELECTIVE –IV)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains understanding basics of deep neural networks, CNN architectures of deep neural networks, concepts of Artificial Neural Networks, basics of Data science in Deep learning, applications of deep learning in AI and Data Science

Course Outcomes: At the end of the course, student will be able to

CO1: Explain the basics in deep neural networks

CO2: Apply Convolution Neural Network for image processing

CO3: Explain the basics of Artificial Intelligence using deep learning

CO4: Apply deep learning algorithms for data science

CO5: Apply deep learning algorithms for variety applications

SYLLABUS

Unit-1:

DEEP NETWORKS BASICS

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization – Machine Learning Basics: Capacity – Over fitting and under fitting – Hyper parameters and validation sets -- Estimators -- Bias and variance -- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization -- Optimization .

Unit-2:

CONVOLUTIONAL NEURAL NETWORKS

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.

Unit-3:

DEEP LEARNING ALGORITHMS FOR AI

Artificial Neural Networks – Linear Associative Networks – Perceptrons -The Back propagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Auto encoders - Deep Backprop Networks- Auto encoders

Unit-4:

DATA SCIENCE AND DEEP LEARNING

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

Unit-5:

APPLICATIONS OF DEEP LEARNING

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion -NLP tasks - dimensionality estimation - time series forecasting - building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016

2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019

3. Vance, William, Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science (Hardcover - 2020), Joiningthedotstv Limited

4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022

5. Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018.

B.TECH HONORS	HN	L	T	P	C
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20CSHN01 UNIX & SHELL PROGRAMMING
(Honors Engineering Course)

Course Objectives:

1 Written technical communication and effective use of concepts and terminology.
2 Facility with UNIX command syntax and semantics.
3 Ability to read and understand specifications, scripts and programs.
4 Individual capability in problem solving using the tools presented within the class
5 Students will demonstrate a mastery of the course materials and concepts within in class discussions.

Course Outcomes:

CO1: Create powerful data processing applications using UNIX shell and commands
CO2: Manage data, files and programs at command line using UNIX
CO3: Create and modify data files and documents using editors and tools
CO4: Demonstrate knowledge of creating new commands.
CO5: Develop Scripts and programs that demonstrate effective use of structured programming.

SYLLABUS

UNIT-I

Introduction to UNIX-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-PATH, man, echo, who, date, stty, pwd ,cd, mkdir, rmdir, cp, mv, rm, cat, more, wc, tar, kill, sleep.

UNIT-II

The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions- INodes-The Directory Hierarchy, ls command with options-File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT-III

Introduction to Basic Regular Expressions -The Grep Command with options-EGrep and FGrep Commands, The Stream Editor Sed Command with options-The AWK command- awk preliminaries, awk using print and printf.

UNIT-IV

Simple Filtering commands: pr, cmp, comm, diff, head tail, cut, paste, sort -Meta characters- Creating New Commands -More on I/O Redirection-Command Substitution-Giving Multiple commands- Command Line Structure.

UNIT-V

Shell Programming-Shell Variables-The First Shell Script-The read Command-Positional
parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The Sleep Command-Debugging Scripts-The Script Command.

TEXT BOOKS:

1. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.(Units
1,2,3,4,5)
2. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.(Unit2,4)

REFERENCE BOOKS:

1. Unix and shell programming by B.M. Harwani, OXFORD university press.
2. UNIX and Shell Programming by Behrouz A. Forouzan, Richard F. Gilverg

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20CSHN02 NO SQL DATABASES
(Honors Engineering Course)

Course Objectives:

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column oriented and Graph)
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases
- Explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases
- Ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes:

After the completion of the course, student will be able to

CO1: Identify the type of NoSQL database to implement based on business requirements (keyvalue, document, full text, graph,etc.)

CO2: Apply NoSQL data modeling from application specific queries

CO3: Understand NoSQL Storage Architecture

CO4: Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing

CO5: Apply indexing and ordering of data sets

SYLLABUS

UNIT I:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

UNIT II:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

UNIT III:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

UNIT IV:

NoSQL Stores: Similarities Between Sql And Mongodb Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

UNIT V:

Indexing and Ordering Data Sets : Essential Concepts Behind A Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Reference Books:

1 Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional,2012.
2 Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications,2013.
3 Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN:978-0-470- 94224-6
4 Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013

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20CSHN03 ARTIFICIAL NEURAL NETWORKS
(Honors Engineering Course)

Course Objectives:

- To deal with the historical developments of artificial intelligence leading to artificial neural networks (ANN).
- To introduce the basic concepts and models of ANN for solving real world problems.

Course Outcomes:

At the end of this course the student will be able to:

CO1- Understand biological neuron & artificial neuron and basic building blocks of ANN.

CO2- Understand different single layer/multiple layer Perceptron learning algorithms.

CO3- Understand and analyze Adaline and Madeline Networks and their applications

CO4- Learning algorithms based on basic gradient descent, backpropagation and their modifications.

CO5- Understand self-organization learning, ART, Radial basis Functions.

SYLLABUS

UNIT - I: Introduction to Artificial Neural Networks:

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT - II: Fundamental Models of Artificial Neural Networks:

Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS)Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.

Perceptron Networks: Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks

UNIT – III: Adaline and Madaline Networks:

Introduction, Adaline, Madaline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

UNIT - IV: **Feedback Networks**:

Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets.

Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT - V: **Self Organizing Feature Map:**

Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

Adaptive Resonance Theory: Introduction, ART Fundamentals, ART 1, ART2.

TEXT BOOKS:

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL : 2005.

REFERENCES:

1. “Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

B.TECH HONORS **HN**

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20CSHN04 CYBER SECURITY
(Honors Engineering Course)

Course Objective:

- Understand the importance of Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

Course Outcomes:

CO1: Understand and classify various forms of Cybercrimes

CO2: Interpret the reasons for Cyber offence

CO3: Detect and analyze vulnerabilities in Mobile and Wireless devices

CO4: Analyze tools used to perform cyber crimes

CO5: Understand cyber security Laws

SYLLABUS:

UNIT-I: Introduction, Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes

UNIT-II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT-III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT-IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-V: Cybercrimes and Cyber security:

The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime

Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, Micheal E.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

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20CSMN01 **DATABASE MANAGEMENT SYSTEMS**
(Minor Engineering Course)

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases

Course Outcomes:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT-I: Database System Applications:

A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT-II: Introduction to the Relational Model:

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III: SQL:

QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL.

UNIT-IV: Schema Refinement (Normalization):

Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.

UNIT-V: Transaction Management and Concurrency Control:

Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL” by Shashan k Tiwari, 2011, WROX Press.

REFERENCE:

1. Peter Rob & Carlos Coronel, “Data base Systems design, Implementation, and Management”, 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, “Data base System Concepts”, 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
4. C.J.Date, “Introduction to Database Systems”, 7th Edition, Pearson Education, 2002

B.TECH MINOR	MN	L	T	P	C
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20CSMN02 **SOFTWARE ENGINEERING (Minor Engineering Course)**

Course Objective:

- Gain knowledge about software process models.
- Familiarize the basic software engineering methods, practices and its applications.
- Facilitate students in software design.

Course Outcomes:

CO1: Understand the software life cycle models

CO2: Understand the scrum approach to agile project management.

CO3: Analyze the software requirements and generate SRS document

CO4: Understand some of the different models that may be used to design

CO5: Understand various software testing approaches and quality control to ensure good quality software

SYLLABUS

Unit-I:

Introduction to Software Engineering: Nature of software, Software engineering, The Software Processes, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialised Process models, The Unified Process, Personal and Team Process Models.

Unit-II:

Requirements Engineering: Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

Requirements Modelling: Requirement Analysis, Scenario-Based Modelling, Data Modelling Concepts, Class-Based Modelling

Unit-III:

Design Concepts: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles. User Interface Design: The Golden Rules, User Interface Analysis and

Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Unit-IV:

Understanding of UML diagrams: Structural diagrams - class diagram, object diagram, component diagram, deployment diagram, Behavioural diagrams - Use-case diagram, activity diagram, sequence diagram, collaboration diagram, state chart diagram.

Unit-V:

Implementation: Structured coding Techniques, Coding Styles-Standards and Guidelines, Implementation Issues.

Software Testing Strategies: A Strategic approach to Software Testing, Strategic Issues and Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing, Software Quality concepts.

TEXT BOOKS:

1. Roger S. Pressman (2010), Software Engineering, A Practitioner's Approach, 7th Edition, McGraw-Hill International Edition, India.
2. Ian Sommerville (2011), Software Engineering, 9th Edition, Pearson education, India.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.Jim ConallenKelli A. Houston," Object-Oriented Analysis and Design with Applications", 3rd edition.

REFERENCES:

1. Pankaj Jalote (2010), Software Engineering, A Precise Approach, Wiley India.
2. Waman S. Jawadekar (2008), Software Engineering: A Primer, McGraw-Hill, India.
3. Hans Van Vilet (2008), Software Engineering Principles and Practice, 3rd Edition, John Wiley & Sons Ltd.
4. Rajib Mall (2005), Fundamental of Software Engineering, PHI.
5. Deepak Jain, Software Engineering, Principles and Practices, Oxford, University Press, India.

B.TECH MINOR	MN	L	T	P	C
		3	0	0	3

20CSMN03 DATA MINING
(Minor Engineering Course)

Course Objectives:

- To teach the basic principles, concepts and applications of data mining
- To introduce the task of data mining as an important phase of knowledge recovery process
- To impart knowledge of the fundamental concepts that provide the foundation of data mining

Course Outcomes:

After undergoing the course, Students will be able to understand

CO1: Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.

CO2: Apply pre processing methods for any given raw data.

CO3: Extract knowledge using data mining techniques.

CO4: Apply the techniques of classification and association finding to real world data.

CO5: Apply the techniques of clustering and feature selection and visualization to real world data.

SYLLABUS

UNIT-I: Data Mining:

Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns–Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining

UNIT–II: Processing:

Data Quality, Major Tasks in Data Pre processing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration.

UNIT–III: Mining Frequent Patterns, Associations and Correlations:

Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Are All the Pattern Interesting, Pattern Evaluation Methods, Applications of frequent pattern and associations

UNIT–IV: Classification:

Basic Concepts, Decision Tree Induction, Bayesian Classification Methods, Rule-

Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification, Bayesian Belief Network, Classification by Neural Networks, Support Vector Machines, Lazy Learners (or Learning from Your Neighbors).

UNIT–V: Clustering and Applications:

Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber, JianPei (2012), Data Mining : Concepts and Techniques, 3rd edition, Elsevier, United States of America.

REFERENCES:

1. Margaret HDunham (2006), Data Mining Introductory and Advanced Topics, 2ndedition, PearsonEducation, NewDelhi, India.
2. Amitesh Sinha(2007), Data Warehousing, Thomson Learning, India.
3. XingdongWu,VipinKumar(2009),theTopTenAlgorithmsinDataMining,CRCPress,UK.

B.TECH MINOR	MN	L	T	P	C
		3	0	0	3

20CSMN04 ARTIFICIAL INTELLIGENCE
(Minor Engineering Course)

Course Objectives:

The main objectives are

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

Course Outcomes:

At the end of the course, the students will be able to:

CO1: Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

CO2: Apply the language/framework of different AI methods for a given problem.

CO3: Implement basic AI algorithms- standard search algorithms or dynamic programming.

CO4: Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

CO5: Ability to understand the Expert system and its applications

SYLLABUS

UNIT-1:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends

UNIT-2:

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT-3:

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-4:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

UNIT-5:

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
2. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA

e-Resources:

1. https://nptel.ac.in
2. http://aima.cs.berkeley.edu/

ELECTRONICS & COMMUNICATION ENGINEERING
COURSE STRUCTURE
B.TECH I SEMESTER

S. No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EC1T01	BSC	Linear Algebra and Differential Equations	3	-	-	3	3
2	20EC1T02	BSC	Applied Physics	3	-	-	3	3
3	20EC1T03	HSMC	English	3	-	-	3	3
4	20EC1T04	ESC	Electronic Devices	2	-		2	2
5	20EC1T05	ESC	Problem solving through C	3	-	-	3	3
6	20EC1L06	HSMC	English Communication Skills Lab	-	-	3	3	1.5
7	20EC1L07	BSC	Applied Physics Lab	-	-	3	3	1.5
8	20EC1L08	ESC	Problem solving through C Lab	-	-	3	3	1.5
9	20EC1L09	ESC	Electronic Devices Lab	-	-	2	2	1
Total number of Credits								**19.5**

B.TECH II SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EC2T01	BSC	Transform Techniques	3	-	-	3	3
2	20EC2T02	BSC	Applied Chemistry	3	-	-	3	3
3	20EC2T03	ESC	Network Theory	3	-	-	3	3
4	20EC2T04	ESC	Basic Electrical Technology	3	-	-	3	3
5	20EC2T05	ESC	Engineering Drawing	1	-	4	5	3
6	20EC2L06	BSC	Applied Chemistry Lab	-	-	3	3	1.5
7	20EC2L07	ESC	Engineering & IT Workshop	-	-	3	3	1.5
8	20EC2L08	ESC	Basic Electrical Technology Lab	-	-	3	3	1.5
9	20EC2M09	MC	Environmental Science	3	-	-	3	0
Total number of Credits								**19.5**

B.TECH III SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EC3T01	BSC	Complex Variables	3	0	0	3	3
2	20EC3T02	PCC	Probability Theory and Stochastic Processes	3	0	0	3	3
3	20EC3T03	PCC	Digital Electronics	3	0	0	3	3
4	20EC3T04	PCC	Signals & Systems	3	0	0	3	3
5	20EC3T05	PCC	Electronic Circuits Analysis	3	0	0	3	3
6	20EC3L06	PCC	Electronics Circuits Analysis Lab	0	0	3	3	1.5
7	20EC3L07	PCC	Signals & Systems Lab	0	0	3	3	1.5
8	20EC3L08	PCC	Digital Electronics Lab	0	0	3	3	1.5
9	20EC3S09	SC	Data Structures through C	0	0	4	4	2
Total number of credits								**21.5**

B.TECH IV SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EC4T01	BSC	Numerical Methods and Vector Calculus	3	0	0	3	3
2	20EC4T02	ESC	Control Systems	2	0	0	2	2
3	20EC4T03	PCC	Analog Integrated Circuits	3	0	0	3	3
4	20EC4T04	PCC	Electromagnetic Waves and Transmission lines	3	0	0	3	3
5	20EC4T05	HSMC	Managerial Economics and Financial Analysis	3	0	0	3	3
6	20EC4T06	PCC	Analog and Digital Communications	3	0	0	3	3
7	20EC4L07	PCC	Analog Integrated Circuits lab	0	0	2	2	1
8	20EC4L08	PCC	Analog and Digital Communications Lab	0	0	3	3	1.5
9	20EC4S09	SC	Python Programming	0	0	4	4	2
10	20EC4M10	MC	Constitution of India	2	0	0	2	0
Total number of credits								**21.5**
Honors/Minor courses				**4**	**0**	**0**	**4**	**4**

B. Tech V SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EC5T01	PCC	Microprocessors and Microcontrollers	3	-	-	3	3
2	20EC5T02	PCC	Antennas and Wave Propagation	3	-	-	3	3
3	20EC5T03	PCC	Digital system Design using VHDL& Verilog	3	-	-	3	3
4	**Open Elective–I**			3	-	-	3	3
Professional Elective–I				3	-	-	3	3
5	20EC5T07	PEC-I	Computer Architecture and Organization					
	20EC5T08		Telematics					
	20EC5T09		Cellular and Mobile Communications					
6	20EC5L10	PCC	Microprocessors and Micro-controllers Lab	-	-	3	3	1.5
7	20EC5L11	PCC	Digital system Design using VHDL & Verilog Lab	-	-	3	3	1.5
8	20EC5S12	SC	JAVA Programming	-	-	4	4	2
9	20EC5M13	MC	Essence of Indian Traditional knowledge	2	-	-	2	-
10	20EC5I14	I	Summer internship	-	-	-	-	1.5
Total number of credits								**21.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B. Tech VI SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EC6T01	PCC	VLSI Design	3	-	-	3	3
2	20EC6T02	PCC	Digital Signal Processing	3	-	-	3	3
3	20EC6T03	PCC	Microwave Engineering	3	-	-	3	3
Professional Elective-II				3	-	-	3	3
4	20EC6T04	PEC-II	Embedded systems					
	20EC6T05		Electronics Measurements and Instrumentation					
	20EC6T06		Digital Modulation Techniques					
5	**Open Elective–II**			3	-	-	3	3
6	20EC6L10	PCC LAB	Microwave Engineering and optical communications Lab	-	-	3	3	1.5
7	20EC6L11	PCC LAB	VLSI Design lab	-	-	3	3	1.5
8	20EC6L12	PCC LAB	Digital Signal Processing Lab	-	-	3	3	1.5
9	20EC6S13	SC	Soft Skills	-	-	4	4	2
10	20EC6M14	MC	Disaster Management	2	-	-	2	-
11	20EC6P15	P	Community Service Project	-	-	-	-	4
Total number of credits								**25.5**
Honors/Minor courses				**4**	**-**	**-**	**-**	**4**

B. Tech VII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
Professional Elective-III				3	0	0	3	3
1	20EC7T01	PEC-III	CMOS Analog IC Design					
	20EC7T02		Data Communications And Networks					
	20EC7T03		Information theory and Coding					
Professional Elective-IV				3	0	0	3	3
2	20EC7T04	PEC-IV	Digital Image processing					
	20EC7T05		Low power VLSI Design					
	20EC7T06		Optical Communications					
Professional Elective-V				3	0	0	3	3
3	20EC7T07	PEC-V	Radar Engineering					
	20EC7T08		Embedded real time Operating Systems					
	20EC7T09		Satellite Communications					
4	**Open Elective-III**			3	0	0	3	3
5	**Open Elective-IV**			3	0	0	3	3
6	20EC7T16	HSMC	Universal Human values 2 Understanding Harmony	3	0	0	3	3
7	20EC7S17	SC	Internet of things applications with Latest Boards	-	-	4	4	2
8	20EC7I18	I	Industrial Internship	-	-	-	-	3
Total number of credits								**23**
Honors/Minor courses				4	0	0	-	**4**

B. Tech VIII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EC8P01	P	Project work	-	-	-	-	8
Total number of credits								**8**

OPEN ELECTIVE –I:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE5T04	Architecture and Town Planning	3	0	0	3	CE
2	20CE5T05	Elements of Civil Engineering	3	0	0	3	CE
3	20EE5T04	Basics of Control Systems	3	0	0	3	EEE
4	20EE5T05	Special Electrical Machines	3	0	0	3	EEE
5	20ME5T04	Design Thinking & Product Innovation	3	0	0	3	ME
6	20ME5T05	Nanotechnology	3	0	0	3	ME
7	20EC5T04	Linear System Analysis	3	0	0	3	ECE
8	20EC5T05	Digital Logic Design	3	0	0	3	ECE
9	20EC5T06	Solid State Devices	3	0	0	3	ECE
10	20CS5T07	Introduction to Artificial Intelligence	3	0	0	3	CSE
11	20CS5T08	Operating System	3	0	0	3	CSE
12	20CS5T09	Software Engineering	3	0	0	3	CSE
13	20IT5T07	Computer Networks	3	0	0	3	IT
14	20IT5T08	Computer Graphics	3	0	0	3	IT
15	20HS5T01	Quantitative Aptitude and Reasoning	3	0	0	3	BED
16	20MB5T01	Principles of Management	3	0	0	3	DMS
17	20MB5T02	Technology Management	3	0	0	3	DMS
18	20AD5T07	Foundations of Data Science	3	0	0	3	AIDS
19	20AM5T07	Introduction to Machine Learning	3	0	0	3	AIML

OPEN ELECTIVE –II:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE6T08	Remote Sensing and GIS	3	0	0	3	CE
2	20CE6T09	Environmental Impact Assessment	3	0	0	3	CE
3	20EE6T08	Renewable Energy Sources	3	0	0	3	EEE
4	20EE6T09	Energy Audit, Conservation and Management	3	0	0	3	EEE
5	20ME6T07	Industrial Robotics	3	0	0	3	ME
6	20ME6T08	Additive manufacturing	3	0	0	3	ME
7	20EC6T07	Electronic Circuits and Networks	3	0	0	3	ECE
8	20EC6T08	Principles of Communications	3	0	0	3	ECE
9	20EC6T09	Microcontrollers and its Applications	3	0	0	3	ECE

10	20CS6T07	Introduction to Machine Learning	3	0	0	3	CSE
11	20CS6T08	Information Security	3	0	0	3	CSE
12	20CS6T09	Agile Technologies	3	0	0	3	CSE
13	20IT6T07	Fundamentals of Machine Learning	3	0	0	3	IT
14	20IT6T08	Database Management Systems	3	0	0	3	IT
15	20HS6T01	Operations Research	3	0	0	3	BED
16	20MB6T01	Organizational Behaviour	3	0	0	3	DMS
17	20MB6T02	Project Management	3	0	0	3	DMS
18	20AD6T07	Visual Analytics	3	0	0	3	AIDS
19	20AM6T07	Big data Analytics	3	0	0	3	AIML

OPEN ELECTIVE –III:

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CE7T13	Construction Technology and Management	3	0	0	3	CE
2	20CE7T14	Green Buildings	3	0	0	3	CE
3	20EE7T13	Concept of Power System Engineering	3	0	0	3	EEE
4	20EE7T14	Instrumentation	3	0	0	3	EEE
5	20ME7T10	Green Engineering Systems	3	0	0	3	ME
6	20ME7T11	Hybrid Electric Vehicles	3	0	0	3	ME
7	20EC7T10	Data Communications	3	0	0	3	ECE
8	20EC7T11	Mechatronics	3	0	0	3	ECE
9	20EC7T12	Bio Medical Instrumentation	3	0	0	3	ECE
10	20CS7T10	Artificial Neural Networks	3	0	0	3	CSE
11	20CS7T11	Cyber Security	3	0	0	3	CSE
12	20CS7T12	Software Testing Methodologies	3	0	0	3	CSE
13	20IT7T10	Internet of Things	3	0	0	3	IT
14	20IT7T11	Computer Vision	3	0	0	3	IT
15	20HS7T01	Fuzzy sets	3	0	0	3	BED
16	20MB7T01	Digital Media management	3	0	0	3	DMS
17	20MB7T02	Entrepreneurship Development	3	0	0	3	DMS
18	20AD7T10	Data Analysis and Visualization with Python	3	0	0	3	AIDS
19	20AM7T10	NoSQL Databases	3	0	0	3	AIML

OPEN ELECTIVE –IV:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE7T15	Waste water treatment	3	0	0	3	CE
2	20CE7T16	Repair and Rehabilitation of Concrete Structures	3	0	0	3	CE
3	20EE7T15	Power Quality	3	0	0	3	EEE
4	20EE7T16	Electric Vehicles	3	0	0	3	EEE
5	20ME7T12	Micro-Electro- Mechanical Systems	3	0	0	3	ME
6	20ME7T13	Solar Energy Systems	3	0	0	3	ME
7	20EC7T13	Introduction to Embedded Systems	3	0	0	3	ECE
8	20EC7T14	Internet of Things	3	0	0	3	ECE
9	20EC7T15	Analog and Digital IC applications	3	0	0	3	ECE
10	20CS7T13	Data Analytics	3	0	0	3	CSE
11	20CS7T14	Block Chain Technology	3	0	0	3	CSE
12	20CS7T15	Software Project Management	3	0	0	3	CSE
13	20IT7T13	Cloud Computing	3	0	0	3	IT
14	20IT7T14	Business Intelligence	3	0	0	3	IT
15	20HS7T02	Polymer Chemistry	3	0	0	3	BED
16	20MB7T03	Total Engineering Quality Management	3	0	0	3	DMS
17	20MB7T04	Stress Management	3	0	0	3	DMS
18	20AD7T11	Natural Language Processing	3	0	0	3	AIDS
19	20AM7T11	Deep Learning	3	0	0	3	AIML

HONORS/MINOR COURSES OFFERED BY THE DEPARTMENT

Honors/ Minor Course Fulfillments:

- The 20 additional credits need to be acquired, 16 credits can be earned by undergoing specified courses, with each carrying 4 credits.
- The remaining 4 credits must be acquired through two online MOOCs (SWAYAM /NPTEL), which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of Studies.
- Minor Engineering subjects are offered to other branches by ECE Department (except for ECE Students).
- Honors engineering subjects are offered to ECE Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (SWAYAM/NPTEL).

HONORS COURSES

S.No.	Course code	Course Name	L	T	P	C
		Pool-1				
1	20ECHN01	Micro Electronic Devices	4	0	0	4
2	20ECHN02	Wireless sensor Networks	4	0	0	4
3	20ECHN03	CMOS Digital IC Applications	4	0	0	4
4	20ECHN04	Image and Video Processing	4	0	0	4
		Pool-2				
5	20ECHN05	Analog VLSI Design	4	0	0	4
6	20ECHN06	Spread spectrum Communications	4	0	0	4
7	20ECHN07	Advanced Digital Signal processing	4	0	0	4
8	20ECHN08	Optical Networks	4	0	0	4
		Pool-3				
9	20ECHN09	VLSI Signal Processing	4	0	0	4
10	20ECHN10	Wireless Communications	4	0	0	4
11	20ECHN11	Adaptive Signal Processing	4	0	0	4
12	20ECHN12	Software Design Radio	4	0	0	4
		Pool-4				
13	20ECHN13	FPGA Design	4	0	0	4
14	20ECHN14	DSP Processors & Architecture	4	0	0	4
15	20ECHN15	Soft Computing Techniques	4	0	0	4
16	20ECHN16	RF and Mixed signals Circuits	4	0	0	4

MINOR COURSES

S.No.	Course code	Course Name	L	T	P	C	Offered by
1	20ECMN01	Systems and Signal Processing	4	0	0	4	**ECE**
2	20ECMN02	Networks and Transmission Lines	4	0	0	4	**ECE**
3	20ECMN03	Modulation Techniques	4	0	0	4	**ECE**
4	20ECMN04	Analog Electronics	4	0	0	4	**ECE**
5	20ECMN05	Sensors and Actuators	4	0	0	4	**ECE**
6	20ECMN06	Antenna Theory	4	0	0	4	**ECE**
7	20ECMN07	Digital Electronics	4	0	0	4	**ECE**
8	20ECMN08	Mobile Communications	4	0	0	4	**ECE**
9	20ECMN09	Advanced Microcontrollers	4	0	0	4	**ECE**
10	20ECMN10	Statistical Signal Processing	4	0	0	4	**ECE**
11	20ECMN11	Mixed System Design	4	0	0	4	**ECE**
12	20ECMN12	Nano Technology	4	0	0	4	**ECE**

		L	T	P	C
B.TECH I SEMESTER	**BSC**	**3**	**0**	**0**	**3**

20EC1T01 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

Pre-requisite: Basic knowledge about matrices, differentiation and integration

Course Objective: Objective of the course is to impart

- Basic understanding of mathematical methods to solve simultaneous linear systems
- Understanding of formation and solutions of ordinary differential equations
- Knowing the mathematical methods to solve applications of differential equations

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the knowledge to solve a system of homogeneous and non homogeneous linear equations

CO2: Illustrate the methods of computing eigen values and eigen vectors

CO3: Able to analyze the real life situations, formulate the differential equations and then applying the methods

CO4: Determine the solutions of linear differential equations

CO5: Optimize functions of several variables and able to find extreme values of constrained functions

SYLLABUS

UNIT-I: Linear systems of equations:

Rank of a matrix, Echelon form, Normal form, PAQ is in normal form, linear dependence and independence of vectors, Consistency of linear system of equations, System of linear homogeneous equations, Gauss-elimination and Gauss -Jordan methods.

UNIT-II: Eigen values & Eigen vectors:

Eigen values, Eigen vectors, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), finding inverse and powers of a matrix using

C-H theorem, Reduction to diagonal form, reduction of quadratic form to canonical form using orthogonal reduction, nature of quadratic forms.

UNIT-III: Ordinary Differential Equations of first order:

Linear equations, Bernoulli's equation, Exact differential equations. Equations reducible to exact equations, **Applications:** Orthogonal Trajectories, Newton's Law of cooling, Rate of decay &growth., R-L series circuits.

UNIT-IV: Linear Differential Equations higher order:

Definitions, Complete solution (without proof), Operator D, Rules to find complementary function, Inverse operator, Rules to find the particular integral(nonhomogeneous term of the form e^{ax} , sin(ax+b), cos(ax+b), polynomials in x^m, e^{ax} V(x), any other function), Method of variation of parameters.

UNIT-V: Partial Differentiation:

Functions of two variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Jacobian and functional dependence, Taylor's theorem for functions of two variables. **Applications:** Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI &Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH I SEMESTER	BSC	L	T	P	C
		3	0	0	3

20EC1T02 APPLIED PHYSICS

Pre-requisite: Knowledge of basic concepts of waves, Optics, Electricity and Magnetism

Course Objective: Objective of the course is to impart

- ***Knowledge*** of fundamentals of Physics which helps them in the study of advanced topics of Engineering.
- ***Develop*** analytical capability and understand various Engineering concepts.

Course Outcomes:

At the end of the course, student will be able to

CO1: ***Impart*** knowledge of Physical Optics phenomenon Polarization and identify these phenomenon in natural processes

CO2: ***Gain*** knowledge of applications of lasers and optical fibers in various fields .

CO3: ***Classify*** magnetic and dielectric materials and their Engineering applications.

CO4: ***Understand*** basic quantum mechanics and free electron theories.

CO5: ***Obtain*** the concept of concept of holes and electrons in semiconductors.

SYLLABUS

UNIT-I: Wave Optics:

Interference: Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Colors in thin films-Newton's rings-Determination of wave length nd refractive index.

Diffraction: C Introduction- Fresnel and Fraunhofer diffraction - Fraunhofer Diffraction due to Single slit, Double slit, N –slits(Qualitative) - Diffraction Grating – Resolving Power of Grating(Qualitative).

Polarizations: Introduction- Types of polarization-polarization by reflection, refraction and Double refraction-Nicol's prism –Half and Quarter wave plates.

UNIT-II: Lasers and Fiber Optics:

Lasers:: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber-Construction- - Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes .

UNIT-III: Magnetic and Dielectric Materials:

Magnetic Materials: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para ferro, anti ferro&ferri – Domain concept of Ferromagnetism(Qualitative) - Hysteresis – soft and hard magnetic materials .

Dielectric Materials: Introduction - Dielectic polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation.

UNIT-IV: Quantum Mechanics, Free Electron Theory:

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of States(3D),Fermi energy.

UNIT-V: Band Theory of Solids and Semiconductors:

Band theory of Solids: Introduction- Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - V vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Semiconductors::Introduction– Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Drift and Diffusion currents – Einstein's equation-Hall effect- Hall coefficient - Applications of Hall effect.

Text Books

1. "A Text book of Engineering Physics" by M.N.Avadhanulu, P.G.Kshirsagar - S.ChandPublications, 2019.
2. "Engineering Physics" by D.K.Bhattacharya and PoonamTandon, Oxford press (2015).
3. "Engineering Physics" by R.K Gaur. and S.L Gupta., - DhanpatRai publishers, 2012.

Reference Books

1. Applied Physics by P.K. Palanisamy, Scitech publications (2014).
2. Engineering Physics by M. Arumugam, Anuradha Publication (2014).
3. Physics for Engineers by M.R. Srinivasan, New Age international publishers (2009).

B.TECH I SEMESTER	**HSMC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC1T03 ENGLISH

Pre-requisite:

Course Objective:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: At the end of the course, student will be able to

CO1 understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information

CO2 ask and answer general questions on familiar topics

CO3 employ suitable strategies to master the art of letter writing and email writing

CO4 recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs

CO5 form sentences using proper grammatical structures and correct word forms

SYLLABUS

UNIT-I A Drawer full of happiness (Detailed Study)

	Deliverance (Non-detailed Study)
UNIT-II	Nehru's letter to his daughter Indira on her birthday(Detailed Study) Bosom Friend (Non-detailed Study)
UNIT-III	Stephen Hawking-Positivity 'Benchmark' (Detailed Study) Shakespeare's Sister(Non-detailed Study)
UNIT-IV	Liking a Tree, Unbowed: Wangari Maathai-biography (Detailed Study) Telephone Conversation(Non-detailed Study)
UNIT-V	Stay Hungry-Stay foolish (Detailed Study) Still I Rise(Non-detailed Study)

Text Books

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The Individual Society", Pearson Publications.(Non-detailed)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition,2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) MacmillanEducational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP,2012.

B.TECH I SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**2**

20EC1T04 ELECTRONIC DEVICES

Pre-requisite: Physics

Course Objective: the students can able to Analyze the characteristics electronic devices such as diodes, transistors in different modes etc., and simple circuits like rectifiers, clippers and clampers.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand basic semiconductor devices

CO2: Observe characteristics diodes

CO3: Analyze applications of Semiconductor diodes

CO4: Characterize the Bipolar Junction Transistor in different modes

CO5: Understand the construction and working of Field Effect Transistor

SYLLABUS

UNIT-I: Semi-Conductor Physics

Introduction, Insulators, semiconductors and metals, Mobility and conductivity, Intrinsic and extrinsic semiconductors, Charge density, current components in semiconductors, Continuity equation. Active and passive components.

UNIT-II: Diodes

PN junction diode- Energy band diagram of PN junction Diode- V-I Characteristics - Current components in PN junction Diode- Diode equation- Diode resistance and capacitance- Characteristics of Zener Diode- Varactor Diode- SCR ,UJT ,Photodiode and LED

UNIT-III: Diode Applications

Half wave, Full wave Rectifier and Bridge rectifier- Derivations of characteristics of rectifiers- Filters- Inductive and Capacitive filters, Clipping& Clamping Circuits.

UNIT-IV: Bipolar Junction Transistor

Bipolar Junction Transistor- Transistor current components- Transistor equation- Transistor configurations- Characteristics of a transistor in CB,CC& CE configurations- junction biasing condition for active, saturation and cut-off modes, current gain α, β and γ.h-parameter representation of a transistor.

UNIT-V: Field Effect Transistors (FET):

Junction Field Effect Transistor construction & operation- characteristics CS, CD & CG- - **MOSFET:** Metal Oxide Semiconductor Field Effect Transistor- Types- Construction- Operation & characteristics

Text Books:

1. 1.Electronic Devices & Circuits –J.Millman, C.Halkias, Tata Mc-graw Hill,2nd Edition
2. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, TATA McGraw Hill, 2ndEdition
3. D.P. Kothari andI. J. Nagrath, -Basic Electrical Engineering‖, Tata McGraw Hill, 2010.

Reference Books:

1. D.C.Kulshreshtha,-Basic Electrical Engineering‖, McGraw Hill, 2009.
2. Basic Electronic Circuits -V.K.Mehta,S-chandPublications,2008.
3. Electronic Devices & Circuits-David-A-Bell, oxford University Press 5thEdition.

B.TECH I SEMESTER **ESC**

L	T	P	C
3	0	0	3

20EC1T05 PROBLEM SOLVING THROUGH C

Pre-requisite:

Course Objective:

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor. To assimilate about File I/O and significance of functions

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of programming

CO2: Understand and Apply loop construct for a given problem

CO3: Demonstrate the use pointers

CO4: Understand the use of functions and develop modular reusable code

CO5: Understand File I/O operations

SYLLABUS

UNIT-I:

INTRODUCTION TO COMPUTERS: Functional Components of computer, computer software, categories of memory, types of programming languages, Development of algorithms, flow charts, software development process, Computer Numbering system

BASICS OF C PROGRAMMING: Introduction to programming paradigms, Structure of C program, Data Types, C Tokens, Operators: Precedence and Associativity, Expressions Input/output statements, Assignment statements

UNIT-II:

Decision making statements: if, if else, nester if. Multi way decision making statements: else if, Switch statement. **Loop statements**: while, do while, for, Compilation process.

UNIT-III:

Introduction to Arrays: Declaration, Initialization, One dimensional array, Example Programs on one dimensional array, Selection sort, linear and binary search, two dimensional arrays, Matrix Operations, Multi-dimensional Arrays

Strings: Declaration, String operations: length, compare, concatenate, copy, String handling functions.

UNIT-IV:

FUNCTIONS: Introduction to functions: Function prototype, function definition, function call, Built-in functions, Recursion, Storage classes, Passing Arrays & Strings to the functions, Preprocessor directives

POINTERS: Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers, Parameter passing: Pass by value, Pass by reference, Dynamic Memory Allocation

UNIT-V:

STRUCTURES AND UNIONS: Structure, Nested structures, Pointer and Structures, Array of structures, Example Program using structures and pointers, Self-referential structures, Unions.

FILE PROCESSING: Files, Types of file processing: Sequential access, Random access, Sequential access file, Random access file, Command line arguments

Text Books:

1. Krnighan. B.W and Ritche, D.M, "The C Programming Language", Second Edition, Pearson Education, 2006
2. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.

References:

1. Pradepdey, Manas Ghosh, "Fundamentals of Computing and programming in C", First Edition, Oxford University Press, 2009.
2. Paul Deitel and Harvey Deitel, "C How to Program", Seventh Edition, Pearson Publication.
3. E Balagursamy, "Programming in C, Sixth Edition, Tata McGraw Hill.
4. Ajay Mittal, "Programming in C A practical Approach", Pearson education

B.TECH I SEMESTER	**HSMC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20EC1L06 ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

- Facilitate effective usage of functional English through role plays
- Focus on vocabulary enhancement
- Foster various nuances of phonetics and accent neutralization

Course Outcomes: At the end of the course, student will be able to

CO1: Acquire basic proficiency in English by learning functional aspects of English language

CO2: Learn the methods of enhancing vocabulary

CO3: Acquaint himself/herself with nuances of Phonetics

LIST OF EXPERIMENTS

1 Greetings and Introductions
2 Requesting Permission & Giving Directions
3 Inviting/Complaining/Congratulating
4 Root Words
5 Phonetics-Sounds and Symbols
6 Pronunciation Rules

References:

1. Strengthen Your Steps, Maruti Publications

2. Interact, Orient Blackswan

3. Word Power Made Easy, Pocket Books

B.TECH I SEMESTER	BSC	L	T	P	C
		0	0	3	1.5

20EC1L07 APPLIED PHYSICS LAB

Pre-requisite: Fundamental understanding of usage of an instrument with proper care.

Course Objective: Objective of the course is to impart

- Training Engineering graduates to handle instruments and their usage methods to improve the accuracy of measurements.

At the end of the course, student will be able to

CO1: **Outcomes**:The student is exposed to different methodsof chemical analysis and use of some commonly employed instruments. They thus acquire someexperimentalskills.

CO2: Implement the basic principles of Mechanics to measure different physical parameters.

CO3: Enhance the knowledge of Usage of electronic devices in various applications

SYLLABUS

1. Newton's rings –Determination of radius of curvature of Plano Convex Lens.
2. Determination of wavelength of spectral lines -Diffraction Grating
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of wavelength of laser source using diffraction grating
5. Determination of Numerical Aperture and bending loss of a given Optical Fiber.
6. Determination of dispersive power of prism.
7. Determination of Rigidity modulus of a material- Torsional Pendulum.
8. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
9. Determination of Young's modulus by method of single cantilever oscillations
10. Verification of laws of vibrations in stretched strings – Sonometer.
11. Estimation of Planck's Constant using Photo electric Effect

12. Study of I /V Characteristics of Semiconductor diode.
13. I/V characteristics of Zener diode.
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
15. Energy Band gap of a Semiconductor using p - n junction diode

ReferenceBooks

1.A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers, 2017.

		L	T	P	C
B.TECH I SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20EC1L08 PROBLEM SOLVING THROUGH C LAB

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers &functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

- Demonstrate Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.

3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 … 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.

2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( )function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name
3. Write a program in C to remove a file from the disk.

B.TECH I SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

20EC1L09 ELECTRONIC DEVICES LAB

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

Course objectives:

- To study basic electronic components
- To observe characteristics of electronic devices

Course outcomes:

At the end of the course the students can able to

- Measure voltage, frequency and phase of any waveform using CRO.
- Generate sine, square and triangular waveforms with required frequency and amplitude using function generator.
- Analyze the characteristics of different electronic devices such as diodes, transistors etc., and simple circuits like rectifiers,

LIST OF EXPERIMENTS
(All Experiments has to be performed)

1. Identification of circuit Components
2. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multi meter, Function
3. Generator, Regulated Power Supply and CRO.
4. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
5. Soldering Practice- Simple circuits using active and passive components.
6. CRO Operation and its Measurements
7. **Characteristics of Semiconductor Diode and Zener Diode:** Determination of forward and reverse resistance from VI characteristics.
8. **Static Characteristics of BJT under CE Mode:** Transistor Biasing **Determination** of h-parameters h_{ie}, $h_{re}$from input characteristics and

h_{fe}& h_{oe} from outputcharacteristics.

9. **Static Characteristics of JFET:** Determination of $r_d$from drain characteristics and $g_m$from mutual characteristics and hence obtain µ.
10. **Characteristics of UJT and SCR:** Determination of intrinsic standoff ratio from emitter characteristics.
11. **Resonant Circuits:** Characteristics of Series and Parallel Circuits, Determination of quality factor and bandwidth.
12. **Half Wave and Full Wave Rectifier with and Without Filter**: Display of output waveforms and Determination of ripple factor, efficiency and regulation for different values of load current.
13. **Bridge Rectifier with and without C-Filter:** Display of output waveforms and Determination of ripple factor, efficiency and regulation for different values of load current.
14. **Diode Clipping Circuits:** Design and display the transfer characteristics of single ended series, shunt type and double ended shunt type clipping circuits.

B.TECH II SEMESTER	BSC	L	T	P	C
		3	0	0	3

20EC2T01 TRANSFORM TECHNIQUES

Pre-requisite: Linear Algebra and Differential Equations

Course Objective: Objective of the course is to impart

- Learning the techniques of Laplace transforms to solve ordinary differential equations
- knowledge of Fourier series & Fourier transforms for piecewise continuous functions
- knowledge of solving boundary valued problems

Course Outcomes: At the end of the course, student will be able to

CO1: Able to analyze a class of integrals in terms of beta and gamma functions

CO2: Provide the techniques of Laplace transformations and able to solve problems related to digital signal processing

CO3: Analyze the general periodic functions in the form of an infinite convergent sine and cosine series

CO4: Illustrate the methods to solve the boundary value problems

CO5: Determine a solution of a discrete system using Z- transforms

SYLLABUS

UNIT-I: Special functions:

Beta function, Properties & problems, Gamma function, properties & problems, Relation between Beta and Gamma functions, Evaluation of improper integrals.

UNIT-II: Laplace Transforms (all properties without proofs):

Definition, Transforms of elementary functions, properties of Laplace transforms, Transforms of periodic functions, Transforms of derivatives and integrals, Multiplication by t^n, Division by t, Evaluation of improper integrals. Inverse Laplace transforms–Method of partial fractions, other methods of finding inverse transforms, Convolution theorem (without proof). Application: Application to differential equations.

UNIT-III: Fourier Series &Fourier Transforms:

Euler's formulae (without proof), Conditions of Fourier expansion, Functions having points of discontinuity, Change of inerval, Even and odd functions, Half-range series.
Fourier Integral theorem (without proof), Fourier cosine & sine integral, complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, properties of Fourier transforms (without proof), Convolution theorem(without proof), finite & infinite Fourier sine & cosine transforms.

UNIT-IV: Partial Differential Equations:

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of Variables, Applications: One-dimensional wave and heat equations, two-dimensional heat equation.

UNIT-V: Z-Transforms: (all properties without proofs)

Introduction, definition, some standard z-transforms, linearity property, damping rule, some standard results, shifting U_n to the right, multiplication by n, initial and final value theorems, Inverse z-transforms, convolution theorem, evaluation of inverse z-transforms by partial fractions, applications to difference equations.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

3. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
4. N. P. BALI &Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH II SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC2T02 APPLIED CHEMISTRY

Pre-requisite: Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objective: Objective of the course is to impart

- Importance of usage of plastics in house hold appliances and composites(FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of green chemistry and molecular switches

Course Outcomes: At the end of the course, student will be able to

CO1: Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

CO2: Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.

CO3: Synthesize nanomaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

CO4: Design models for energy by different natural sources. Analyzetheprinciplesofdifferentanalyticalinstrumentsandtheirapplications.

CO5: Obtain the knowledge of green chemistry and molecular machines

SYLLABUS

UNIT-I: Polymer Technology:

Polymerisation: Introduction, methods of polymerization (addition and Condensation), Physical and mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers: Natural rubber-Drawbacks-vulcanization, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics – GFRP and Aramid FRP

Conducting polymers: Intrinsic and extrinsic conducting polymers

Biodegradable polymers: preparation and applications

UNIT-II: Electrochemical Cells And Corrosion:

Part I*: ELECTROCHEMICAL CELLS:* Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Part II: *Corrosion:* Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings (cathodic coatings, anodic coatings, electroplating and electroless plating)

UNIT-III: Material Chemistry:

Part I*: Non-elemental semiconducting materials:* Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling technique) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Super conductors:-Type –I, Type II-characteristics and applications

Part II: *Nano materials:* Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals: Introduction-types-applications.

UNIT-IV: Non-Conventional Energy Sources & Spectroscopy:

Part I: NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Part II: SPECTROSCOPY

UV spectroscopy- Basic principle-Instrumentation-Applications

IR spectroscopy- Basic principle-Instrumentation-Applications

NMR spectroscopy- Basic principle-Instrumentation-Applications

UNIT-V: Advanced Concepts/Topics In Chemistry:

Part-I: *Green chemistry*: Introduction, Principles of green chemistry, Green synthesis-Aquaeous Phase method-Microwave method-Phase transfer catalysis method, R4M4 principles (Econoburette).

PART-II: *Molecular switches*: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid- base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor.

TextBooks:

1. P.C. Jainand M.Jain “Engineering Chemistry”,15/e, Dhanpat Rai &Sons, Delhi,(Latest edition).
2. Shikha Agarwal,“Engineering Chemistry”, Cambridge University Press, New Delhi,(2019).
3. S.S. Dara, “A Text book of Engineering Chemistry ”,S. Chand &Co,(2010).
4. Shashi Chawla, “Engineering Chemistry”, Dhanpat Rai Publicating Co.(Latest edition).

References:

1. K.SeshaMaheshwarammaandMridulaChugh,“EngineeringChemistry”,PearsonIndia
2. O.G.Palana,“EngineeringChemistry”,TataMcGrawHillEducationPrivateLimited,(2009).
3. CNR Rao and JM Honig (Eds) “Preparation and characterization of materials” Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, “Textbook of Nano science and Nanotechnology”, University press (latest edition)

B.TECH II SEMESTER **ESC**

L	T	P	C
3	0	0	3

20EC2T03 NETWORK THEORY

Pre-requisite:

Course objectives:

The primary objective of this course is:

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states in RLC circuits.
- To know the basic Laplace transforms techniques in periods‘ waveforms.
- To understand the two port network parameters.
- To understand the properties of LC networks and filters

Course Outcomes: At the end of the course, student will be able to

CO1: Gain the knowledge on basic network elements and graph theory.

CO2: Understand Network Theorems and applications

CO3: Analyze Coupled circuits and Resonance.

CO4: Will analyze the RLC circuit‘s behavior in detailed.

CO5: Gain the knowledge in characteristics of two port network parameters

SYLLABUS

UNIT-I: Introduction to Electrical Circuits

Network Elements- Sources- Sources Conversions- Kirchhoff‘s laws- RMS value, Average value, Form factor and peak factor- Phasor representation. **Graph Theory:** Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule.

UNIT-II: Network Theorems:

Thevinin‘s, Norton‘s, Milliman‘s, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens and Duality.

UNIT-III: Coupled Circuits:

Self inductance, Mutual inductance, Coefficient of coupling, Natural current, conductively coupled equivalent circuits- **Resonance:** Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, current in anti resonance, anti resonance at all frequencies.

UNIT-IV: Time and Frequency Domain Analysis of Electrical Circuits :

Time domain analysis of R-L R-C and RL-C circuits, initial and final conditions of Network elements, steady state and transient response, Analysis of electrical circuits using Laplace Transform, steady state analysis using phasors, solutions of network equations using Laplace Transform, frequency domain analysis of RL-Circuit.

UNIT-V: Two-port networks

Relationship of two port networks, Z-parameters, Y parameters Transmission line parameters, h-parameters, Inverse h parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks.

Text books:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition,2000.
2. Network Analysis by K.Satya Prasad and S Sivanagaraju, Cengage Learning,2ndEdition,2005

References:

1. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.2002
2. Basic Circuit Analysis by DR Cunninghan, Jaico Publishers pearson publishers 2005

B.TECH II SEMESTER **ESC**

L	T	P	C
3	0	0	3

20EC2T04 BASIC ELECTRICAL TECHNOLOGY

Pre-requisite: Fundamental in Engineering Mathematics and Physics

Course Objective:

- To understand the principle of operation and construction details of DC machines.
- To understand the principle of operation and construction details of transformer.
- To understand the principle of operation and construction details of 3-Phase induction motor.
- To Understand the principles and construction of special machines

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the operation of DC generators.

CO2: Able to understand the operation of DC motors, Speed control methods.

CO3: Analyse the performance of transformer.

CO4: Explain the operation of 3-phase induction motors.

CO5: Able to explain the operation of Stepper & BLDC motors.

SYLLABUS

UNIT-I: DC GENERATORS:

Principle of operation and construction of DC generators - EMF equation – types of generators – magnetization and load characteristics of DC generators.

UNIT-II: DC MOTORS:

Principle of operation of DC Motors – types of DC Motors –Characteristics of DC motors – losses and efficiency – Swinburne's test – speed control of DC shunt motor – flux and Armature voltage control methods.

UNIT-III: TRANSFORMERS:

Principle of operation and construction of single phase transformer– types-phasor diagram on no load and load –equivalent circuit, losses and efficiency of transformer - regulation of transformer – OC and SC tests.

UNIT-IV: INDUCTION MACHINES:

Principle of operation and construction of three phase induction motors –slip ring and squirrel cage motors – slip-torque characteristics –efficiency calculation – starting methods.

UNIT-V: SPECIAL MACHINES:

STEPPER MOTOR: Principle of Operation and construction of stepper motor, Classification of stepper motors – Hybrid and Variable Reluctance Motor (VRM) – Different configuration for switching the phase windings.

BLDC MOTOR: Principle of Operation and Types of constructions – Surface mounted and interior type permanent magnet, Torque speed characteristics.

Text Book(s)

1. Principles of Electrical Machines by V.K. Mehta &Rohit Mehta, S.Chand publications.
2. Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria& Sons.

References

1. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications.
2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition.
3. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition.
4. Brushless Permanent magnet and reluctance motor drives, Clarenden press,T.J.E. Miller, 1989, Oxford.
5. Special electrical Machines, K.Venkata Ratnam, University press, 2009, New Delhi.

B.TECH	II SEMESTER	ESC	L	T	P	C
			1	0	4	3

20EC2T05 ENGINEERING DRAWING

Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons and curves. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scalingetc.

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the techniques of constructing various polygons and curves
2. Understand the concepts of projections and draw projections for simple entities such as points and lines.
3. Draw orthographic projections of planes and simple solids
4. Analyze the 2D drawings and convert to 3D isometric views

UNIT I

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normal for the curves.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

UNIT III

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT IV

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one plane

UNITV

Conversion of orthographic views to isometric view for Simple Solids such as prism, pyramid, cylinder and cone; Conversion of isometric view to orthographic views.

Text books:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L. Narayana& P. Kannaiah, Scitech Publishers

Reference books:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers
2. Engineering Graphics by PI Varghese, McGraw Hill Publishers
3. Engineering Drawing + Auto Cad – K Venugopal, V. Prabhu Raja, NewAge
4. Engineering Drawing by Agarwal & Agarwal, Tata McGraw HillPublishers

B.TECH II SEMESTER	BSC	L	T	P	C
		0	0	3	1.5

20EC2L06 APPLIED CHEMISTRY LAB

Pre-requisite: Acquire some experimental skills.

Course Objective: Objective of the course is to impart

- The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations.
- A few instrumental methods of chemical analysis.

Course Outcomes:

At the end of the course, student will be able to

CO1: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire som experimental skills.

LIST OF EXPERIMENTS

1. Determination of HCl using standard Na2CO3 solution.
2. Determination of alkalinity of a sample containing Na2CO3 and NaOH.
3. Determination of Mn+2 using standard oxalic acid solution.
4. Determination of ferrous iron using standard K2Cr2O7 solution.
5. Determination of Cu+2 using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe+3 by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method
10. Determination of the concentration of strong acid vs strong base (by conductometric method).

11 Determination of strong acid vs strong base (by potentiometric method).

12 Determination of Mg+2 present in an antacid.

13 Determination of CaCO3 present in an egg shell.

14 Estimation of Vitamin C.

15 Determination of phosphoric content in soft drinks.

16 Adsorption of acetic acid by charcoal.

17 Preparation of nylon-6, 6 and Bakelite (demonstration only).

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20EC2L07: ENGINEERING & IT WORKSHOP

Course Objective: To impart hands-on practice on basic engineering trades and skills.

Trade:

1. **Carpentry**
   a. T-Lap Joint
   b. Cross Lap Joint
   c. Dovetail Joint
   d. Mortise and Tenon Joint
2. **Fitting**
   a. Vee Fit
   b. Square Fit
   c. Half Round Fit
   d. Dovetail Fit
3. **House Wiring**
   a. Parallel / Series Connection of three bulbs
   b. Stair Case wiring
   c. Florescent Lamp Fitting
   d. Measurement of Earth Resistance
4. **Tin Smithy**
   a. Taper Tray
   b. Square Box without lid
   c. Opens coop
   d. Funnel
5. **Product prototyping using 3D Printing**
6. **IT Workshop**

   Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.

   Task 2: Practicing disassembling and assembling components of a PC

   Note: At least two exercises to be done from each trade.

B.TECH II SEMESTER	ESC	L	T	P	C
		0	0	3	1.5

20EC2L08 BASIC ELECTRICAL TECHNOLOGY LAB

Course Objectives: To understand the operation of network elements &electrical machines

Course Outcomes:

CO 1 Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.

CO 2 Determination of time constant and steady state error & Two port network parameters

CO 3 Experimentation of network theorems

CO 4 Compute the efficiency of DC shunt machine without actual loading of the machine

CO 5 Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SC tests.

CO 6 Analyze the performance characteristics and to determine efficiency of DC shunt motor &3-Phase induction motor.

LIST OF EXPERIMENTS

1. Series and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
3. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
4. Verification of Superposition and Reciprocity theorems.
5. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
6. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.
7. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
8. Speed control of D.C. Shunt motor by Armature & flux control methods

9 Brake test on DC shunt motor. Determination of performance characteristics.

10 OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).

11 Brake test on 3-phase Induction motor (performance characteristics).

12 Swimburne’s test on DC shunt machine

B.TECH II SEMESTER	MC	L	T	P	C
		2	0	--	--

20EC2M09 ENVIRONMENTAL SCIENCE

Course objective:

- To understand the importance of Environment and the importance of biodiversity

Course outcomes:

- The importance of environment, Natural resources and current global environmental challenges for the sustenance of the life on planet earth.
- The concepts of the ecosystem and its function in the environment.
- 3.The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- The various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices.
- The environmental legislations of India and Social issues and the possible means
- Environmental assessment and the stages involved in EIA.

SYLLABUS

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Introduction- Scope of Environmental Studies- Importance of Environmental Studies- Need for public awareness, Environmental ethics- Contemporary Environmentalists- Environmental Global moves: Stockholm conference, Earth summit

Concept of an ecosystem - Structure of an ecosystem- function of an ecosystem- Food chains, food webs- ecological pyramids- Energy flow in the ecosystem- Ecological succession- Nutrient cycling- 1^{o}production& 2^{o}production- Major ecosystems: Forest ecosystem- Grassland ecosystem, Desert ecosystem- Aquatic ecosystem: pond, Lake Ecosystem- Streams, river ecosystem, Oceans

UNIT-II: NATURAL RESOURCES AND CONSERVATION

Introduction and classification of natural resources-Forest resources**:** Use and over-exploitation- Deforestation-Timber extraction-Mining- Conservation-Water resources**:** Use and over utilization of surface and ground water,- Floods, drought, Dams and associated problems- Water conservation, rain water harvesting, water shed management-Energy resources**:** renewable energy sources –solar-wind-hydro-tidal- Ocean thermal-geo thermal-bio mass-bio gas-bio fuels- Hydrogen.- Non-renewable energy sources-coal-petroleum-natural gas-Nuclear energy

UNIT-III: **BIODIVERSITY AND ITS CONSERVATION**

Definition, classification- Value of biodiversity-Threats to biodiversity: habitat loss, man-wildlife conflicts- Endangered and endemic species of India-Conservation of biodiversity- Biodiversity at national and local levels, Hot-sports of biodiversity

UNIT-IV: ENVIRONMENTAL PROBLEMS

Global warming, Climate change- Acid rain, Ozone depletion- Air pollution-Water pollution- Soil pollution- Noise pollution, Nuclear hazards- Solid Waste Management: Causes, Consequences and Control methods- Solid Waste Management- Population growth and explosion, effects, control measures-Pollution case studies- Role of an individual in prevention of pollution

UNIT-V: ENVIRONMENTALLEGISLATION&MANAGEMENT

Sustainable development- Air (Prevention and Control of Pollution) Act-Drawbacks- Water (Prevention and control of Pollution) Act- Drawbacks-Wildlife Protection Act- Drawbacks- Forest Conservation Act- Drawbacks-Environmental Protection Act- Drawbacks- Environmental Impact Assessment and its significance- Preparation of Environmental Management Plan and Environmental Impact Statement- Ecotourism

TEXT BOOKS:

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age Publications, New Delhi

2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada

3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCES:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Delhi

B.TECH III SEMESTER

	L	T	P	C
BSC	3	0	0	3

20EC3T01 COMPLEX VARIABLES

Pre-requisite: Basic knowledge about Calculus and Differential Equations

Course Objective: Objective of the course is to impart

- basic understanding of complex variable theory
- knowing the theory of line integral together with the theory of power series
- understanding the geometrical nature of analytic functions

Course Outcomes:

S. No.	At the end of the course, student will be able to
CO 1:	Determine analytic and non-analytic functions
CO 2:	Analyze the analytic function into a power series which is useful in the study of communication systems.
CO 3:	Illustrate the techniques of the contour integration to determine the real integrals
CO 4:	Determine the solution of boundary value problems by mapping complex domains into the standard domains
CO 5:	Analyze the solutions of Bessel's and Legendre's equations using power series

SYLLABUS

UNIT-I: Analytic Functions:

Introduction, Complex function, Limit and continuity of a complex function, Derivative of f(z), Analytic functions, Harmonic functions & orthogonal system, finding analytic functions by Milne-Thomson method. Applications to flow problems.

UNIT-II: Complex Integration:

Complex integration, Cauchy's theorem and Cauchy's integral formula (without proofs), Series of complex terms, Taylor's series and Laurent's series (without proofs).

UNIT-III: Residues:

Zeros and singularities of an analytic function, Residues and Cauchy-Residue theorem (without proof). Evaluation of real definite integrals-Integration around the unit circle, Integration around a small semi-circle and indenting the contours having poles on real axis.

UNIT-IV: Conformal Mappings:

Transformation by e^z, lnz, z^2, z^n (n positive integer), sin z, cosz, z + a/z. Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio – properties – invariance of circles and cross ratio – determination of bilinear transformation mapping 3 given points.

UNIT-V: Bessel's and Legendre's Equations:

Bessel's equation, Recurrence formulae for $J_n(x)$, Expansions for J_0 and J_1, Value of $J_{1/2}$. Legendre's equation, Rodrigue's formula, Legendre polynomials, Recurrence formulae for $P_n(x)$.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC3T02 PROBABILITY THEORY AND STOCHASTIC PROCESSES

Pre-requisite: Basic knowledge about linear algebra, set theory, matrices, differentiation, and integration

COURSE OBJECTIVES:
The main objectives of this course are given below:

- To introduce elementary probability theory, in preparation for courses on statistical analysis, random variables.
- To introduce special random variables and study operations on single random variables.
- To introduce vector random variables and study operations on multiple random variables.
- To introduce random process and study temporal characteristics
- To study spectral characteristics of random process and relation between correlation and power spectrum.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Define and estimate probability of any random experiment and analyze random variable.

CO2: Analyze and apply special random variables to find moments, perform different operations on single random variable.

CO3: Perform several operations on multiple random variables.

CO4: Analyze random process and apply time averages.

CO5: Analyze relation between correlation and power spectrum.

SYLLABUS

UNIT-I: Probability and Random Variable:

INTRODUCTION: Overview of Probability Theory: Sets, sample space and events, Axioms of Probability, Baye's Rule.

RANDOM VARIABLES: Types, Distribution and Density function of Random Variables and Properties, Conditional distribution and density function.

UNIT-II: Some special random variables and operation on single random variable:

SOME SPECIAL RANDOM VARIABLES: Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh. Monotonic transformation of random variables. **OPERATION ON SINGLE RANDOM VARIABLE:** Mean of random variable, moments about mean, central moments, moment generating function, characteristic function

UNIT-III: Operations on Multiple Random Variables

Joint Moments about origin, Joint central moments, properties, Marginal distribution and density functions. Central limit theorem. Distribution and Density function of sum of two Independent Random variables.

UNIT-IV: Random Processes and temporal characteristics

Concept and classification of Random Process, Concept of Stationary Random Process, Wide Sense Stationary. Time Averages, Ergodicity, Auto Correlation function, Cross Correlation function, Covariance function and their properties

Unit-V Spectral Characteristics of Random Process

Response of linear Systems with Random Inputs. Power Spectrum-Properties, Relation between PSD and Autocorrelation function of a Random Process, Cross spectral Density and its relation with Cross Correlation function.

<u>Text Books:</u>

1. Peyton Z. Peebles, Probability, Random Variables & Random Signal Principles - TMH, 4Ed.2001.
2. Athanasios Papoulis and S. Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes – PMI, 4 Ed., 2002.

<u>Reference Books</u>:

1. Henry Stark and John W. Woods, Probability and Random Processes with Application to Signal Processing –, 3 Ed., PE 2002
2. George R. Cooper, Clave D. MC Gillem, Probability Methods of Signal and System Analysis - 3 Ed., 1999,Oxford.

B.TECH III SEMESTER **PCC**

L	T	P	C
3	0	0	3

20EC3T03 DIGITAL ELECTRONICS

COURSE OBJECTIVES:
The primary objectives of this course are given below:

- To represent numbers and conversion between different representations.
- To analyze logic processes and implement logical operations.
- To develop the combinational logic circuits.
- To understand concept of programmable logic devices like PROM, PLA, PAL.
- To design and analyze the concepts of sequential circuits.

COURSE OUTCOMES:
Upon completion of the course student will be able to:

CO1: Understand different number systems and their conversions.

CO2: Analyze the logical operations and Boolean algebra

CO3: Develop combinational circuits, perform logical operations and different programmable logic devices.

CO4: Design the sequential logic functions.

CO5: Know finite state machines and Mealy and Moore Models for reduction.

SYLLABUS

UNIT-I: Number Systems

INTRODUCTION: Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r‘s Complement- (r-1)‘s Complement- Subtraction of Unsigned Numbers- Problems- Signed Binary Numbers- Weighted and Non weighted codes.

UNIT-II: Logic Gates and Boolean Algebra

Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- SOP- POS- K Map Method- Minimization of Boolean Functions. Basic Gates- Universal Gates- Ex-OR and Ex-NOR Gates.

UNIT-III: Combinational Logic Circuits

Design of Half Adder- Full Adder- Half Subtractor- Ripple Adder, Carry Look Ahead adder and Binary Adder-Subtractor- Magnitude Comparator - Design of Decoders- Cascading of Decoders -Code Converters- BCD -7 Segment, BCD-

Gray and Gray –BCD converters, Encoders- Multiplexers- Cascading of Multiplexers, Realization of Functions Using MUX, Demultiplexers.

Introduction to Programmable Logic Devices (PLDs):
PLA- PAL- PROM- Realization of Switching Functions Using PROM, PAL - Comparison of PLA, PAL and PROM.

UNIT-IV: Introduction to Sequential Logic Circuits

Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear).

Registers and Counters: Design of Registers- Control Buffer Registers- Bidirectional Shift Registers- Universal Shift Register- Design of Ripple Counters- Synchronous Counters and Variable Modulus Counters- Ring Counter- Johnson Counter.

Unit-V: Finite state Machine

Analysis of clocked sequential circuits- state Equations-state diagrams- state tables- design procedures- Realization of circuits using various flip-flops- Mealy and Moore Models of Finite State Machines- Mealy to Moore conversion and vice-versa.

TEXT BOOKS

1. Digital Design , M. Morris Mano, Michael D Ciletti, 4th Edition,PEA,2003
2. Fundamentals of Logic Design, ROTH, C. H. 5th ed . St. Paul, MN: Brooks/Cole, 2004 .

REFERENCE BOOKS

1. Switching and Finite Automata Theory, Kohavi, Jha, 3rd Edition, Cambridge, 2005.
2. Digital Logic Design, Leach, Malvino, Saha, TMH,2000.

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC3T04 SIGNALS & SYSTEMS

Pre-requisite: Basic knowledge about linear algebra, differentiation and integration

COURSE OBJECTIVES:
The main objectives of this course are given below:

- To introduce the terminology of signals and systems.
- To introduce Fourier tools through the analogy between vectors and signals.
- To introduce the concept of sampling and reconstruction of signals.
- To analyze the linear systems in time and frequency domains.
- To study z-transform as mathematical tool to analyze discrete-time signals and systems.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Characterize the signals and systems and principles of vector spaces, Concept of Orthogonality.

CO2: Analyze the Fourier series, Fourier transform and Laplace transform.

CO3: Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.

CO4: Understand the relationships among the various representations of LTI systems

CO5: Apply z-transform to analyze discrete-time signals and systems.

SYLLABUS

UNIT-I: Introduction and Fourier Series

INTRODUCTION: Definition of Signals and Systems, Elementary signals, Operations on signals, classification and characteristics of Signals, Analogy between vectors and signals, and Orthogonality concepts.

FOURIER SERIES: Fourier series representation of continuous time periodic signals, properties of Fourier series.

UNIT-II: Fourier transform and Laplace Transform

FOURIER TRANSFORM: Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms and Hilbert Transform.

LAPLACE TRANSFORMS: Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept ROC, Relation between L.T‘s, and F.T. of a signal.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS

Linear system, impulse response, Concept of convolution in time domain and frequency domain, Transfer function of a LTI system, **Concept of Correlation**, Distortion less transmission through a system, Ideal LPF, HPF and BPF characteristics, Causality and Poly- Wiener criterion for physical realization

UNIT-IV: SAMPLING THEOREM

Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal, effect of under sampling – Aliasing and Band Pass sampling.

Unit-V Z–TRANSFORMS

Z–TRANSFORMS: Difference between continuous-time and discrete-time, Concept of Z- Transform of sequences. ROC in Z-Transform, constraints on ROC, Inverse Z-transform and properties of Z-transforms. Differences between Transforms(F.T,L.T and Z.T)

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications,2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2ndEdn.2002

REFERENCE BOOKS:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2ndEdition.2002
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press,2015

		L	T	P	C
B.TECH III SEMESTER	**PCC**	**3**	**0**	**0**	**3**

20EC3T05 ELECTRONIC CIRCUIT ANALYSIS

Pre-requisite: Basic knowledge about electronics devices and circuits

COURSE OBJECTIVES:

The main objectives of this course are given below:

- Small signal low and high frequency BJT transistor amplifier models and the expressions for the respective parameters are derived.
- Cascading of single stage amplifiers is discussed. Expressions for overall voltage gain are derived.
- The concept of feedback is introduced. Effect of negative feedback on amplifier characteristics is explained and necessary equations are derived.
- Basic principle of oscillator circuits is explained, and different oscillator circuits are given with their analysis.
- Power amplifiers Class A, Class B, Class C, Class AB and other types of amplifiers are analyzed.

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Design and analyze the small signal low and high frequency transistor amplifier using BJT

CO2: Design and analysis of multi stage amplifiers using BJT and FET and Differential amplifier using BJT Identify and analyze the different feedback topologies.

CO3: Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.

CO4: Know the classification of the power amplifiers and their analysis with performance comparison.

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SYLLABUS

UNIT-I: BJT-SMALL SIGNAL TRANSISTOR AMPLIFIER MODELS

Low Frequency Transistor Amplifier Models: Two port networks, Transistor hybrid model, determination of h-parameters, generalized analysis of transistor amplifier model using h-parameters.

High Frequency Transistor Amplifier models: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II: MULTISTAGE AMPLIFIERS

Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascade amplifier, Boot-strap emitter follower, Analysis of multistage amplifiers using FET, Differential amplifier using BJT.

UNIT-III: FEEDBACK AMPLIFIERS & OSCILLATORS

Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

Conditions for oscillations, Classification, RC phase shift oscillator, Wien bridge oscillator, generalized analysis of LC oscillators, Quartz, Hartley and Colpitts Oscillators, Frequency stability-simple problems.

UNIT-IV: POWER AMPLIFIERS

Classification of amplifiers, Class A power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Distortion in amplifiers.

Unit-V TUNED AMPLIFIERS & MULTIVIBRATORS

Introduction, Q-Factor, single stage Tuned Amplifiers, double tuned amplifiers-frequency response of tuned amplifiers.

Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

Text Books:

1. J. MILLMAN AND C.C. HALKIAS, Integrated Electronics, Tata Mc Graw-Hill, 2009.
2. SALIVAHANAN, N.SURESSH KUMAR, A. VALLAVARAJ, Electronic Devices and Circuits, TATA McGraw Hill, Second Edition.

Reference Books:

1. DONALD A. NEAMAN, Electronic Circuit Analysis and Design, Mc Graw Hill.
2. ROBERT L. BOYLESTAD AND LOUIS NASHELSKY, Electronic Devices and Circuits, Pearson/Prentice Hall, Tenth Edition.

B.TECH III SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20EC3L06 ELECTRONIC CIRCUIT ANALYSIS LAB

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Understand how the amplification under small signal models.

CO2: Analyzing frequency response of amplifiers.

CO3: Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.

CO4: Utilize the Concepts of negative feedback to improve and importance of multivibrators.

CO5: Understand the concepts of sampling gates.

LIST OF EXPERIMENTS:
(Minimum of Ten Experiments has to be performed)

1. Evaluation of h-parameters of BJT
2. Darlington Amplifier
3. Class A Power Amplifiers Analysis & Efficiency
4. RC Coupled Single-stage BJT Amplifier: Determination of lower and upper cutoff frequencies, mid band voltage gain, gain bandwidth product from the frequency response
5. Emitter Follower: Determination of mid band voltage gain, input and output impedances at mid frequency range
6. Class-B Complementary Symmetry Power Amplifier: Display of input and output waveforms
7. Voltage series and current shunt feedback amplifiers
8. Hartley/Colpitt‘s Oscillator: Design and test the performance for a given frequency
9. RC Phase Shift Oscillator: Design and test the performance for a given frequency
10. Design of Bistable Multivibrator
11. Design of Monostable Multivibrator
12. Design of Astable Multivibrator

EQUIPMENT REQUIRED:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Millimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

B.TECH III SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20EC3L07 **SIGNALS AND SYSTEMS LAB**

COURSE OUTCOMES:

After studying this course the students would gain enough knowledge

CO1: Have a thorough understanding of the fundamental concepts and techniques used

CO2: To understand and examine the signals and its operations.

CO3: The ability to understand and analyze sampling process.

CO4: Ability to identify basic requirements for a transformation techniques in continuous and discrete time

LIST OF EXPERIMENTS

((Minimum of Ten Experiments has to be performed)

1 Basic Operations on Matrices
2 Generation of Various Signals and Sequences (Periodic and A periodic), such as Unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp, sinc.
3 Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power
4 Finding the even and odd parts of signal/ sequence and real and imaginary parts of signal
5 Convolution between signals and sequences.
6 Autocorrelation and cross correlation between signals and sequences.
7 Verification of linearity and time invariance properties of a given continuous/discrete system.
8 Computation of unit sample, unit step and sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
9 Gibbs phenomenon.
10 Finding the Fourier transform of a given signal and plotting its magnitude and phase spectrum
11 Waveform synthesis using Laplace Transform.
12 Locating the zeros and poles and plotting the pole-zero maps in S plane

and Z-plane for the given transfer function

13 Generation of Gaussian noise (real and complex), computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function

14 Sampling theorem verification

15 Removal of noise by autocorrelation / cross correlation

16 Extraction of periodic signal masked by noise using correlation.

17 Verification of Winer- Khinchin relations

18 Checking a random process for stationarity in wide sense.

Equipment & Software required:

Software:

i. Computer Systems with latest specifications
ii. Connected in Lan (Optional)
iii. Operating system (Windows XP)

Simulations software (Simulink & MATLAB signal Processing Toolbox)

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20EC3L08 DIGITAL ELECTRONICS LAB

COURSE OBJECTIVES:
The primary objectives of this course are given below:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems
- Verifying and analyzing the practical digital electronic circuits.
- To implement simple logical operations using combinational logic circuits
- Enabling students to take up application specific sequential circuit to specify the finite state machine and designing the logic circuit.

COURSE OUTCOMES:
Upon completion of the course student will be able to:

CO1: Understand working of logic gates and verify Boolean theorems.

CO2: Design, Test and evaluate various combinational circuits such as adders, Decoders, multiplexers, and de-Multiplexers.

CO3: Construct flips-flops, counters and shift registers and verify its functionality

LIST OF EXPERIMENTS

1. Verification of Basic Logic Gates.
2. Implementing all individual gates with universal gates NAND & NOR.
3. Design a circuit for the given canonical form, draw the circuit diagram and verify the De-Morgan laws.
4. Construct Half Adder and Full Adder and verify the truth table.
5. Construct Full Adder using 2 Half Adders and verify the truth table.
6. Design a combinational logic circuit for 4 * 1 MUX and verify the truth table.
7. Design a combinational logic circuit for 1 * 4 De -MUX and verify the truth table.
8. Design a combinational logic circuit for BCD - 7 Segment Decoder
9. Verification of truth tables of the basic Flip -Flops
10. Implementation of Master Slave Flip-Flop with J-K Flip- Flop and verify the truth table for Race Around condition.
11. Design the Mod 6 counter and verify the truth table.

12. Design a Decade Counter and verify the truth table.
13. Design a Up Down Counter and verify the truth table.
14. Construct 4-Bit Ring counter and verify the truth table.
15. Design a 8- Bit Shift Register and verify the truth table.

Equipment Required:

1. Hardware kits using Various digital IC's

TEXT BOOKS:

1. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

B.TECH III SEMESTER **SC**

L	T	P	C
0	0	4	2

20EC3S09 DATA STRUCTURES THROUGH C (Skill Oriented Course)

Course Objectives:

- Understand different Data Structures
- Apply Data Structures to real world problems using C.

Course Outcomes:

CO1: Use basic data structures such as arrays and linked list.

CO2: Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.

CO3: Use various searching and sorting algorithms.

CO4: Understand and use Trees for complex operations

Topics Covered: Searching, Sorting, Linked Lists, Stacks, Queues, Trees-Operations, Binary Search Trees- Operations

LIST OF EXPERIMENTS:

Exercise -1 (Searching)

a) Write C program that use both recursive and non-recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non-recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order.

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order.

Exercise -3 (Sorting-II)

a) Write C program that implement radix sort, to sort a given list of integers in ascending order

b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4 (Singly Linked List)

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion operation on a singly linked list

c) Write a C program that uses functions to perform deletion operation on a singly linked list

d) Write a C program to reverse elements of a single linked List.

Exercise -5 (Queue)

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists

Exercise -6 (Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write C program for implementing infix to postfix conversion

d) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7 (Binary Tree)

Write a recursive C program for traversing a binary tree in preorder, in-order and post-order.

Exercise -8 (Binary Search Tree)

a) Write a C program to create a BST

b) Write a C program to insert a node into a BST.

c) Write a C program to delete a node from a BST.

Text Books:

1. Data Structures Using C. 2ndEdition. Reema Thareja, Oxford.

2. Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1. Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.

2. Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.

3. Data Structures with C, Seymour Lipschutz TMH

B.TECH IV SEMESTER	BSC	L	T	P	C
		3	0	0	3

20EC4T01 NUMERICAL METHODS & VECTOR CALCULUS

Pre-requisite: Linear Algebra and Differential Equations & Transformation Techniques

Course Objective: Objective of the course is to impart

- understand the basic numerical methods to solve simultaneous linear equations
- knowledge of numerical methods to solve ordinary differential equations
- the types of integration over the lines, surfaces & volumes

Course Outcomes:

S. No.	At the end of the course, student will be able to
CO1:	Determine the solution of transcendental equations by different numerical methods
CO2:	Provide the interpolation techniques which analyze the data of an unknown function
CO3:	Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries
CO4:	Evaluate areas and volumes using double & triple integrals
CO5:	Apply the concepts of calculus to scalar and vector fields and establish the relation between line, surface and volume integrals.

SYLLABUS

UNIT-I: Numerical Solution of Equations:

Solution of Algebraic and transcendental equations: Bisection method, Method of false position and Newton-Raphson method. Iterative methods of solution of linear simultaneous equations: Jacobi's and Gauss-Seidel iteration methods.

UNIT-II: Interpolation:

Forward and backward, relation between these operators, Differences of a polynomial, Interpolation with unequal intervals: Lagrange's interpolation formula, Newton's forward & backward interpolation formulae & problems.

UNIT-III: Numerical Integration & Numerical Solutions of ordinary differential equations with initial conditions:

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rules.

Numerical Solution of ODE: Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method of 4^{th} order.

UNIT-IV: Multiple Integrals:

Double integrals in Cartesian & polar coordinates, Change of order of integration, Triple integrals, Change of variables (Cartesian to Polar, Rectangular coordinates to Cylindrical & Rectangular coordinates to Spherical polar coordinate systems). **Applications:** Area enclosed by plane curves, Volume of solids.

UNIT-V: Vector Differentiation & Vector Integration:

Introduction, Scalar and Vector point functions, Del applied to scalar point functions-Gradient, directional derivatives, Del applied to vector point functions-Div& Curl, physical interpretation of div & curl, Del applied twice to point functions, Del applied to products of point functions (Identities without proofs).

Line integral, Green's theorem in the plane (without proof), Surface integrals, Stoke's theorem (without proof), Volume integral, Gauss Divergence theorem (without proof).

Text Books:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014.
2. **B. V. RAMANA,** Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH	IV SEMESTER	ESC	L	T	P	C
			2	0	0	2

20EC4T02 CONTROL SYSTEMS

Pre-requisite: Basic knowledge about linear algebra, Laplace Transformations, differentiation, integration and Matrices

COURSE OBJECTIVES:
The main objectives of this course are given below:

- Learn the fundamental concepts of Control systems and mathematical modelling of the system.
- Study the concepts of transfer functions of the system.
- Understand the basics of time response &stability analysis of the system.
- Understand the basics of Frequency domain analysis of the system.
- Know the Concept of State Variable Models

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Represent the mathematical model of a system.

CO2: Reduce the Block diagram and signal flow graph

CO3: Determine the response of different order systems for various inputs in time domains

CO4: Know the Frequency Response Using Different Graphical Networks

CO5: Decompose the transfer function and Test Controllability and observability of a system.

SYLLABUS

UNIT-I: Introduction to Control Systems

Concept of Control Systems-Classification, Open Loop and closed loop control systems and examples, Effects of feedback- Gain, Sensitivity, Stability, Noise. Mathematical models – Differential equations and transfer functions.

Translational and Rotational mechanical systems

UNIT-II: TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor-Field Controlled, Armature controlled - AC Servo motor-, Block diagram representation of systems -Block diagram algebra – Representation by Signal flow graph - Reduction using mason‘s gain formula. Conversion from Block diagram to signal flow graph

UNIT-III: TIME RESPONSE ANALYSIS&STABILITY ANALYSIS IN S-DOMAIN

Time response of first order systems and second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative and proportional integral systems.

The concept of stability – Routh‘s stability criterion The root locus concept - construction of root locus

UNIT-IV: FREQUENCY RESPONSE ANALYSIS

Bode diagrams-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Plots and Stability Analysis.

Unit-V CLASSICAL CONTROL DESIGN TECHNIQUES

Concepts of state, state variables and state model, derivation of state models from block diagrams, Transfer Function Decomposition, State Transition Matrix and its Properties – Concepts of Controllability and Observability. Test for Controllability and Observability.

TEXT BOOKS:

1. Automatic Control Systems– by B. C. Kuo– John wiley and son‘s. 8th edition, 2003.

2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.2002

REFERENCE BOOKS:

1. Modern Control Engineering – Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd.,3rd ed,.2000

2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers

3. Linear Control systems by Prof.B.S.Manke Khanna Publishers

B.TECH IV SEMESTER **PCC**

L	T	P	C
3	0	0	3

20EC4T03 ANALOG INTEGRATED CIRCUITS APPLICATIONS

Pre-requisite: Basic knowledge about linear algebra, differentiation, and integration

COURSE OBJECTIVES:

The main objectives of this course are given below:

The student will be made

- To learn the working of logic families
- To understand the functioning of different types of Time-base Generators.
- To understand the analysis & design of different types of active filters using op-amps
- To learn the internal structure, operation and applications of different analog ICs
- To Acquire Knowledge of A/D and D/A Converter

COURSE OUTCOMES:

After going through this course the student will be able to

CO1: Understand about Logic Families with Diode-Transistor

CO2: Design different Time base generators.

CO3: Design circuits using operational Amplifier for various applications

CO4: Understand the concept of A/D & D/A Converters

CO5: Analyze and design amplifiers and active filters using Op-amp.

SYLLABUS

UNIT-I: LOGIC FAMILIES

INTRODUCTION: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, AOI Logic and Comparison of Logic Families.

UNIT-II: TIME BASE GENERATORS:

General features of a time base signal, Methods of generating time base waveform- Exponential Sweep Circuits, Negative Resistance Switches, Miller and Bootstrap time base generators.

UNIT-III: OPERATIONAL AMPLIFIER

Classification; IC Chip Size and Circuit Complexity; the Ideal Operational Amplifier; Operational Amplifier Internal Circuit. Op-Amp parameters & Measurement, DC Characteristics, input & output off set voltages & currents, slew rate, CMRR, PSRR, drift, AC Characteristics and Compensation Techniques.

UNIT-IV: OPERATIONAL AMPLIFIER APPLICATIONS

Basic Op-Amp Applications; Inverting and Non-inverting amplifier,. Integrator and differentiator, Difference amplifier, Instrumentation Amplifier; AC Amplifier; V to I & I to V Converters. Op-Amp Circuits using Diodes, Sample and Hold Circuit, Comparator, Regenerative Comparator (Schmitt Trigger).

D-A AND A-D CONVERTERS Introduction; Series Op-Amp Regulator; Basic DAC Techniques Weighted Resistor DAC,R-2R DAC ; AD Converters, Flash ADC and Successive approximation Converter.

Unit-V FILTERS USING OP-AMP & 555 TIMERS

Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters .

Description of Functional Diagram of 555 Timer; Monostable Operation; Astable Operation and its Applications and PLL, Applications PLL. VCO and its applications.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGrawHill,4th Edition,2005

2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.

REFERENCES:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill,Second Edition, 2007.

2. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

B.TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC4T04 ELECTRO MAGNETIC WAVES AND TRANSMISSION LINES

COURSE OBJECTIVES:

The students will be introduced to

- Vector algebra coordinate systems
- Electro statics and magneto statics principles.
- Maxwell Equations in time varying fields.
- Electromagnetic wave and propagation characteristics.
- Transmission lines characteristics and different loading concepts.

COURSEOUTCOMES:

Upon completion of this course students will be able to

CO1: Know the basic principles of electrostatics

CO2: Understand the primary laws in magneto statics and its importance

CO3: Gain knowledge on functionalities of time varying fields

CO4: Determine the parameters in EM Wave propagating conditions

CO5: Derive and determine the conditions and constants in transmission lines

SYLLABUS:

UNITI Electrostatics: Coulomb's Law, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Dielectric Constant, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitances, Problems.

UNIT-II Magneto Statics: Biot- Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances, Problems.

UNIT III: Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms, Boundary Conditions, Problems.

UNITIV:EM Wave Characteristics: Wave Equations, Uniform Plane Waves – Relations between E & H. Wave Propagation in Lossless and Conducting Media, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, Brewster Angle, Critical Angle and Poynting Theorem, Problems.

UNIT V: Transmission Lines: - Transmission Line Equations, Primary & Secondary Constants, Phase and Group Velocities, Condition for Distortion less and Minimum Attenuation, Loading-Types of Loading. Reflection Coefficient, VSWR. $\lambda/4$, $\lambda/2$,$\lambda/8$LinesSmithChart, Stub Matching, Problems.

TEXTBOOKS:

1. Elements of Electromagnetic–Matthew N.O. Sadiku, Oxford Univ. Press, 3rdEdition, 2001.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G.Balmain, PHI,2nd Edition,2000.

REFERENCES:

1. Electromagnetic Fields and Wave Theory G.S.N. Raju, Pearson Education, 2006.
2. Engineering Electromagnetics– Nathan Ida, Springer (India)Pvt. Ltd., New Delhi, 2nd Edition,2005.

B.TECH IV SEMESTER	**HSMC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC4T05 **MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product

CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs

CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units

CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis

CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

SYLLABUS

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function-Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.

2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition

3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.

4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd

5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd

6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

B.TECH IV SEMESTER **PCC**

L	T	P	C
3	0	0	3

20EC4T06 ANALOG AND DIGITAL COMMUNICATIONS

Course Objectives: Students undergoing this course, are expected to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Distinguish the figure of merits of various analog modulation methods
4. Familiarize with the fundamentals of digital communication systems
5. Familiarize with various techniques for digital modulation and demodulation of signals

Course Outcomes: After undergoing the course, students will be able to

CO1: Differentiate various Analog modulation schemes

CO2: Analyze demodulation schemes and their spectral characteristics

CO3: Analyze noise characteristics of various analog modulation methods

CO4: Differentiate various Digital modulation schemes

CO5: Analyze demodulation schemes and their spectral characteristics

UNIT I: AMPLITUDE MODULATION

Introduction to communication system, need for modulation, , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Detection of AM Waves;, Envelope detector, SNR Calculations of AM waves.

UNIT II: DSB & SSB MODULATION

DSB SC (Double side band suppressed carrier) modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Coherent detection of DSB-SC Modulated waves, SNR Calculations of DSB SC.

SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves. SNR of SSB.

UNIT III: ANGLE MODULATION

Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, zero crossing detector, Phase locked loop, SNR Calculations.

UNIT IV: PULSE DIGITAL MODULATION

Elements of digital communication systems, advantages of digital communication systems, Elements of PCM, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT V: DIGITAL MODULATION TECHNIQUES

Introduction, ASK, FSK, PSK, DPSK, QPSK Transmitter and receivers Probability of error calculations.

TEXT BOOKS:

1. Principles of Communication Systems – H Taub& D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

REFERENCES:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed.,.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.

B.TECH IV SEMESTER	PCC	L	T	P	C
		0	0	2	1

20EC4L07 ANALOG INTEGRATED CIRCUITS LAB

Course Outcomes

After going through this course the student will be able to

CO1: Understand about Logic Families with Diode-Transistor

CO2: Design different Time base generators.

CO3: Design circuits using operational Amplifier for various applications

CO4: Analyze and design amplifiers and active filters using Op-amp.

CO5: Understand the concept of A/D & D/A Converters

LIST OF EXPERIMENTS
(Minimum Twelve Experiments to be conducted)

1. Study of Logic families using Diodes and Transistors.
2. Bootstrap sweep circuit.
3. Active Filter Applications – LPF, HPF (first order)
4. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
5. Study of Basic Op-Amp Circuits: Design and verification of inverting amplifier, non-inverting amplifier, voltage follower,
6. Study of Integrator and differentiator circuits using IC741.
7. Op-Amp Schmitt Trigger: Design, testing, and display of waveforms.
8. Op-Amp RC Phase-Shift Oscillator: Design and test the performance for the given frequency.
9. Op-Amp Wein Bridge Oscillator: Design and test the performance for the given frequency.
10. Study of 555 Timer: Design and test the performance of Monostable multivibrator circuit for a given pulse width.
11. Study of 555 Timer: Design and test the performance of Astable multivibrator circuit for a given frequency.
12. Study of Voltage Regulator: Design and study of IC7805 voltage regulator, calculation of line and load regulation.
13. A/D Converter

Equipment required for Laboratory:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 MHz.
3. Function Generators - 0 – 1 MHz
4. Components
5. MultiMeters
6. IC Trainer Kits(Optional)
7. BreadBoards
8. Components: - IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 and other essential components.
9. Analog ICTester

B.TECH IV SEMESTER **PCC**

L	T	P	C
0	0	3	1.5

20EC4L08 ANALOG AND DIGITAL COMMUNICATIONS LAB

LIST OF EXPERIMENTS

All the experiments should be performed in Hardware and software (MATLAB)

1. Amplitude modulation (AM)- Modulation and demodulation
2. DSB-SC Modulation and demodulation
3. SSB-SC Modulation and demodulation
4. Frequency Modulation and demodulation
5. PCM Modulation and demodulation
6. DPCM Modulation and demodulation
7. DM Modulation and demodulation
8. ASK Modulation and demodulation
9. FSK Modulation and demodulation
10. PSK Modulation and demodulation
11. Sampling theorem
12. Time division Multiplexing

Equipment required for Laboratories:

1. RPS – 0 – 30 V
2. CRO – 0 – 20 M Hz.
3. Function Generators – 0 – 1 M Hz
4. RF Generators – 0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for analog and Digital Communication
7. Components

B.TECH IV SEMESTER **SC**

L	T	P	C
0	0	4	2

20EC4S09: **PYTHON PROGRAMMING (Skill Oriented Course)**

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to:

CO1: Structure simple Python programs for solving problems.
CO2: Decompose a Python program into functions.
CO3: Represent compound data using Python lists, tuples, and dictionaries.
CO4: Read and write data from/to files in Python Programs.
CO5: To build software for real needs.

Concepts to be covered:

- Introduction: Variables, Assignment, Keywords, Comments, Input-Output, Indentation
- Types, Operators and Expressions: Data types, Operators, Control flow statements
- Data Structures: Lists, Tuples, Sets, Dictionary, Sequences, Comprehensions
- Functions: Types of Arguments, Anonymous, Fruitful and Lambda Functions.
- Python Packages: Installation and Importing packages, Brief tour of packages like System, math, random, date and time, Numpy, Matplotlib, Multi-threading, scikit-learn and Internet Access.
- Object Oriented Programming Concepts in Python.
- Exception handling in python

Lab Exercises:

1. Write a program to perform various list of operations(eg: Arithmetic, logical, bitwise etc) in python.

2. Write a program to implement control flow statements. 3. Write a programs implementing various predefined function of Lists, Sets, Tuples and Dictionaries.

4. Write a program covering various arguments for a function.

5. Write a program to implement various types of functions.

6. Write a program to implement recursion.

7. Write a program to implement command line arguments.

8. Write a program to create a class and its constructors.

9. Write a program to implement inheritance.

10. Write a program for exception handling.

11. Write a program to perform various linear algebra operations like finding eigen vales and vectors, determinant for a matrix.

12. Write a program to read a file.

13. Write a program to use System,math etc packages.

14. Write a program for visualizing the data using matplotlib package.

15. Write a program to access data from the web and validate it.

16. Write a program to demonstrate multi- threading.

TEXT BOOKS

1. Learning Python, Mark Lutz, Orielly

2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

3. John V Guttag, ―Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press , 2013.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press

2. Core Python Programming, W.Chun, Pearson.

3. Introduction to Python, Kenneth A. Lambert, Cengage

4. “Python in easy steps In Easy Steps”, Mike MC Grath, illustrated edition, In easy steps 2013 publishers.

B.TECH IV SEMESTER

	L	T	P	C
MC	2	0	0	-

20EC4M10 CONSTITUTION OF INDIA

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand historical background of the constitution making, importance for building a democratic India, features and principles of Indian Constitution.

CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO3: Understand the roles and powers of State Government and its Administration and value of the fundamental rights and duties for becoming good citizen of India.

CO4: Understand and analyze the decentralization of power between Union, State and Local self-Government and local administration.

CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission, UPSC, Welfare commissions for sustaining democracy.

SYLLABUS

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution -Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, CentreState relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, Rajya Sabha, The Supreme Court and High Court: Powers
and Functions;

UNIT III

State Government and its Administration Governor, Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV

A.Local Administration, District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy(Different departments), Village level, Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V

Election Commission: Election Commission, Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.

2) Subash Kashyap, Indian Constitution, National Book Trust

3) J.A. Siwach, Dynamics of Indian Government & Politics

4) D.C. Gupta, Indian Government and Politics

5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

6) J.C. Johari, Indian Government and Politics Hans

7) J. Raj Indian Government and Politics

8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-sources:

1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

B. TECH V SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC5T01 MICROPROCESSORS AND MICROCONTROLLERS

Course Objectives:

At the end of the course, student will be able to

1. To understand the basics of 8086 microprocessors architectures and its functionalities.
2. To develop machine language programming in microprocessors.
3. To design and develop Microprocessor based interfacing for real time applications using low level language like ALP.
4. To understand the basics of microcontrollers architectures and its functionalities.
5. To design and develop microcontroller based interfacing for real time applications using low level language like ALP.

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the overview of 8086 microprocessor in general.
CO2: Understand the Assembly Language Programming in microprocessors.
CO3: Understand Interfacing I/O devices through PPI with microprocessor.
CO4: Understand the overview of microcontroller in general & ALP in microcontrollers.
CO5: Understand the microcontroller interfacing with I/O devices using ALP.

SYLLABUS

UNIT-I: MICROPROCESSOR ARCHITECTURE

Introduction to 8085,Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architectures, bus interfacing unit, execution unit, 8086 system timing, minimum mode and maximum mode configuration.

UNIT-II: PROGRAMMING

Addressing modes, instruction set, assembler & directives, writing simple programs with an assembler, assembly language programs

UNIT-III: INTERFACING

I/O INTERFACE: 8255 PPI, Various Modes of Operation and Interfacing to 8086, D/A and A/D Converter, Stepper motor, keyboard interfacing, 7-segment display, Interfacing of DMA controller 8257, Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine, 8251 USART Architecture and Interfacing.

UNIT-IV: INTRODUCTION TO MICROCONTROLLERS

Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051, Simple Programs

UNIT-V: REAL TIME CONTROL

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters, Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters.

TEXT BOOKS:

1. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition.
2. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J. Ayala, Dhananjay V. Gadre, Cengage Learninbg , India Edition.
3. Advanced Microprocessors and Peripherals KM Bhurchandi, AK Ray (3rd Edition)

REFERENCE BOOKS:

1. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B. Brey, Pearson, Eighth Edition
2. Microprocessors and Microcontrollers by N. Senthil Kumar, M. Saravanan and S. Jeevananthan, Oxford University Press, Seventh Impression.

B. TECH V SEMESTER	PCC	L	T	P	C
		3	0	0	3

20EC5T02 ANTENNAS AND WAVE PROPAGATION

Course Overview:

It gives comprehensive study of basic antenna fundamentals, types of antennas, radiation pattern, main lobes and side lobes. Student will come to know how the different antennas work, student also gain knowledge in microwave antennas, antenna arrays. Wave propagation concepts, frequency range, transmission losses, calculations, space wave propagation, and troposphere wave propagation.

Prerequisite(s): Electromagnetic waves and Transmission Lines.

Course Objectives:
The main objectives of this course are given below:

1. To understand the basic terminology and concepts of Antennas.
2. To attain knowledge on the basic parameters those are considered in the antenna design process and the analysis while designing that.
3. Analyze the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis.
4. To have knowledge on antenna operation and types as well their usage in real time field.
5. Aware of the wave spectrum and respective band-based antenna usage and also to know the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure.

Course Outcomes:

At the end of this course the student will able to:

CO1: Identify basic antenna parameters.
CO2: Design and analyze wire antennas, loop antennas
CO3: Design and analyze antenna arrays
CO4: Analyze antenna measurements to assess antenna’s performance
CO5: Identify the characteristics of radio wave propagation

SYLLABUS

UNIT-I: ANTENNA BASICS

Introduction, Functions of Antenna, Basic Antenna Elements, Sources of Radiation and Radiation Mechanism, Single Wire and Two Wire Antenna, Dipole Antenna, Basic antenna parameters- Radiation pattern, Beam Area, Radiation Intensity, Directivity Gain, Directivity, Resolution, Power Gain, Radiation Efficiency, Front to Back Ratio, Antenna Beam Width, Beam Efficiency, Antenna Bandwidth, Effective height, Antenna Apertures, Friis transmission formula, Fields from oscillating dipole, Field Zones of Antenna, Antenna Polarization, Antenna temperature, basic Maxwell's equations, retarded Potential- Helmholtz Theorem, Illustrative problems.

UNIT-II: THIN LINEAR WIRE ANTENNAS

Small Electric Dipole, Quarter wave Monopole and Half Wave Dipole, Long wire antennas, V-antennas, Inverted V-Antenna, Rhombic Antennas, Small Loop antennas, Helical Antennas, Design Relations. Illustrative problems.

UNIT-III: ANTENNA ARRAYS

Introduction, Types of Antenna Arrays, Two element array- Two Point Sources with equal magnitude and phase, Two Point Sources with equal magnitude and opposite phase, Two Point Sources with unequal magnitude and opposite phase, N element Uniform Linear Arrays - Broadside, End fire Arrays, End Fire Array (EFA) with Increased directivity, Principle of Pattern Multiplication, Binomial Arrays, Concept of Phased arrays.

UNIT-IV: VHF & UHF MICROWAVE ANTENNAS

Frequency range of Microwave Antennas, Yagi Uda Antenna, Flat Sheet Reflectors, Corner Reflectors, Parabolic Reflectors – Working principle, F/D ratio, Spill over, Cassegrain Feed Systems, Horn Antenna-Types of Horn Antenna, Design Equations, Lens Antenna-Types, Feed Systems, Zoning of Lens, E-Plane and H-Plane Metal Plate Lens Antenna.

UNIT-V: WAVE PROPAGATION

Overview of propagation effects, Flat and Spherical Earth Considerations, Ground Wave propagation, Sky Wave Propagation Formation of Ionospheric Layers and their characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF & Skip Distance, Virtual Height, Space Wave Propagation, Duct Propagation, Tropospheric Scattering, Fading and Multipath.

TEXT BOOKS:

1. E. C. Jordan and K. G. Balmain, ―Electromagnetic Waves and Radiating Systems‖, PHI, 2nd edition, 2000.
2. John D. Kraus and Ronald J. Marhefka, ―Antennas and Wave propagation‖ TMH, 4th Edition, 2010

REFERENCES BOOKS:

1. G.S.N Raju, ―Antennas and Wave Propagation‖, 1st Edn Pearson Education, 2004.
2. C.A. Balanis, ―Antenna Theory Analysis and Design‖, 4th Edn., John Wiley & Sons, 2016.

B. TECH V SEMESTER	PCC	L	T	P	C
		3	0	0	3

20EC5T03 DIGITAL SYSTEM DESIGN USING VHDL & VERILOG

Course Overview:

It gives comprehensive study of basic antenna fundamentals, types of antennas, radiation pattern, main lobes and side lobes. Student will come to know how the different antennas work, student also gain knowledge in microwave antennas, antenna arrays. Wave propagation concepts, frequency range, transmission losses, calculations, space wave propagation, and troposphere wave propagation.

Prerequisite(s): Electromagnetic waves and Transmission Lines.

Course Objectives:

At the end of the course, student will be able to

1. In this course, students can study Integrated circuits for all digital operational designs like adder, Subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM.
2. Design and to develop the internal circuits for different digital operations and simulate them using hardware languages using integrated circuits.
3. Understand the concepts of Latches and Flip-Flops and Design of Counters using Digital ICs, modelling of sequential logic integrated circuits using VHDL.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand the concepts of Design Flow and Programming Statements

CO2: Understand the concepts of Combinational logic circuits & sequential logic circuits in digital system

CO3: Understand The Concepts of Verilog & Language Constructs And Conventions

CO4: Understand The Concepts of Gate Level Modelling & Data Flow modelling

CO5: understand the concepts of behavioral modelling

SYLLABUS

UNIT-I: Introduction to VHDL

Design flow, program structure, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Objects and Classes, Subprograms, Entity Declaration, Architecture Body, Structural Style of Modelling , Dataflow Style of Modelling , Behavioural Style of Modelling ,. Configuration Declaration , Comparison of VHDL and Verilog HDL

UNIT-II: Combinational Logic Design and Sequential Logic Design

Combinational Logic Design

Adders & Subtractor, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Simple Floating-Point Encoder.

Sequential Logic Design

Flip-Flops, Asynchronous Counters-2 bit,3 bit,4 bit, Synchronous Counters-2 bit,3 bit,4 bit, Ring Counter, Johnson Counter, Modulus N Asynchronous Counters, Modulus N Synchronous Counters, Shift Registers, Bi-directional shift register, Universal Shift Register

UNIT-III: INTRODUCTION TO VERILOG & LANGUAGE CONSTRUCTS AND CONVENTIONS

INTRODUCTION TO VERILOG

Verilog as HDL, Levels of design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Module, Simulation and Synthesis Tools, Test Benches.

LANGUAGE CONSTRUCTS AND CONVENTIONS: Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators

UNIT-IV: GATE LEVEL MODELING & MODELING AT DATA FLOW LEVEL

GATE LEVEL MODELING AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Design of Flip-flops with Gate Primitives, Delays, Strengths and Contention Resolution, Net Types, Design of Basic Circuits.

MODELING AT DATA FLOW LEVEL Introduction, Continuous assignment structures, Delays and continuous, Assignments, Assignment to vectors, Operators

UNIT-V: BEHAVIORAL MODELING

BEHAVIORAL MODELING Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Examples, Assignments with Delays, Wait construct, Multiple Always Blocks, Blocking and Non-blocking Assignments, The case statement, i*f* and i*f* -else constructs, Assign-de-assign construct, repeat construct, for loop , The disable construct, while loop, forever loop, Parallel blocks, Force-release, construct, Event.

TEXT BOOKS:

1. Digital Design Principles & Practices – John F.Wakerly, PHI/ Pearson Education Asia, 3rd Edition, 2005.

2. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, IEEE Press, 2004.

REFERENCES:

1. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition, 2004

2. Advanced Digital Design with Verilog HDL – Michael D. Ciletti, PHI, 2005.

B. TECH V SEMESTER	PEC	L	T	P	C
		3	0	0	3

20EC5T07 COMPUTER ARCHITECTURE & ORGANIZATION (PROFESSIONAL ELECTIVE-I)

Course Objectives:

At the end of the course, student will be able to

1. Understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system
2. In addition to this the memory management system of computer.

Course Outcomes:

At the end of this course the student will able to:

CO1: Know the Basic Structure of computers

CO2: Know the Register Transfer Language And Micro operations

CO3: Understanding of how a computer performs arithmetic operation of positive and negative numbers

CO4: Understand how computer stores positive and negative numbers.

CO5: calculate the effective address of an operand by addressing modes

SYLLABUS

UNIT-I: BASIC STRUCTURE OF COMPUTERS

The history of Computer development, Computer Types, Functional units, Basic operational concepts, Bus structures, System Software, Performance, Data types, Complements, Data Representation. Fixed Point Representation. Decimal Arithmetic operations Floating – Point Representation.

UNIT-II: REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS:

Register Transfer language. Register Transfer, Bus and memory transfer, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes. Computer Registers Computer instructions –Instruction cycle. Memory – Reference Instructions. Input – Output and Interrupt.

UNIT-III: CENTRAL PROCESSING UNIT &MICRO PROGRAMMED CONTROL

CENTRAL PROCESSING UNIT: Stack Organization. Instruction formats. Addressing modes. Data Transfer and manipulation. Program control.

MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, micro program example, Design of control unit-Hard wired control. Micro programmed control

UNIT-IV: THE MEMORY SYSTEM:

Memory Hierarchy, Main Memory- RAM, ROM, PROM, EPROM, EEPROM , Flash Memory, Associative memory, Cache Memories: Mapping Functions, Virtual memory, Auxiliary memory, Secondary Storage: Magnetic Hard Discs, Optical Disks, Memory management hardware.

UNIT-V: INPUT-OUTPUT ORGANIZATION

Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB).

TEXT BOOKS

1. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson, 2006.
2. 2. Computer Architecture and Organization – John P. Hayes, Mc Graw Hill International editions, 1998.

REFERENCE BOOKS

1. Computer Organization and Architecture – William Stallings 7th Edition, PHI/Pearson, 2006.
2. 2. Computer Organization – Car Hamacher, ZvonksVranesic, SafwatZaky, 5th Edition, McGraw Hill, 2002

B. TECH V SEMESTER

PEC	L	T	P	C
	3	0	0	3

TELEMATICS
20EC5T08 (PROFESSIONAL ELECTIVE-I)

Course Objectives:

At the end of the course, student will be able to

1. To introduce the concepts of Frequency and Time division multiplexing.
2. to introduce digital multiplexing and digital hierarchy namely SONET / SDH
3. to introduce the concepts of space switching, time switching and combination switching,
4. To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in subscriber loop.
5. To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.

Course Outcomes:

At the end of the course, student will be able to

CO1: To learn about the various switching systems

CO2: To learn in detail about time division switching.

CO3: To know about traffic management.

CO4: To understand about various signaling in tele communication systems

CO5: To analyze various telecommunication networks

SYLLABUS

UNIT-I: SWITCHING SYSTEMS

Introduction-Message switching-Circuit switching-Manual switching-Functions of switching system- Strowger step by step system-Register translator-Senders-Distribution frames-Cross bar systems-General trunking-Electronic switching-Reed electronic systems-Digital switching systems.

UNIT-II: TIME DIVISION SWITCHING

Introduction-Space and time switching-Time division switching networks-grades of services Time division switching networks-non blocking networks-synchronization

UNIT-III: TELECOMMUNICATION TRAFFIC

Introduction-Unit of traffic-Congestion-Traffic measurement-A mathematical model-Local call systems-Queuing systems.

UNIT-IV: TELECOMMUNICATION SIGNALLING

Introduction-Customer line signaling- Audio frequency junction and trunk circuits-FDM carrier systems-PCM signaling- Inter register signaling- Common channel signaling principles-CCITT signaling, CCITT signaling, Digital customer line signaling.

UNIT-V: TELECOMMUNICATION NETWORKS

Introduction-Analog networks-Integrated digital networks-Integrated service digital networks Cellular radio networks-Intelligent networks-Private networks-numbering-charging-Routing Network management.

TEXTBOOKS:

1. Bellamy John, “Digital Telephony”, John Wily & Sons, Inc. 3rd edn. 2000.
2. J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education

REFERENCES

1. Viswanathan. T., “Telecommunication Switching System and Networks”, Prentice Hall of India Ltd., 1994.

2. Joseph Y. Hui/Switching and Traffic Theory for Integrated Broad Band Networks/Kleewer Academic publishers, 1990

B. TECH V SEMESTER

PEC	L	T	P	C
	3	0	0	3

20EC5T09 CELLULAR AND MOBILE COMMUNICATIONS
(PROFESSIONAL ELECTIVE-I)

Course Objectives:

At the end of the course, student will be able to

1. Students should familiarize with different cellular systems
2. Channel allocations with bandwidth utilizations
3. Signal traffic in cellular systems
4. Frequency management.
5. Handoffs

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc., and various cellular systems.

CO2: Understand the different types of interference s influencing cellular and mobile communications.

CO3: Understand the frequency management, channel assignment and various propagation effects in cellular environment.

CO4: Understand the different types antennas used at cell site and mobile.

CO5: Understand the concepts of handoff and types of handoffs.

SYLLABUS

UNIT-I: CELLULAR SYSTEMS

Limitations of Conventional System, Basic Cellular Mobile System, First, second, third and fourth Generation cellular wireless systems, operation of Cellular System, Fundamentals of cellular Radio System Design: concept of frequency reuse channels, Co-channel Interference, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system

UNIT-II: CO-CHANNEL & NON CO-CHANNEL INTERFERENCE

Measurement of Real Time Co-Channel Interference, design of Antenna system, cell-splitting Non-co channel interference-adjacent channel interference, Near End far end interference

UNIT-III: CELL COVERAGE FOR SIGNAL AND TRAFFIC

Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, foliage loss, and general formula for mobile propagation over water and flat open area, near and long distance propagation.

UNIT-IV: CELL SITE AND MOBILE ANTENNAS

Space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, mobile Antennas. Frequency Management And Channel Assignment: Numbering and grouping, setup access and paging channels ,channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells

UNIT-V: HANDOFFS

Handoff Initiation, types of handoff, delaying handoff, advantages of Handoff, power difference handoff, forced handoff, mobile assisted and soft handoff. Intersystem handoff

TEXTBOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.

REFERENCES:

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2ndEdition, 2001.
2. Modern Wireless Communication –Simon Haykin Michael Moher, PersonsEduction,2005

B. TECH V SEMESTER	L	T	P	C
	0	0	3	1.5

20EC5L10 MICROPROCESSORS AND MICROCONTROLLERS LAB

Course Objectives:

At the end of the course, student will be able to

1. To develop and execute variety of assembly language programs of Intel 8086 including arithmetic and logical, sorting, searching, and string manipulation operations.
2. To develop and execute the assembly language programs for interfacing Intel 8086 with peripheral devices.
3. To develop and execute simple programs on 8051 micro controller.

Course Outcomes:

At the end of this course the student will able to:

CO1: Design and implement programs on 8086 microprocessor.

CO2: Design interfacing circuits with 8086

CO3: Design and implement 8051 microcontroller based systems

CO4: Understand the concepts related to I/O and memory interfacing

SYLLABUS

PART- A (Minimum of 5 Experiments has to be performed)
8086 Assembly Language Programming using Assembler Directives

1. Sorting.
2. Multibyte addition/subtraction
3. Sum of squares/cubes of a given n-numbers
4. Addition of n-BCD numbers
5. Factorial of given n-numbers
6. Multiplication and Division operations
7. Stack operations
8. BCD to Seven segment display codes

PART- B (Minimum of 3 Experiments has to be performed) 8086 Interfacing

1. Hardware/Software Interrupt Application
2. A/D Interface through Intel 8255
3. D/A Interface through Intel 8255

4. Keyboard and Display Interface through Intel 8279
5. Generation of waveforms using Intel 8253/8254

PART- C: (Minimum of 3 Experiments has to be performed) 8051 Assembly Language Programs

1. Finding number of 1‘s and number of 0‘s in a given 8-bit number
2. Addition of even numbers from a given array
3. Ascending / Descending order
4. Average of n-numbers

PART- D: (Minimum of 2 Experiments has to be performed) 8051 Interfacing

1. Switches and LEDs
2. 7-Segment display (multiplexed)
3. Stepper Motor Interface
4. Traffic Light Controller

B. TECH V SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20EC5L11 DIGITAL SYSTEM DESIGN USING VHDL & VERILOG LAB

The students are required to design and draw the internal structure of the following Digital Integrated Circuits and to develop VHDL& Verilog source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer. Further, it is required to verify the logic with necessary hardware.

Course Outcomes:
At the end of the course the student will be able to
CO1: Understand the concepts of Design Flow and Programming Statements

CO2: Understand the concepts of Combinational logic circuits in digital system

CO3: Understand the concepts of sequential logic circuits in digital system

CO4: Understand the concepts of Programmable logic devices & memories.

CO5: Understand the concepts of HDL modelling and logic families

LIST OF EXPERIMENTS:

1. Realization of Logic Gates
2. 3 to 8 Decoder
3. 8*1 Multiplexer and 2*1 De-multiplexer
4. 4-Bit Comparator.
5. D Flip-Flop
6. Decade Counter
7. 4 Bit Counter
8. Shift Register
9. Universal shift register
10. Ram (16*4) (read and write operations)
11. ALU

Equipment Required:

1. Xilinix ISE software-latest version
2. Personal computer with necessary pheripherals
3. Hardware kits- Various FPGA families.

B.TECH V SEMESTER	**SC**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

20EC5S12 JAVA PROGRAMMING
(Skill Oriented Course)

Course Objectives:

- Understand fundamentals of Object-Oriented Programming in java including defining classes, invoking methods using class libraries etc.,
- Demonstrate an understanding of graphical user interfaces, multi-threaded programming and event driven programming.

Course Outcomes: By the end of the course student will be able to

1. Implement java applications using OOP principles and proper program structuring.
2. Develop java programs using packages, inheritance and interfaces.
3. Implement error and exception handling techniques.
4. Design event driven GUI and real-time web related applications.

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3 (Class, Objects)

Implement java programs using the concept of

a) Class mechanism. Create a class, methods and invoke them inside main method.

b) Constructor.

c) Constructor overloading.

b) Method overloading.

Exercise -4 (Inheritance)

Implement java programs using the concept of

a) Single Inheritance

b) Multilevel Inheritance

c) Abstract class

Exercise - 5 (Inheritance - Continued)

Implement java programs using the concept of

a)"super" keyword. b) Interfaces

Exercise – 6 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

Exercise – 7 (Exception)

Implement the programs by using the concepts of

a. Exception handling mechanism

b. Multiple catch clauses

c. Finally

d. Creating user defined exceptions

Exercise – 8 (Threads)

a) Write a JAVA program that creates threads by extending Thread class. First thread displays "Good Morning" every 1 sec, the second thread displays "Hello" every 2 seconds and the third display "Welcome" every 3 seconds,(Repeat the same by implementing Runnable)

b) Write a program illustrating isAlive and join ()

c) Write a Program illustrating Daemon Threads.

Exercise – 9 (Packages)

a) Create a user defined package and demonstrate different ways of importing packages

Exercise - 10 (Applet)

a) Write a JAVA program to paint like paint brush in applet.

b) Write a JAVA program to create different shapes and fill colors using Applet.

B. TECH V SEMESTER		L	T	P	C
	MC	2	-	-	-

20EC5M13 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing.
- Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Understand the significance of Indian Traditional Knowledge
CO2: Classify the Indian Traditional Knowledge
CO3: Compare Modern Science with Indian Traditional Knowledge system.
CO4: Analyze the role of Government in protecting the Traditional Knowledge
CO5: Understand the impact of Philosophical tradition on Indian Knowledge System.

SYLLABUS

Unit I
Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in Global Economy.

Unit II
Basic structure of Indian Knowledge System: Astadash Vidya- 4 Ved - 4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi),6vedanga (Shisha, Kalppa, Nirukha,Vykaran, Jyothisha & Chand),4upanga (Dharmashastra, Meemamsa, purana & Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System: Indigenous Knowledge, Characteristics-Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge -Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain &Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, Nruthya Yevam Sahithya.

Text Books

1. Traditional Knowledge System in India, by AmitJha, 2009.

2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.

References

1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, BharatiyaVidya

2. Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan

3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.

4. Pramod Chandra, India Arts, Howard Univ. Press, 1983.

5. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html

2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf

3.https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_tex t.pdf

B. TECH VI SEMESTER	PCC	L	T	P	C
		3	0	0	3

20EC6T01 VLSI DESIGN

Course Objectives:

At the end of the course, student will be able to

1. To learn basic MOS and CMOS Fabrication principles and Basic Electrical Properties of MOS and CMOS circuits
2. To Implement CMOS logic circuits.
3. To learn Scaling and Circuit Concepts of CMOS logic circuits.
4. To Design Combinational and Sequential logic circuits
5. To learn the concepts implementation techniques

Course Outcomes:
At the end of this course the student will able to:

CO1: Understand the insights of the MOS devices and its characteristics.

CO2: Implement the CMOS logic circuits

CO3: Analyze Scaling and Circuit Concepts of CMOS logic circuits.

CO4: Implement the CMOS combinational logic and sequential circuits.

CO5: Perform implementation techniques

SYLLABUS

UNIT-I: Introduction to MOS Devices

Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS,MOS transistor action, BICMOS technology. Comparison between CMOS and bipolar technologies.

Basic Electrical Properties of MOS Circuits: Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit.

UNIT-II: CMOS Logic Circuits

CMOS Logic Circuits: Implementation of logic circuits using nMOS and CMOS, Pass transistor and transmission gates,various pullups

UNIT-III: MOS CIRCUITS

Scaling of MOS Circuits: Scaling models, Scaling factors for device parameters, Limitations of scaling.

Basic Circuit Concepts: Sheet Resistance Rs and its concepts to MOS, Area Capacitance calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out.

UNIT-IV: COMBINATIONAL LOGIC CIRCUITS & SEQUENTIAL LOGIC CIRCUITS

Combinational Logic Circuits: Pass transistor Logic, Transmission gates, combinational circuits design using pass transistors, combinational circuits design using transmission gates.

Sequential Logic circuits: latches and Registers, Static latches and Registers, Bistability principle, Multiplexer based latches, Static latches –D,SR,JK,T latches, Master-slave edge triggered register, Dynamic latches- D,SR,JK,T latche

UNIT-V: IMPLEMENTATION STRATEGIES

Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems – Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGrawHill Education, 2003.

REFERENCE BOOKS

1. M. J. S. Smith, ‘Application Specific Integrated Circuits’, Addison Wesley, 1997.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.

B. TECH VI SEMESTER

		L	T	P	C
	PCC	3	0	0	3

20EC6T02 DIGITAL SIGNAL PROCESSING

Pre-requisite: Basic knowledge about transformations, differentiation and integration

COURSE OBJECTIVES:

The main objectives of this course are given below:

1. Analyze the Discrete Time Signals and Systems
2. Know the importance of FFT algorithm for computation of Discrete Fourier Transform
3. Understand the various implementations of digital filter structures
4. Learn the FIR and IIR Filter design procedures
5. Know the need of Multirate Processing

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Apply the difference equations concept in the analyzation of Discrete time systems

CO2: Use the FFT algorithm for solving the DFT of a given signal

CO3: Design a Digital filter (FIR&IIR) from the given specifications

CO4: Realize the FIR and IIR structures from the designed digital filter

CO5: Use the Multirate processing concepts in various applications

SYLLABUS

UNIT-I: INTRODUCTION

Introduction to Digital Signal Processing: Discrete time sequences, Classification of Discrete time signals and systems, Review of Z-transforms, solution of difference equations using Z-transforms

UNIT-II: DISCRETE FOURIER SERIES & FOURIER TRANSFORMS

Introduction of discrete Fourier series and representation of periodic sequences. Discrete Fourier transforms &it's Properties.

Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms for DFT calculation.

UNIT-III: DESIGN OF IIR DIGITAL FILTERS& REALIZATIONS

Basic structures of IIR systems-Direct form 1,Direct form 2 and cascade structures, Analog to Digital frequency transformation techniques, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters.

UNIT-IV: DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS

Basic structures of FIR systems- Direct form, cascade structures, Characteristics of FIR Digital Filters, Design of FIR Digital Filters using Window Techniques- Rectangular and Hamming windows, Frequency Sampling technique, and Comparison of IIR & FIR filters.

UNIT-V: MULTIRATE DIGITAL SIGNAL PROCESSING

Introduction, Decimation, Interpolation, Applications – Sub-band Coding of Speech Signals, Implementation of Digital Filter Banks, Trans-multiplexers.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, DimitrisG.Manolakis,Pearson Education / PHI, 2007.

2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI,2008

REFERENCE BOOKS:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill, 2006
2. Digital Signal Processing: MH Hayes, Schaum‘s Outlines, TATA Mc-Graw Hill, 2007.

B. TECH VI SEMESTER

PCC	L	T	P	C
	3	0	0	3

20EC6T03 MICROWAVE ENGINEERING

Pre-requisite: Basic knowledge about transformations, differentiation and integration

Course Overview:

To adopt microwave technology in diverse applications as radio astronomy, long distance communication, space navigation, radar systems, medical equipment and missile electronic systems. Because microwave communication system handles a large fraction of the world‘s international and other long-haul telephone, data and television transmissions. To use microwave technology in wireless communication system such as Direct Broadcast Satellites (DBS) television, personal communication system (PCS), Wireless Local Area Networks (WLAN‘s), Cellular Video (CV) Systems, and global positioning Satellite (GPS) Systems operate in the frequency of range (1.5 GHZ to 94 GHZ). Thus, really heavily on microwave technology.

Prerequisite(s): Electromagnetic waves and Transmission Lines, Antenna and wave Propagation.

Course Objectives:
The main objectives of this course are given below:

1. Understand Fundamental Characteristics of rectangular Waveguides through Electromagnetic Field Analysis.
2. Understand Fundamental Characteristics of Circular Waveguides through Electromagnetic Field Analysis, microstrip and cavity resonators
3. Understand the various components of microwaves and the Basic Properties of Polarization and Ferrite Materials Composition in the Case of Waveguide Components.
4. Understand the concept of generating high microwave powers using microwave tubes
5. Understand the basics of microwave power generation using Gunn diodes, etc and Familiarize in Building a Microwave Test Bench Setup for Measurements.

Course Outcomes:
At the end of this course the student will able to:

CO1: Gain Knowledge of Transmission Lines and Waveguide Structures and How They Are Used as Elements in Impedance Matching and Filter Circuits.

CO2: Gain Knowledge of microstrip lines and cavity resonators

CO3: Apply Analysis Methods to Determine Circuit Properties of Passive or Active Microwave Devices.

CO4: Gain Knowledge and Understanding of Microwave Analysis Methods. Distinguish Between M-Type and O-Type Tubes

CO5: Gain knowledge in Gunn diodes with avalanche effects and Analyse and Measure Various Microwave Parameters Using a Microwave Test Bench

SYLLABUS

UNIT-I: RECTANGULAR WAVEGUIDES

Introduction to microwave communication, microwave spectrum and bands, Applications of Microwaves, **Rectangular wave guide**: Field Components, Transverse Electric (TE mode), Transverse Magnetic (TM mode), Transverse Electro Magnetic (TEM mode), Cut-off Frequency, Dominant mode, Filter characteristics, Phase Velocity, Group Velocity, Guide Wavelength, Relationship Between Phase and Group Velocities, Wave Impedances, Power Losses in a rectangular Waveguide.

UNIT-II: CIRCULAR WAVEGUIDES & MICROSTRIP LINES

Circular waveguides: Field Components, Transverse Electric (TE mode), Transverse Magnetic (TM mode), Transverse Electro Magnetic (TEM mode), Cut-off Frequency, Dominant mode. Micro strip transmission line (TL), Zo Relations of Micro stirp Line, Effective Dielectric Constants, Cavity Resonators-Rectangular and Circular cavity Resonator Quality Factor for Cavity Resonators. Re-entrant Cavities

UNIT-III: MICROWAVE COMPONENTS

Scattering Parameters of Microwave Tee-Junctions-E-plane, H-Plane, EH-Plane, Magic Tee Junctions, Directional Couplers: Two-hole Directional Coupler, S-matrix of Two-hole Directional Coupler, Waveguide Joints, Waveguide Bends, Corners, Transitions & Twists, Waveguide Irisis, Coupling Probe & Loops, Microwave propagation in Ferrite Devices- Faraday Rotation in Gyrator, Isolator, Circulator, Attenuators, Phase Shifters.

UNIT-IV: MICROWAVE TUBES

Limitations of conventional devices at microwave frequency, Operation and constructional details of two cavity Klystron Amplifier and Applegate diagram, Reflex Klystron, Magnetron, Helix Traveling wave tube.

UNIT-V: MICROWAVE SOLID STATE DEVICES

Transferred electron devices: Gunn-effect diodes & modes of operation. Avalanche transit – time devices: IMPATT diode, TRAPATT diode.

MICROWAVE MEASUREMENTS:

Microwave Bench Setup-Microwave power measurement using Bolometer method, Microwave attenuation measurement, VSWR measurement, Frequency measurement.

TEXT BOOKS:

1. Dr. M. Kulkarni- Microwave and Radar Engineering, 5th edition, Umesh Publications
2. Samuel Y. Liao, ―Microwave Devices and Circuits‖, 3rd Edition, Pearson Education, 2011.

REFERENCES:

1. Microwave and Radar Engineering – G Sasibhushana Rao Pearson
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.

B. TECH VI SEMESTER

PEC	L	T	P	C
	3	0	0	3

20EC6T04 **EMBEDDED SYSTEMS**
(PROFESSIONAL ELECTIVE-II)

Pre-requisite: Basic knowledge about transformations, differentiation and integration

Course Objectives:
The main objectives of this course are given below:

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained.
3. Different steps involved in the design and development of firmware for embedded systems is elaborated.
4. Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
5. Fundamental issues in hardware software co-design were presented and explained.

Course Outcomes:
At the end of this course the student will able to:

CO1: Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
CO2: Understand how to integrate hardware and firmware of an embedded system using real time operating system.
CO3: Understand the Task communication of RTOS
CO4: The various embedded firmware design approaches on embedded environment.
CO5: Define the unique design problems and challenges of real-time systems

SYLLABUS

UNIT-I: INTRODUCTION TO EMBEDDED SYSTEMS

What is an embedded system Vs. General Computing system, history, classification, major application areas, and purpose of embedded systems, Core of embedded system, Characteristics and Quality Attributes of Embedded systems, Application specific and Domain specific embedded systems-Examples

UNIT-II:

Factors to be considered in selecting a controller, 8051 Architecture, RTOS and Scheduling Operating basics, types, RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Types of multitasking, Non preemptive Scheduling, Preemptive Scheduling

UNIT-III:

Task communication of RTOS, Shared memory, Pipes, Memory mapped objects, Message passing, Message queue, Mailbox, Signaling, RPC and sockets, Task communication/Synchronization issues, Racing, deadlock, live lock, The dining philosopher‘s problem.

UNIT-IV:

The producer-consumer problem, Reader writers problem, Priority Inversion, Priority ceiling, Task Synchronization techniques-Busy waiting, Sleep and wakery, Semaphore, mutex, Critical section objects, Device drivers, How to clause an RTOS, Integration and Testing of embedded hardware and firmware

UNIT-V:

Simulators, Emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry, Introduction to ARM family of processor.

TEXT BOOKS:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.

2. Embedded Systems: A Contemporary Design Tool Paperback by James K. Peckol

REFERENCES:

1. Ayala & Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE

2. Embedded Systems, Rajkamal, TMH, 2009.

B. TECH VI SEMESTER	PCC	L	T	P	C
		3	0	0	3

20EC6T05 **ELECTRONIC MEASUREMENTS AND INSTRUMENTATION**
(PROFESSIONAL ELECTIVE-II)

Course Objectives:
The main objectives of this course are given below:

1. Explain basic concepts and definitions in measurement.
2. Describe the bridge configurations and their applications.
3. Elaborate discussion about the importance of signal generators and analyzers in Measurement.
4. To introduce monitor, analyze and control any physical system.
5. To understand how different types of meters ‘work and their construction

Course Outcomes:
At the end of this course the student will able to:

CO1: Select the instrument to be used based on the requirements.

CO2: Understand and analyze different signal generators and analyzers.

CO3: Understand the design of oscilloscopes for different applications.

CO4: Design different Bridges for measurement of different parameters.

CO5: Design different transducers for measurement of different parameters.

SYLLABUS

UNIT-I:

Performance characteristics of instruments, Static characteristics- Accuracy, Resolution, Precision, Expected value, Error, Sensitivity, Dynamic Characteristics- speed of response, Fidelity, Lag and Dynamic error. Errors in Measurement. DC Voltmeters- Multi range, Range extension, AC voltmeters- multi range, range extension, Thermocouple type RF ammeter, Ohmmeters series type, Multimeter for Voltage, Current and resistance measurements.

UNIT-II:

Signal Generator- fixed and variable, AF oscillators, AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform Generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT-III:

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, standard specifications of CRO, CRO probes- Active & Passive, Lissajous method of frequency measurement, Dual trace oscilloscope, Sampling oscilloscope, Storage oscilloscope, Digital Storage oscilloscope.

UNIT-IV:

Measurement of Resistance-Wheat stone bridge. Kelvin‘s bridge, Kelvin‘s Double bridge**,** AC Bridges Measurement of Inductance- Maxwell‘s bridge, Anderson bridge, Hay‘s bridge. Measurement of Capacitance -Schering Bridge. Wien Bridge, Errors and precautions in using AC bridges. Q-meter.

UNIT-V:

Data Acquisition Systems, Transducers- Types of transducers, Resistance, Capacitance, inductance, LVDT, Strain gauges, Piezo Electric transducers, Thermocouples, Thermistor, Sensistors. Measurement of physical parameters - force, pressure, velocity, humidity and displacement.

TEXTBOOKS:

1. Electronic Instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education

B. TECH VI SEMESTER	PEC	L	T	P	C
		3	0	0	3

20EC6T06 DIGITAL MODULATION TECHNIQUES
(PROFESSIONAL ELECTIVE-II)

Course Objectives:
The main objectives of this course are given below:

1. Analyze the properties of basic Modulation techniques and apply them to Digital Communication.
2. Apply different types of coding techniques to design the optimum receiver for channels with ISI and AWGN
3. Design and develop the different types of modulation techniques, equalizer to improve the performance under fading channels for various applications.
4. Understand and appreciate the need of various modulations and spread spectrum techniques.
5. Analyze the performance of spread spectrum systems in the presence of interference.

Course Outcomes:
At the end of this course the student will able to:

CO1: Explain merits and demerits of different modulation techniques & coding techniques, spread spectrum signals and channel behaviors.

CO2: Analyze various modulation, equalization, diversity and coding techniques for communication systems.

CO3: Compare performance of different types of modulation on different wireless application fading channels.

CO4: Design and demonstrate various modulation/coding equalization techniques and measure their performance.

CO5: Apply spread spectrum techniques to the baseband signal in the presence of interference to reduce the occurrence of error

SYLLABUS

UNIT-I:

Information and Entropy, Conditional Entropy and Redundancy, Mutual information, Source coding Huffman Code, Shannon-Fano Coding, Source coding to increase average information per bit, Bandwidth-S/N Trade off, Hartley Shannon Law, Error Control Codes, Linear Block Codes: Matrix Description of Linear Block Codes, Error Detection and Error Correction, Capabilities of Linear Block Codes. Cyclic Codes: Algebraic Structure, Encoding, Syndrome Calculation, Decoding. Convolution Codes: Encoding, Decoding,

UNIT-II:

Review of fundamental concepts and parameters in Digital Communication. Digital modulation schemes, Power spectra of digital modulation signals. Performance of carrier modulation schemes : Performance of BPSK and QPSK in AWGN Channel, M-ary PSK in AWGN Channel, Minimum Shift keying (MSK) Modulation, GMSK continuous phase modulation(CPM) schemes.

UNIT-III:

Channel characterization and modeling: Optimum receivers for AWGN Channels, Equalization techniques, Orthogonal Frequency Division Multiplexing (OFDM). Carrier Synchronization, Timing synchronization.

UNIT-IV:

Introduction to spread spectrum modulation, Direct Sequence modulation, spreading codes, Advantage of CDMA for wireless, Channel estimation, Frequency Hopping spread spectrum, , slow and fast frequency hopping, Processing gain.

UNIT-V:

Spread spectrum as a Multiple access technique: Multi channel and Multi carrier systems; Digital Communication through fading multipath channels; Multi user communications. 'Space diversity on Receiver' technique, MIMO antenna systems.

TEXT BOOKS:

1. John G. Proakis and Masoud Salehi, "Digital Communications," McGraw Hill, 5/e, 2008.

2. Stephen G. Wilson, "Digital Modulation and coding," Pearson Education, 2010.

REFERENCE BOOKS:

1. Simon Haykin and Michael Moher, "Modern Wireless Communications," Pearson Education, 2005.

2. Andrew J Viterbi, “CDMA principles spread spectrum communications,” Adison Wesley, 1995

B. TECH VI SEMESTER	PEC	L	T	P	C
		0	0	3	1.5

20EC6L10 MICROWAVE & OPTICAL COMMUNICATIONS LAB

Course Outcomes:
At the end of this course the student will able to:

CO1: The student will be able to understand the characteristics of Reflex Klystron, GUNN Diode.

CO2: The student will be able to measure the attenuation of variable attenuator.

CO3: The student will be able to measure the scattering parameters of Circulator, Directional coupler and Magic Tee.

CO4: The student will be able to understand the characteristics of LED, LASER Diode and calculate the losses in analog optical Link.

CO5: The student will be able to determine numerical aperture and calculate the data rate in digital optical link.

Introduction

This lab is offered to B.Tech. ECE students and concentrates on introducing the advances in communications. This lab is well equipped with all the microwave devices. The Laboratory conducts practical sessions to enable the students to implement their theoretical knowledge and observe the practical results, following outcome-based education. Lab deals with the measurements of the signals at microwave frequency range. It involves measurement of attenuation, reflex klystron and Gunn diode characteristics and scattering parameters of various microwave devices like Circulator, Direction Coupler, and Magic-Tee. Even the latest trend of communication technology i.e., fiber optics is also introduced and propagation conditions will be verified by evaluating the losses and digital data rate for transmission.

LIST OF MICROWAVE LAB EXPERIMENTS

1. Reflex klystron characteristics.
2. Measurement of Attenuation
3. Waveguide Parameters Measurement
4. Measurement of scattering parameters for Two Hole Directional Coupler
5. Measurement of scattering parameters for Three Port Circulator
6. Measurement of scattering parameters for Magic Tee

7. Measurement of GUNN Diode Characteristics.

LIST OF OPTICAL EXPERIMENTS

1. LED Characteristics.
2. LASER Diode Characteristics.
3. Measurement of Digital Data Rate using Digital Optical Link.
4. Measurement of Losses in Analog Optical Link.
5. Numerical Aperture determination for Fibers.

			L	T	P	C
B. TECH VI SEMESTER		**PCC**	**0**	**0**	**3**	**1.5**

20EC6L11 VLSI DESIGN LAB

Note: The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the following experiments using 130nm technology with the Industry standard EDA Tools.

COURSE OBJECTIVES:

The main objectives of this course are given below:

1. To study understand the MOS device at device, circuit and layout level
2. To learn the implementation of designed circuit on FPGA Board

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Design and analyse the MOS at device, circuit and layout level using back end CAD tool.

CO2: Design of combinational circuits using CAD tool

CO3: Design of Sequential combinational circuits using CAD tool

CO4: Design static RAM Cell using CAD tool

CO5: Design DAC using CAD tool

List of Experiments:

1. Design and Implementation of an Universal Gates
2. Design and Implementation of an Inverter
3. Design and Implementation of Full Adder
4. Design and Implementation of Full Subtractor
5. Design and Implementation of Decoder
6. Design and Implementation of Multiplexer
7. Design and Implementation of RS-Latch
8. Design and Implementation of D-Latch
9. Design and Implementation of Master Slave Flip-flop
10. Design and Implementation asynchronous counter
11. Design and Implementation of static RAM cell
12. Design and Implementation of 8 bit DAC using R-2R latter network

Software Required:

i. Mentor Graphics Software / Equivalent Industry Standard Software.ii. Personal computer system with necessary software to run the programs and to implement.

B. TECH VI SEMESTER

L	T	P	C
0	0	3	1.5

20EC6L12 DIGITAL SIGNAL PROCESSING LAB

LIST OF EXPERIMENTS

1. Generation of basic sequences impulse, unit step, ramp, Sinusoidal, exponentially growing and decaying sequences.

2. Verification of linear convolution.

3. Verification of circular convolution.

4. DFT of an N-point sequence

5. IDFT of an N-point sequence

6. a) Frequency response of IIR low pass Butterworth filter.

   b) Frequency response of IIR high pass Butterworth filter.

7. a) Frequency response of IIR low pass

   b) Frequency response of IIR high pass Chebyshev filters

8. a)Frequency response of FIR low pass filter using Rectangular Window.

   b) Frequency response of FIR low pass filter using Hamming Window.

9. Decimation.

10. Interpolation

Software needed: MATLAB

B. TECH VI SEMESTER

	L	T	P	C
SC	0	0	4	2

20EC6S13 SOFT SKILLS

(Skill Oriented Course)

Course Outcomes

The student will acquaint himself with various nuances of Soft Skills and Personality Development besides aspects related to Campus Recruitment Process.

SYLLABUS

1 Life Skills

2 JAM

3 Presentation Skills

4 Resume Writing

5 Group Discussion

6 Interview Skills

References:

1. ***Interact*****,** Orient Blackswan

2. **Communication Skills,** Sanjay Kumar and Pushp Latha.OUP,2011

		L	T	P	C
B.TECH VI SEMESTER	MC	2	0	0	-

20EC6M14 DISASTER MANAGEMENT

Course Learning Objectives: The objective of this course is to

1. Understand Types of disasters like Earthquake, Landslide, Flood, Drought, Fire
2. Know Panchayati Raj Institutions/ Urban Local Bodies (PRIs/ ULBs), States,Centre, and other stakeholders
3. Understand Climate Change Adaptation - IPCC Scenario and Scenarios in the context of India
4. Understand Role of GIS and Information Technology Components in Preparedness, Risk Assessment
5. Know various case studies

Course Learning Outcomes: On successful completion of this course, the students will be able to

CO1: Differentiate the types of disasters, causes and their impact on environment and society

CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation.

CO3: Draw the hazard and vulnerability profile of India, Scenarios in the Indian context

CO4: Analyze the Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

CO5: Understand about Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment

SYLLABUS

UNIT-I:

INTRODUCTION TO DISASTERS Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT-II:

APPROACHES TO DISASTER RISK REDUCTION (DRR) Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT-III:

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT-IV:

DISASTER RISK MANAGEMENT IN INDIA Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT-V:

DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Text Books:

1. Singhal J.P.“Disaster Management”, Laxmi Publications, 2010. ISBN-10: ISBN-13: 978-9380386423

2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

Reference Books:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009

B. TECH VII SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EC7T01 **CMOS ANALOG IC DESIGN**
(PROGRAM ELECTIVE-III)

Course Objectives:
The main objectives of this course are given below:

1. to study the fundamentals of analog circuits and MOS device models
2. to gain knowledge on various configurations of MOS transistors and feedback concepts
3. to study the characteristics of noise and frequency response of the amplifier
4. to learn the concepts of Op-Amp frequency compensation, capacitor switches and PLLs

Course Outcomes:
At the end of this course the student will able to:

CO1: Realize the concepts of Analog MOS devices and current mirror circuits.

CO2: Design different configuration of Amplifiers and feedback circuits.

CO3: Analyze the characteristics of frequency response of the amplifier and its noise.

CO4: Analyze the performance of the stability and frequency compensation techniques of Op- Amp Circuits.

CO5: Construct switched capacitor circuits and PLLs

SYLLABUS

UNIT-I: INTRODUCTION TO ANALOG IC DESIGN AND CURRENT MIRRORS

Concepts of Analog Design - General consideration of MOS devices – MOS I/V Characteristics – Second order effects – MOS device models. Basic current mirrors- Cascode current mirrors- Active current mirrors- Large and Small signal analysis- Common mode properties.

UNIT-II: AMPLIFIERS AND FEEDBACK

Basic Concepts – Common source stage- Source follower- Common gate stage- Cascode stage. Single ended and differential operation- Basic Differential pair- Common mode response- Differential pair with MOS loads- Gilbert Cell. Feedback-

General Consideration of feedback circuits- Feedback topologies- Effect of loading- Effect of feedback on Noise.

UNIT-III: FREQUENCY RESPONSE OF AMPLIFIERS AND NOISE

General considerations- Miller Effect and Association of Poles with Nodes, Common source stage- Source followers- Common gate stage- Cascode stage- Differential pair. Noise- Statistical characteristics of noise- Types of noise- Representation of noise in circuits- Noise in single stage amplifiers- Noise in differential pairs- Noise Bandwidth.

UNIT-IV: OPERATIONAL AMPLIFIER STABILITY AND FREQUENCY COMPENSATION

General Considerations- One and Two Stage Op Amps- Gain Boosting- Comparison- Common mode feedback- Input range limitations- Slew rate- Power Supply Rejection- Noise in Op Amps- General consideration of stability and frequency compensation- Multipole system- Phase margin- Frequency compensation- Compensation of two stage op Amps- Other compensation techniques.

UNIT-V: SWITCHED CAPACITOR CIRCUITS AND PLLS

General Considerations- Sampling switches- Switched Capacitor Amplifiers- Switched Capacitor Integrator- Switched Capacitor Common mode feedback. Phase Locked Loops-Simple PLL- Charge pump PLLs - Non ideal Effects in PLLs- Delay locked loops- its Applications.

TEXT BOOK:

1. Behzad Razavi, ―Design of Analog CMOS Integrated Circuits‖, Tata McGraw Hill, 2001, 33rd re-print, 2016.
2. Phillip Allen and Douglas Holmberg ―CMOS Analog Circuit Design‖ Second Edition, Oxford University Press, 2004.

REFERENCES:

1. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley, 2009
2. Grebene, ―Bipolar and MOS Analog Integrated circuit design‖, John Wiley & sons, Inc., 2003

B. TECH VII SEMESTER	PEC	L	T	P	C
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20EC7T02 **DATA COMMUNICATIONS AND NETWORKS**
(PROGRAM ELECTIVE-III)

COURSE OBJECTIVES:
The main objectives of this course are given below:

1	To Focus on information sharing and networks.
2	To Introduce flow of data, categories of network, different topologies.
3	To Focus on different coding schemes.
4	Brief the students regarding protocols and standards.
5	To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices, etc.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1:	On successful completion of the course, the student will be having the basic knowledge of data sharing, transmission media and their protocols.
CO2:	Student will have the basic knowledge of computer networks.
CO3:	To Focus on information sharing and networks.
CO4:	To Introduce flow of data, categories of network, different topologies.
CO5:	To Focus on different coding schemes

SYLLABUS

UNIT-I:

Introduction to data communication and networking: Why study data communication? Data Communication, Networks, Protocols and Standards, Standards Organizations. Line Configuration, Topology, Transmission Modes, Categories of Networks Internet works.

Study of OSI and TCP/IP protocol suit: The Model,Functions of the layers,TCP/IP Protocol Suites

UNIT-II

Study of Signals: Analog and Digital, Periodic and Aperiodic Signals, Analog Signals, Time and Frequency Domains, Composite Signals, Digital Signals.

Study of Digital transmission: Digital to Digital Conversion, Analog to Digital Conversion.

UNIT-III:

Study of Analog transmission: Digital to Analog Conversion, Analog to Analog Conversion.

Study of Multiplexing: Many to one/one to Many, Frequency division Multiplexing, Wage division Multiplexing, Time division Multiplexing, Multiplexing applications.

UNIT-IV:

Types of transmission media: Guided Media, Unguided Media, Transmission Impairments, Performance Wavelength, Shannon Capacity, Media Comparison, PSTN, Switching.

Error Detection and Correction: Types of Errors, Detection, Parity Check, Vertical Redundancy Check Longitudinal Redundancy Check, Cyclic Redundancy Check, Checksum, Error Correction.

UNIT-V:

Study of DTE-DCE in brief: Digital data transmission, DTE-DCE Interface, Modems, 56K Modems, Cable Modems.

Introduction to networks and devices: Network classes, Repeaters, Hub, Bridges, Switches, Routers, Gateways Routers, Routing Algorithms, Distance Vector Routing, Link State Routing.

TEXT BOOKS:

1. Data communication & Networking by Bahrouz Forouzan.
2. Computer Networks by Andrew S. Tanenbaum

REFERENCE BOOKS:

1. Data and Computer Communications by William Stallings
2. Kleinrock, Leonard. *Queueing Systems, Vol 1: Theory*. New York, NY: Wiley J., 1975. ISBN: 0471491101.

B. TECH VII SEMESTER

PEC	L	T	P	C
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20EC7T03 **INFORMATION THEORY AND CODING**
(PROGRAM ELECTIVE-III)

Course Objectives:
The main objectives of this course are given below:

1. To Understand the concept of Entropy, Rate of information and order of the source with reference to dependent and independent source.
2. To Study various source encoding algorithms.
3. To Model discrete & continuous communication channels.
4. To Study various error control coding algorithms.

Course Outcomes:
At the end of this course the student will able to:

CO1: Explain concept of Dependent & Independent Source, measure of information, Entropy, Rate of Information and Order of a source

CO2: Represent the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms

CO3: Model the continuous and discrete communication channels using input, output and joint probabilities

CO4: Determine a code word comprising of the check bits computed using Linear Block codes, cyclic codes & convolutional codes

CO5: Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes, BCH and Golay codes.

SYLLABUS

UNIT-I: INFORMATION THEORY

Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Statistical Model of Information Sources, Entropy and Information rate

UNIT-II: SOURCE CODING

Source coding theorem, Prefix Codes, Kraft McMillan Inequality Property Encoding of the Source Output, Shannon's Encoding Algorithm. Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding,

UNIT-III: INFORMATION CHANNELS

Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix, Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of: Binary Symmetric Channel.

UNIT-IV: ERROR CONTROL CODING

Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting Hamming Codes, Table lookup decoding using Standard Array. Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction

UNIT-V: SOME IMPORTANT CYCLIC CODES

Golay Codes, BCH Codes Convolution Codes: Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, The Viterbi Algorithm)

TEXT BOOKS:

1. Information Theory, Inference and Learning Algorithms by David J.C. MacKay. Draft 2.2.4 August 31, 2001.

2. Man Young Rhee, "Error Correcting Coding Theory", 1989, McGraw-Hill Man Young Rhee, "Error Correcting Coding Theory", 1989, McGraw-Hill

REFERENCE BOOKS:

1. Elements of Information Theory, by Thomas M. Cover and Joy A. Thomas, John Wiley, 1991, ISBN 0-471- 06259-6

2. Todd K. Moon, "Error Correction Coding – Mathematical Methods and Algorithms", 2006, Wiley India

B. TECH VII SEMESTER		**PEC**	**L**	**T**	**P**	**C**
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20EC7T04 **DIGITAL IMAGE PROCESSING (PROGRAM ELECTIVE-IV)**

Course Objectives:
The main objectives of this course are given below:

1 To comprehend the relation between human visual system and machine perception and processing of digital images.

2 To provide a detailed approach towards image processing applications like enhancement, segmentation, and compression.

Course Outcomes:
At the end of this course the student will able to:

CO1: Understand digital image fundamentals and various image transform techniques.

CO2: Learn various image enhancement techniques.

CO3: learn different causes for image degradation and overview of image restoration techniques

CO4: Learn different techniques employed for image segmentation and understand different morphological image processing techniques.

CO5: Understand the need for compression and evaluate the basic compression algorithms.

SYLLABUS

UNIT-I: DIGITAL IMAGE FUNDAMENTALS & IMAGE TRANSFORMS

Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT-II: IMAGE ENHANCEMENT (SPATIAL DOMAIN)

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or

Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT-III: IMAGE RESTORATION

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-IV: IMAGE SEGMENTATION

Image Segmentation: Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation.

UNIT-V: IMAGE COMPRESSION

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

TEXT BOOKS:

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- MC GRAW HILL 2010

REFERENCE BOOKS:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - ScotteUmbaugh, 2nd Ed, CRC Press, 2011
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, MC GRAW HILL EDUCATION, 2010.

B. TECH VII SEMESTER **PEC**

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20EC7T05 **LOW POWER VLSI DESIGN**
(PROFESSIONAL ELECTIVE-IV)

Course Objectives:
The main objectives of this course are given below:

1. This course addresses a profound analysis on the development of the CMOS & Bi-CMOS digital circuits for a low voltage low power environment
2. To study the concepts of device behaviour and modelling
3. To study the concepts of low voltage, low power logic Adder circuits.
4. To study the concepts of low voltage, low power logic Multiplier circuits.
5. To study the concepts of low voltage, low power memories.

Course Outcomes:
At the end of this course the student will able to:

CO1: Capability to recognize advanced issues in VLSI systems, specific to the deep-submicron silicon technologies.
CO2: Students able to understand deep submicron CMOS technology and digital CMOS design styles.
CO3: Understand the concept of Low voltage, Low power Adders
CO4: Understand the concept of Low voltage, Low power Multipliers
CO5: Understand the concept of Low voltage, Low power Memories

SYLLABUS

UNIT-I: FUNDAMENTALS

Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT-II: LOW-POWER DESIGN APPROACHES

Low-Power Design Approaches: Low-Power Design through Voltage Scaling: VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel

Processing Approaches. Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT-III: LOW-VOLTAGE LOW-POWER ADDER

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low Voltage Low-Power Design Techniques –Trends of Technology and Power Supply Voltage, Low Voltage Low-Power Logic Styles.

UNIT-IV: LOW-VOLTAGE LOW-POWER MULTIPLIERS

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT-V: LOW-VOLTAGE LOW-POWER MEMORIES

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits – Analysis and Design", TMH, 2011.
2. Kiat-Seng Yeo, Kaushik Roy, "Low-Voltage, Low-Power VLSI Subsystems", TMH Professional Engineering.

REFERENCE BOOKS:

1. Ming-BO Lin, "Introduction to VLSI Systems: A Logic, Circuit and System Perspective", CRC Press
2. Anantha Chandrakasan, "Low Power CMOS Design", IEEE Press, /Wiley International, 1998.

B. TECH VII SEMESTER **PEC**

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20EC7T06 **OPTICAL COMMUNICATIONS**
(PROFESSIONAL ELECTIVE-IV)

Course Objectives:
The main objectives of this course are given below:

The student will be introduced to the functionality of each of the components that comprise a fiber-optic communication system

1. The properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers.
2. To understand optical fiber measurements and various coupling techniques
3. Working of optical sources, detectors and transmission techniques.
4. To Understand the knowledge about optical communication systems and networks
5. To Analyze and design optical communication and fiber optic sensor systems.

Course Outcomes:
At the end of this course the student will able to:

CO1: Understand about the various optical fiber modes, configuration and transmission characteristics of optical fibers

CO2: Explore various idea about optical fiber measurements and various coupling techniques

CO3: Learn about the various optical sources, detectors and transmission techniques

CO4: Enrich the knowledge about optical communication systems and networks

CO5: To be able to design optical system based on requirements.

SYLLABUS

UNIT-I: INTRODUCTION TO OPTICAL FIBERS

Introduction to optical fiber communication system and advantages, Ray theory of transmission, total internal reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Optical Fiber waveguide- Modes, V number, Mode Coupling, Step Index Fibers, Graded Index Fibers. Single Mode Fibers- Cut off Wavelength, Mode Field Diameter, Effective Refractive Index

UNIT-II: TRANSMISSION CHARACTERISTIC AND DISTORTION

Fiber Materials, Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Types of Dispersion – Material Dispersion, Wave- Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Connector Return Loss. Fiber Splicing: Splicing Techniques, Fiber Alignment and Joint Loss

UNIT-III: OPTICAL SOURCES AND DETECTORS

Optical Sources- LEDs, Structures, Materials, surface emitting LED, Edge emitting LED, quantum efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Detectors: PIN photo detector and Avalanche photo diodes

UNIT-IV: POWER LAUNCHING AND RECEPTION

Source to Fiber Power Launching: – Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling, optical receiver operation, digital signal transmission error sources, digital receiver performance-probability of error-receiver sensitivity-quantum limit.

UNIT-V: OPTICAL SYSTEM DESIGN

Optical System design consideration-Point to Point link design, Link power budget, rise time budget, WDM principles and necessity, Measurement of Attenuation and Dispersion, Eye pattern

TEXT BOOKS

1. Optical Fiber Communications — Gerd Keiser, TMH, 4th Edition, 2008.
2. Optical Fiber Communications — John M. Senior, Pearson Education, 3rd Edition, 2009.

REFERENCE BOOKS

1. Fiber Optic Communications — D.K. Mynbaev, S.C. Gupta and Lowell L. Schemer, Pearson Education, 2005.
2. Text Book on Optical Fiber Communication and its Applications — S.C.Gupta, PHI, 2005

B. TECH VII SEMESTER

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20EC7T07 **RADAR ENGINEERING**
(PROFESSIONAL ELECTIVE-V)

Course Objectives:
The main objectives of this course are given below:

1. The Basic Principle of radar and radar range equation.
2. Different types of radars; CW, FM-CW
3. MTI and pulse Doppler radars.
4. Understand the different tracking techniques for radar.
5. Understand the characteristics of a matched filter receiver and its performance, different types of displays, duplexers and antennas used in radar systems.

Course Outcomes:
At the end of this course the student will able to:

CO1: Derive the radar range equation and to solve some analytical problems.
CO2: Understand the different types of radars and its applications.
CO3: Understand the different types of MTI Radars and Pulse Doppler Radar.
CO4: Understand the concept of tracking and different tracking techniques.
CO5: Understand the various components of radar receiver and its performance

SYLLABUS

UNIT-I: BASICS OF RADAR

Introduction, Principle of Radar, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Pulsed Radar, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, SNR, Modified Radar Range Equation, probability of detection, probability of False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses, Illustrative Problems.

UNIT-II: CW AND FREQUENCY MODULATED RADAR

Doppler Effect, **Continuous Wave (CW) Radar** – Block Diagram and Operation, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Doppler Filter Bank, **Frequency Modulated-Continuous Wave (FM-CW) Radar:** Range and Doppler Measurement, Block Diagram and operation Characteristics, FM-CW Radar using Altimeter, Multi Frequency CW Radar, Illustrative Problems.

UNIT-III: MTI AND PULSE DOPPLER RADAR

Introduction, Principle, Simple CW Radar, MTI Radar Block Diagram with Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers, Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. Limitations to MTI Performance. Non-Coherent MTI Radar, Pulse Doppler Radar.

UNIT-IV: TRACKING RADAR

Tracking with Radar principle, Sequential Lobing, Conical Scan, Automatic Gain Controller Tracking Radar, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse of Single Coordinate and Two coordinate, Phase Comparison Mono pulse, tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT-V: RADAR RECEIVERS

Radar Receiver, Matched Filter Receiver, relation between matched filter characteristics and correlation functions, Efficiency of non-matched filters, Constant False Alarm Rate Receiver, Radar Displays types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus parallel feeds, Applications, Advantages and Limitations.

TEXT BOOKS

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.
2. Radar Engineering – GSN Raju, IK International.

REFERENCE BOOKS

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.

B.TECH VII SEMESTER	PEC	L	T	P	C
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20EC7T08 **EMBEDDED REAL TIME OPERATING SYSTEMS**
(PROFESSIONAL ELECTIVE-V)

Course Objectives:
The main objectives of this course are given below:

1. Understand the concepts of embedded system design and analysis
2. Learn the architecture and programming of ARM processor
3. Be exposed to the basic concepts of embedded programming
4. Learn the real time operating systems

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Describe the architecture and programming of ARM processor

CO2: Outline the concepts of embedded systems

CO3: Explain the basic concepts of real time operating system design

CO4: Model real-time applications using embedded-system concept

CO5: Know about operating systems

SYLLABUS

UNIT-I: INTRODUCTION TO EMBEDDEDSYSTEM DESIGN

Complex systems and microprocessors– Embedded system design process –Design example: Model train controller- Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques - Designing with computing platforms – consumer electronics architecture – platform-level performance analysis.

UNIT-II: ARM PROCESSOR AND PERIPHERALS

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU.

UNIT-III: EMBEDDED PROGRAMMING

Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT-IV: REAL TIME SYSTEMS

Structure of a Real Time System — Estimating program run times – Task Assignment and Scheduling – Fault Tolerance Techniques – Reliability, Evaluation – Clock Synchronization.

UNIT-V: PROCESSES AND OPERATING SYSTEMS

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real- time operating systems- Priority based scheduling- Inter process communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE. - Distributed embedded systems – MPSoCs and shared memory multiprocessors. – Design Example - Audio player, Engine control unit – Video accelerator.

TEXT BOOKS:

1. Marilyn Wolf, ―Computers as Components - Principles of Embedded Computing System Design‖, Third Edition ―Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (UNIT I, II, III, V)

2. Jane W.S.Liu,‖ Real Time Systems‖, Pearson Education, Third Indian Reprint, 2003.(UNIT IV)

REFERENCES:

1. Lyla B.Das, ―Embedded Systems : An Integrated Approach‖ Pearson Education, 2013.

2. Jonathan W.Valvano, ―Embedded Microcomputer Systems Real Tim Interfacing‖ Third Edition Cengage Learning, 2012.

B. TECH VII SEMESTER	PEC	L	T	P	C
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20EC7T09 SATELLITE COMMUNICATIONS

Course Objectives:
The main objectives of this course are given below:

1. Understand the concepts, applications and subsystems of Satellite communications.
2. Derive the expression for G/T ratio and to solve some analytical problems on satellite link design
3. Understand the concepts of satellite navigation, architecture and applications of GPS.

Course Outcomes:
At the end of this course the student will able to:

CO1: Understand the basic concepts, applications, frequencies used and types of satellite communications.
CO2: Understand the various satellite subsystems and its functionality.
CO3: Understand the concepts of satellite link design and calculation of C/N ratio.
CO4: Understand the concepts of multiple access and various types of multiple access techniques in satellite Systems.
CO5: Understand the concepts of satellite navigation, architecture and applications of GPS

SYLLABUS

UNIT-I:

INTRODUCTION: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications.

UNIT-II:

SATELLITE SUBSYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and Monitoring, Power systems, Communication subsystems, Satellite antenna, Equipment reliability and Space qualification.

UNIT-III:

SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT-IV:

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N, Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA, Code Division multiple access (CDMA), Spread spectrum transmission and reception.

UNIT-V:

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.

2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCES:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.

2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.

B.TECH VII SEMESTER

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20EC7T16 UNIVERSAL HUMAN VALUES 2
Understanding Harmony

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcome

On completion of this course, the students will be able to

CO1: Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society

CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.

CO3: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society

CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.

CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

SYLLABUS

UNIT- I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I

2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential
Validation- as the process for self-exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority

5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT- II

Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

10. Understanding the characteristics and activities of 'I' and harmony in 'I'

11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT- III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students’ lives

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

22. Definitiveness of Ethical Human Conduct

23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

24. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

25. Case studies of typical holistic technologies, management models and production systems

26. Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations

27. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Readings

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj – Pandit Sunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)

13. Gandhi - Romain Rolland (English)

B.TECH VII SEMESTER

	L	T	P	C
SC	0	0	4	2

20EC7T17 INTERNET OF THINGS APPLICATIONS WITH LATEST BOARDS
(Skill Oriented Course)

LIST OF EXPERIMENTS

1. Familiarization with the concept of IOT, Arduino / Raspberry Pi and perform necessary software installation.
2. Design of digital dc voltmeter and ammeter Study of Raspberry-Pi, Beagle board, Arduino and other micro controller
3. Create a web server that displays a text that can be read by signing into the page.
4. Create a web server that displays two buttons that can be used to control two LEDs connected to the board,
5. Design a traffic control system using IOT
6. Design a railway gate control using stepper motor using IOT
7. Study of different operating systems for Node MCU / Raspberry Pi/ Beagle board. Understanding the process of Os installation on Node MCU / Beagle board
8. Study of Connectivity and Configuration of Raspberry-Pi/ Beagle Board circuit with basic peripherals, LEDs, Understanding GPIO and its use in program.
9. To study of IoT Data Logging using Beaglebone Black and Thingspeak.
10. Turn a smartphone into an IoT device using the IBM Watson IoT Platform cloud-hosted service.

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE5T04 ARCHITECTURE AND TOWN PLANNING
(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

- Initiating the students to different architectures of the world.
- Salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization.
- Architectural Design concepts, Principles of Planning and Composition.
- To understand town planning from ancient times to modern times.
- To impart the concepts of town planning standards.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Student should be able to distinguish architectural styles of eastern and Western world.
CO2: Student should understand the importance of Orders of Architecture.
CO3: Should be able to compose spaces of buildings using design concepts, planning principles.
CO4: Student should understand the town planning standards, landscaping features.

SYLLABUS

UNIT-I:

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace – Fort - Tomb.

UNIT-II:

Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT-III:

Principles of Planning: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements,

Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wright, Walter Groping.

UNIT-IV:

Histroical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT-V:

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- neighbor hood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation planning regulations and limitations.

Text books:

1. 'The great ages of World Architecture' by G.K. Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y. S.Sane.
3. 'Professional Practice' by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, NewDelhi.
4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning'by G.K. Haraskar.

Reference Books:

1. 'Drafting and Design for Architecture' by Hepler, Cengage
2. Learning 'Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.
3. 'Mordern Ideal Homes for India' by R. S. Deshpande.
4. 'Town and County Planning' by A.J. Brown and H.M. Sherrard.
5. 'Town Design' by Federik Glbbard, Architectural press, London.

B.TECH V SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE5T05 ELEMENTS OF CIVIL ENGINEERING

(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources, Water Supply, Sanitary, Electrical Works in Building and Highway engineering.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: The student should be able to know the basics of civil engineering and concepts of surveying.

CO2: The student should be able to know various properties of building materials and various types of building.

CO3: The student should be able to know the fundamentals of Water Resources, Water Supply, Sanitary and Electrical Works in Building.

CO4: The student should be able to know the fundamental concepts highway engineering.

SYLLABUS

UNIT-I:

Introduction. Introduction of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on economy of country.

UNIT-II:

Surveying Introduction: Definition of Surveying, Fundamental principles of surveying, Classification of surveying.

Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining and Ranging.

Angular Measurement: Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing local attraction.

Levelling: Objectives and applications-terminology-Instruments, component parts of dumpy level, Types of levelling, levelling staff

UNIT-III:

Building Materials and Construction Materials: Introduction to construction materials - Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen. Construction: Classification of buildings, Building components and their functions.

UNIT-IV:

Water Resources Hydrologic cycle, water use and its conservation, Introduction to dams, barrages and check dams. Water Supply, Sanitary and Electrical Works in Building Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

UNIT–V:

Transportation Engineering, classification of roads, Introduction of flexible and rigid pavements, Introduction to road traffic and traffic control mechanism.

Text Books:

1. Elements of Civil Engineering, Mimi Das Saikia, Bhargab Mohan Dasand Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, Publisher: McGraw Hill Education, India Pvt. Ltd.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, Arun kumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books:

1. Surveying Theory and Practice, James M Anderson and Edward, 7th Edition, M Mikhail Publisher: McGraw Hill Education, India Pvt. Ltd.
2. Surveying and Leveling, R. Subramanian Publisher, Oxford University.
3. Building drawing, M.G. Shah, C.M.Kale and S.Y. Patki Publisher: TataMcGraw Hill.

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE5T04 BASICS OF CONTROL SYSTEMS
(OPEN ELECTIVE-I)

Course Objectives:

- To Enable the student to understand the importance of Modelling of Control systems
- To understand the First order & second order systems
- To understand the transfer function analysis
- To understand the Stability of the systems
- To understand the States Space Analysis

Course Outcomes:

At the end of the course, the student will be able to

CO1: Understand the different Classification of control systems and modelling

CO2: Understand the functioning of Signals & time response analysis

CO3: Understand the concept of Root Locus & Construction of Root Loci

CO4: Understand the concept of Bode plot & Nyquist Plot

CO5: Understand the concept of States Space Analysis of LTI System

SYLLABUS

UNIT – I

Mathematical Modeling of Control Systems: Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems

UNIT-II

Time Response Analysis: Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III

Stability and Root locus Technique: The concept of stability – Routh's stability criterion –limitations of Routh's stability –Root locus concept - construction of root loci

UNIT–IV

Frequency Response Analysis: Introduction to Frequency domain specifications- Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots.

UNIT–V

State Space Analysis of LTI Systems: Concepts of state variables and state model, state space representation of transfer function, Diagonalization- Solving the time invariant state equations.

Text Books:

1. Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2nd Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems, Manik Dhanesh N, Cengage publications.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International
   Publications, 5th Edition.
4. Control Systems Engineering, S.Palani,TataMcGraw Hill Publications.

B.TECH V SEMESTER	**OE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE5T05 SPECIAL ELECTRICAL MACHINES

(OPEN ELECTIVE-I)

Course Objective:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor.
- To explain the theory of travelling magnetic field and applications of linear motors.

Course Outcomes:

The student should be able to

CO1: Distinguish between brush dc motor and brush less dc motor.

CO2: Explain the performance and control of stepper motors, and their applications.

CO3: Explain theory of operation and control of switched reluctance motor.

CO4: Explain the theory of travelling magnetic field and applications of linear motors.

CO5: Understand the significance of electrical motors for traction drives.

SYLLABUS

Unit I: Stepper Motors: Classification and construction details of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of stepper motors – Applications of stepping motors.

Unit II: Switched Reluctance Motors: Construction – Comparison of conventional and switched reluctance motors –Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

Unit III : Brushless DC Motor: Construction – Principle of operation of BLDM – sensing and logic scheme, basic drive circuit, power converter circuit, transient analysis Theory of brushless DC motor as variable speed synchronous motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency.

UNIT-IV: **Linear motors:** Linear induction motor: Construction– principle of operation– applications. Linear synchronous motor: Construction – principle of operation– applications.

Unit V: Electric Motors for traction drives: AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:

1. Special electrical Machines, K. Venkata Ratnam, University press, 2009, New
2. "Linear Electric Motors: Theory, Design and Practical application" , Naser A and Boldea I, Prentice Hall Inc, New Jersey, 1987.

Reference Books:

1. Generalized Theory of Electrical Machines – PS Bhimbra, Khanna Publishers.
2. "Brushless Permanent Magnet and Reluctance Motor Drives" , Miller T.J.E. Clarendon Press, Oxford, 1989.
3. Electric Machines – Theory, operation, Applications and Control - Charles I. Hubert – Pearson Publications.

			L	T	P	C
B.TECH V SEMESTER		**OEC**	**3**	**0**	**0**	**3**
20ME5T04	**DESIGN THINKING & PRODUCT INNOVATION (OPEN ELECTIVE-I)**					

Pre-requisite: Managerial Economics and Financial Analysis, Management Science.

Course Objective: At the end of the course, The student will able to

1. Design and develop the new product
2. Explain the basics of design thinking.
3. Describe the role of reverse engineering in product development.
4. Identify the needs of society and convert into demand.
5. Explain the product planning and product development process

Course Outcomes: At the end of the course, student will be able to

CO1: To bring awareness on innovative design and new product development.

CO2: To explain the basics of design thinking.

CO3: To familiarize the role of reverse engineering in product development.

CO4: To train how to identify the needs of society and convert into demand.

CO5: To introduce product planning and product development process.

SYLLABUS

UNIT-I: SCIENCE TO ENGINEERING:

Job of engineers, engineering units and measurement, elements of engineering analysis, forces and motion, energy, kinematics and motion, conversion of linear motion to rotary and vice versa, motion transmission. Physics to Engineering: Application of Newton laws, Pascal's law, Bouncy, Bernoulli's theorem, Ohm's law, electrical induction in engineering products.

UNIT-II: HISTORICAL DEVELOPMENT:

Invention wheel, early mechanics in design, mechanical advantages, industrial revolution, steam and petrol for mobility. Innovations in Electrical and Electronics: Electrical energy generation, electrical bulb, electrical equipment, electronics and automation, computing for early days to present, innovations in communications.

UNIT-III: SYSTEMATIC APPROACH TO PRODUCT DEVELOPMENT:

Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation. Solution finding methods: Conventional, intuitive, discursive, methods for combining solution, decision making for new design.

UNIT-IV: REVERSE ENGINEERING IN PRODUCT DEVELOPMENT:

Reversing engineering methods, identifying the bad features in a product, reduction in size and weight, usage of new materials, 3D printing, study of introducing electrical and electronic controls to the old products, importance of ergonomics in product development, environmental considerations in design, safety considerations in design.

UNIT-V:

Study of Product Development- Agriculture, development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy. Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of electrical vehicles, unmanned vehicles, design principles in drones.

Text Books:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, “Exploring Engineering: An Introduction to Engineering and Design”, 4th edition, Elsevier, 2016.
2. David Ralzman, “History of Modern Design”, 2nd edition, Laurence King Publishing Ltd., 2010
3. An AVA Book, “Design Thinking”, AVA Publishing, 2010.

Reference Books:

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, “Engineering Design: A Systematic Approach”, 3rd edition, Springer, 2007.
2. Tom Kelley, Jonathan Littman, “Ten Faces in Innovation”, Currency Books, 2006.

			L	T	P	C
B.TECH V SEMESTER		**OEC**	**3**	**0**	**0**	**3**
20ME5T05	**NANOTECHNOLOGY (OPEN ELECTIVE-I)**					

Pre-requisite: Materials Science

Course Objective:

- To familiarize with principles of quantum mechanics on which nano materials behave
- To elucidate applications of nanotechnology

Course Outcomes:

At the end of the course, student will be able to

CO1: Analyze the concepts and preparation methods of Nano materials

CO2: Understand the nano material properties and their behavior

CO3: Use various techniques for investigating nano material

CO4: Know the importance of Nano Technology for advanced materials processing

CO5: Know the importance of Nano structured Materials for Various Energies.

SYLLABUS

UNIT-I: Introduction to Nano technology:

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects

UNIT-II: Unique Properties of Nanomaterials:

Microstructure and Defects in nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple, and disclinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility, Magnetic Properties: Soft magnetic Nanocrystalline alloy, Permanent magnetic Nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT-III: Synthesis Routes :

Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method ,Self assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

UNIT-IV: Nanomaterials for Energy Conversion Systems:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy, Conversion Systems, Fuel Cells, Principles and nanomaterials design for Proton exchange membrane fuel cells (PEMFC); Direct methanol fuel cells (DMFC).

UNIT-V:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy Storage Systems, Primary and Secondary Batteries (Lithium ion Batteries), Cathode and anode materials, Nanostructured Carbon based materials, Nano-Oxides, Novel hybrid electrode materials, Current status and future trends.

Text books:

1. Electrochemical methods: Fundamentals and Applications, Allen J.Bard and Larry R. Faulkner, 2ndEdition John Wiley & Sons. Inc (2004)
2. D. Linden Ed., Handbook of Batteries, 2nd edition, McGraw-Hill, New York (1995)
3. G.A. Nazri and G. Pistoia, Lithium Batteries: Science and Technology, KulwerAcdemic Publishers, Dordrecht, Netherlands (2004).
4. J. Larmine and A. Dicks, Fuel Cell System Explained, John Wiley, New York (2000).

Reference Books:

1. Science and Technology of Lithium Batteries-Materials Aspects: An Overview, A. Manthiram, Kulwer Academic Publisher (2000).
2. M. S. Whittingham, A. J. Jacobson, Intercalation Chemistry, Academic Press, New York (1982).
3. M. Wakihara, O. Yamamoto, (Eds.) Lithium Ion Batteries: Fundamentals and Performance, Wiley –VCH ,Weinheim (1998).

B. Tech V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20EC5T04 LINEAR SYSTEM ANALYSIS (OPEN ELECTIVE –I)

Pre-requisite: Basic knowledge about vectors, differentiation and integration

COURSE OBJECTIVES:
The main objectives of this course are given below:

	At the end of the course, student will be able to
1	To understand basics of Signals and Systems required for all Engineering related courses.
2	To understand the behaviour of signal in time and frequency domain.
3	To understand the characteristics of LTI systems.
4	To understand concepts of Signals and Systems and its analysis using different transform techniques.
5	To understand sampling, convolution and correlation.

COURSE OUTCOMES:
At the end of this course the student will able to:

	At the end of the course, student will be able to
CO1:	Differentiate various signal functions.
CO2:	Represent any arbitrary signal in time and frequency domain.
CO3:	Understand the characteristics of linear time invariant systems.
CO4:	Analyse the signals with different transform technique.
CO5:	Understand the concept of sampling.

SYLLABUS

UNIT-I: Signal Analysis

Analogy between Vectors and Signals, Orthogonal Signal Space, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function

UNIT-II: Fourier series & Fourier transforms

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series.Deriving Fourier Transform from Fourier series,

Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform.

UNIT-III: Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Pauley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time.

UNIT-IV: Laplace Transforms & Z–Transforms

Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal.

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms

UNIT-V: Sampling theorem & Correlation

Graphical and analytical proof for Band Limited Signals, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parseval's Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation.

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2nd Ed.

Reference Books:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

20EC5T05 DIGITAL LOGIC DESIGN (OPEN ELECTIVE –I)

Course Objectives:

At the end of the course, student will be able to

1. To represent numbers and conversion between different representations.
2. To analyze logic processes and implement logical operations.
3. To develop the combinational logic circuits.
4. To understand concept of programmable logic devices like PROM, PLA, PAL.
5. To design and analyze the concepts of sequential circuits.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand different number systems and their conversions.

CO2: Analyze the logical operations and Boolean algebra

CO3: Develop combinational circuits and perform logical operations.

CO4: Understand different programmable logic devices.

CO5: Design the sequential logic functions.\

SYLLABUS

UNIT-I:

Number Systems: Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r‘s Complement- (r-1)‘s Complement- Subtraction of Unsigned Numbers- Signed Binary Numbers- Problems.

UNIT-II:

Logic Gates and Boolean Algebra: Basic Gates- Universal Gates- Ex-Or and Ex-Nor Gates- SOP- POS- Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- K Map Method- Minimization of Boolean Functions.

UNIT-III: Signal Transmission through Linear Systems

Combinational Logic Circuits: Design of Half Adder- Full Adder- Half Subtractor- Full Subtractor- Ripple Adder and Subtractor- Design of Decoders- Encoders- Multiplexers- Demultiplexers- Magnitude Comparator.

UNIT-IV: Laplace Transforms & Z–Transforms

Introduction to Programmable Logic Devices (PLDs): PLA- PAL- PROM- Realization of Switching Functions Using PROM- Comparison of PLA, PAL and PROM.

UNIT-V: Sampling theorem & Correlation

Introduction to Sequential Logic Circuits: Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear)- Design of Registers- Universal Shift Register- Ring Counter- Johnson Counter.

TEXT BOOKS

1. Digital Design, M.Morris Mano, Michael D Ciletti, 4thEdition, PEA, 2003.

2. Fundamentals of Logic Design, Roth, 5thEdition, Cengage, 2004

REFERENCE BOOKS

1. Switching and Finite Automata Theory, Kohavi, 3rd Edition, Jha, Cambridge, 2005

2. Digital Logic Design, Leach, Malvino, Saha, TMH, 2000.

B. TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20EC5T06 SOLID STATE DEVICES (OPEN ELECTIVE –I)

Course Objectives: Students undergoing this course, are expected to

1. Familiarize with the fundamentals of Semiconductor physics
2. Familiarize with various diodes and characteristics.
3. Familiarize with the transistors and their configurations.
4. Disseminate Amplifications with transistors
5. Understand the operation and working of Oscillators

Course Outcomes:

After undergoing the course, students will be able to

CO1: Understand importance of semiconductors.

CO2: Analyze Diode characteristics.

CO3: Differentiate various Transistor BJT configurations.

CO4: Design amplifiers at different applications using transistor.

CO5: Analyze different Feedback amplifiers & oscillators design

SYLLABUS.

Unit I: Basics Concepts of Semiconductor Physics, Charged Particles, Field Intensity, Potential, Energy, the eV unit of energy, Energy Band theory of Crystals, Insulators, Semiconductors and metals, Mobility and Conductivity, Electrons and Holes, Donor and Acceptor impurities, Charge Densities in a Semiconductor, Electrical properties of Ge and Si, Hall Effect, Diffusion and Drift Currents, Mass action Law, Fermi-Dirac distribution.

Unit II: Diodes: PN junction diode- Energy band diagram of PN junction Diode- V-I Characteristics –Current components in PN junction Diode- Diode equation- Diode resistance and capacitance, Characteristics of Zener Diode, Varactor Diode- SCR and UJT.

Unit III: Transistors Bipolar Junction Transistor: Transistor current components- Transistor equation- Transistor configurations- Characteristics of a transistor in CB, CC&CE configurations- Transistor as a Switch,Transistor as an amplifier. Field Effect Transistors (FET): Junction Field Effect Transistor construction & operation, characteristics of CS, CD & CG

Unit IV: Small Signal Transistor Amplifier models: Low Frequency Transistor Amplifier Models: Two port network, Transistor hybrid model, determination of h- parameters, generalized analysis of transistor amplifier model using h-parameters

Unit V: Feedback Amplifiers and Oscillators: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and their analysis. Generalized analysis of LC Oscillators, Hartley and Colpitt‘s oscillators with BJT and their analysis.

Text Books:

1) Millman, Halkias, ―Integrated Electronics- Analog and Digital Circuits and Systems, TMH.

2).Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGrawHill,Second Edition.

Reference Books:

1) Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.

2) . Basic Electronic Circuits -V.K.Mehta, S-chand Publications,2008

B. TECH V SEMESTER **OEC**

L	T	P	C
3	0	0	3

INTRODUCTION TO ARTIFICIAL INTELLIGENCE
20CS5T07 (OPEN ELECTIVE –I)

Course Objectives:

- To gain a historical perspective of Artificial Intelligence and its foundations.
- To familiarize the basic principles of Artificial Intelligence towards problem solving Inference, Perception, Knowledge representation and Learning.
- To understand advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems.

Course Outcomes: At the end of the course, the students will be able to:

CO1: To Understand the history of Artificial Intelligence and its foundations.

CO2: Apply various Artificial Intelligence Techniques for problem solving.

CO3: Formalization of knowledge using the framework of predicate logic.

CO4: Ability to apply knowledge representation and reasoning to real world problems.

CO5: Derive conclusions from uncertain knowledge and quantify the uncertainty in the Conclusions obtained.

SYLLABUS

UNIT-1:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT-2: Problem Solving:

State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem Reduction and Game Playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT-3: Logic Concepts:

Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-4: Knowledge representation:

Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT-5: Expert system and applications:

Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning (Units 1,2,3,4,5)

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
4. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

OPERATING SYSTEMS
20CS5T08 (OPEN ELECTIVE –I)

Course Objectives:

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes:

CO1: Understand the importance, functions and structures of operating systems.

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

SYLLABUS

UNIT - I: Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication

UNIT - II: Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multithreading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT – III: Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures

UNIT - IV: Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock- Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Dead lock.

UNIT - V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling

TEXT BOOKS:

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley, 9thedition.(Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition–2005.(Unit-5)

REFERENCES:

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley ,Operating Systems: A Design-Oriented Approach, Tata Mc Graw Hill Education,1996.

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

SOFTWARE ENGINEERING
20CS5T09 (OPEN ELECTIVE –I)

Course Objective:

- Gain knowledge about software process models.
- Familiarize the basic software engineering methods, practices and its applications.
- Facilitate students in software design.

Course Outcomes:

CO1: Understand the software life cycle models

CO2: Understand the scrum approach to agile project management.

CO3: Analyze the software requirements and generate SRS document

CO4: Understand some of the different models that may be used to design

CO5: Understand various software testing approaches and quality control to ensure good quality software

SYLLABUS

Unit-I:

Introduction to Software Engineering: Nature of software, Software engineering, The Software Processes, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialised Process models, The Unified Process, Personal and Team Process Models.

Unit-II:

Requirements Engineering: Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

Requirements Modelling: Requirement Analysis, Scenario-Based Modelling, Data Modelling Concepts, Class-Based Modelling

Unit-III:

Design Concepts: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Unit-IV:

Understanding of UML diagrams: Structural diagrams - class diagram, object diagram, component diagram, deployment diagram, Behavioural diagrams - Use-case diagram, activity diagram, sequence diagram, collaboration diagram, state chart diagram.

Unit-V:

Implementation: Structured coding Techniques, Coding Styles-Standards and Guidelines, Implementation Issues.

Software Testing Strategies: A Strategic approach to Software Testing, Strategic Issues and Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing, Software Quality concepts.

TEXT BOOKS:

1. Roger S. Pressman (2010), Software Engineering, A Practitioner's Approach, 7th Edition, McGraw-Hill International Edition, India.
2. Ian Sommerville (2011), Software Engineering, 9th Edition, Pearson education, India.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.Jim ConallenKelli A. Houston," Object-Oriented Analysis and Design with Applications", 3rd edition.

REFERENCES:

1. Pankaj Jalote (2010), Software Engineering, A Precise Approach, Wiley India.
2. Waman S. Jawadekar (2008), Software Engineering: A Primer, McGraw-Hill, India.
3. Hans Van Vilet (2008), Software Engineering Principles and Practice, 3rd Edition, John Wiley & Sons Ltd.
4. Rajib Mall (2005), Fundamental of Software Engineering, PHI.
5. Deepak Jain, Software Engineering, Principles and Practices, Oxford, University Press, India.

B. TECH V SEMESTER

	L	T	P	C
OEC	3	0	0	3

COMPUTER NETWORKS

20IT5T07 (OPEN ELECTIVE –I)

Course Objectives:

- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the students to basic principles of networking using the goals like protocol layering and top down approach.
- Build an understanding of the basics of the internetworking and routing used in the computer networks.
- To provide guidelines in developing network applications

Course Outcomes:

At the end of the course, student will be able to

CO1- Independently enumerate the layers of the OSI model and TCP/IP.

CO2- Identify the different types of network topologies and protocols.

CO3- Compare and contrast methods to identify Errors and correct them

CO4- Differentiate between various network routing algorithms.

CO5- Understand WWW and HTTP Architectures.

SYLLABUS

UNIT - I: Introduction:

OSI overview, TCP/IP and other networks models, Examples of Networks: Arpanet, Internet, Network Topologies Wide Area Networks(WAN), Local Area Networks(LAN), Metropolitan Area Networks(MAN).

UNIT - II: Physical Layer and overview of PL Switching:

Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, introduction to switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT – III: Data link layer:

Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction, CRC, Checksum: idea, one's complement internet checksum, services provided to Network.

Elementary Data Link Layer protocols: Simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.

Sliding window protocol: One bit, Go-back N, Selective Repetitive protocol, Stop and wait protocol.

UNIT - IV: Random Access:

ALOHA, MAC addresses, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access(CDMA).

Network layer: Shortest Path, Distance Vector Routing Algorithm, Hierarchal routing algorithm.

UNIT - V: Application layer (WWW and HTTP):

WWWARCHITECTURE: Client (Browser), Server, Uniform Resource Locator, Resource Record, HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Request Message Format, HTTP Response Message Format

TEXT BOOKS:

1. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH. (Units 1,2,4,5)
2. Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education(Units 1, 3, 4)

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

B. TECH V SEMESTER

	L	T	P	C
OEC	3	0	0	3

COMPUTER GRAPHICS
20IT5T08 (OPEN ELECTIVE –I)

Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

Course Outcomes:

After learning the course, the student will be able:

CO1: Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations.

CO2: Apply projections and visible surface detection techniques for display of 3D scene on 2D screen.

CO3: Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics.

CO4: Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).

CO5: Know and be able to discuss hardware system architecture for computer graphics. This Includes, but is not limited to: graphics pipeline, frame buffers, and graphic accelerators/co-processors.

SYLLABUS

UNIT - I: Introduction to Graphics:

Application area of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT - II: 3D Concepts:

Parallel and Perspective projections, Three dimensional object representation-Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT – III: Graphics Programming:

Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Key frame. Graphics programming using OPENGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes

UNIT – IV: Rendering:

Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadow of objects, Building a camera in a program, Creating shaded objects

UNIT - V: Overview of Ray Tracing:

Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics– C Version, second edition, Pearson Education, 2004

REFERENCES:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007

B. TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20HS5T01 QUANTITATIVE APTITUDE AND REASONING (OPEN ELECTIVE –I)

SYLLABUS

Unit-I: Divisibility and remainder rules of numbers, Unit digit , square root, cube root and simplification of numbers, HCF and LCM of numbers, Averages and Percentages, Alphabetical and miscellaneous series, Coding and decoding and Blood Relations

Unit-II: Profit & loss, Simple interest and Compound interest, Direction, Order and Ranking, Sitting arrangement and Puzzle

Unit-III: Ratio & proportions, Partnership, Alligation and mixtures and Ages.
Data sufficiency, Inequalities and Decision making.

Unit-IV: Time and work, Pipes & cisterns and Time and distance.
Syllogism, Statement and course of action and Statement and Assumption.

Unit-V: Boats and streams, Areas, Volume and surface areas.
Statement and argument, Cause and effect and Drawing inference.

Text Books:

1. “Objective Arithmetic” by R.S. Agarwal, S. Chand Publications.
2. Verbal and non-verbal Reasoning, R.S. Agarwal, S. Chand Publications

Reference Books:

1. Quantitative Aptitude by Dinesh Khattar, Pearson Education.
2. Quantitative Aptitude by Abhjit Guha.
3. Fast Track objective Arithmetic, Rajesh Verma, Arihant publications.

B. TECH V SEMESTER	OEC	L	T	P	C
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PRINCIPLES OF MANAGEMENT
20MB5T01 (OPEN ELECTIVE –I)

COURSE OBJECTIVE

This course ensures that the students understand

1. Management Concepts
2. Applications of Concepts in Practical aspects of business and Development of Managerial Skills.
3. Managers manage business organizations in the dynamic global environment and maintain competitive advantage.
4. Business decisions are made using various tools and techniques to remain competitive
5. Managers use problem-solving strategies, critical thinking skills in real-life situations and implement successful planning.

COURSE OUTCOME

After learning the contents of this course, the student would be able to know

CO1: What are the circumstances that lead to management evolution and how it will affect future managers.

CO2: Analyze and evaluate the influence of historical forces on the current practice of management

CO3: Develop the process of management's functions: Planning and Organizing.

CO4: Evaluate leadership styles to anticipate the consequences of each leadership style and directing.

CO5: Identify the areas to control and selecting the appropriate controlling methods/techniques.

SYLLABUS

UNIT I

Introduction to Management: Definition, Functions, Process, Scope and Significance of Management.

Nature of Management, Functions of Management, Managerial Roles, Levels Managerial Skills and Activities, Difference between Management and Administration, Significance of Values and Ethics in Management.

Challenges of Management

UNIT II

Evolution of Management Thought: Approaches to Management - Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT III

Planning and Organizing: Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing.

UNIT IV

Directing: Effective Directing, Supervision, Motivation, Different Theories of Motivation-Maslow, Herzberg, McClelland, Vroom, Porter and Lawler, Job Satisfaction. Concept of Leadership- Theories and Styles. Communication Process, Channels and Barriers, Effective Communication.

UNIT V

Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

TEXT BOOKS

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Management-Tasks, Responsibilities & Practices, Drucker, F. Peter
4. Principles of Management, Terry and Franklin

REFERENCES

1. Essentials of Management, Koontz Weihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

NPTEL WEB COURSE:

nptel.ac.in/courses/122108038/

NPTEL VIDEO COURSE:

nptel.ac.in/courses/122108038/#

B. TECH V SEMESTER **OEC**

L	T	P	C
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TECHNOLOGY MANAGEMENT
20MB5T02 (OPEN ELECTIVE –I)

Course Objective

- The course aims at providing an overview of various issues connected with Management of Technology in organizations.

Course Outcomes

CO1: To understand the importance of technology and innovation management

CO2: To understand the technology absorption, incremental innovation, research and development, technovation and technology fusion that dominate the contemporary world industry.

CO3: To understand the nature, significance, dimensions requirements, concepts, issues, themes, policies and structure of the management of technology and technovation.

SYLLABUS

UNIT-I

Evolution of Technology-Effects of New Technology- Technology Innovation.-Invention-Innovation- Diffusion- Revolutionary and Evolutionary Innovation- Product and Process Innovation- Strategic Implications of Technology- Technology – Strategy Alliance -Convergent and Divergent Cycle- The Balanced Approach.

UNIT-II

Technology Assessment- Technology Choice- Technological Leadership and Followership- Technology Acquisition- Technological Forecasting- Exploratory, Intuitive, Extrapolation, Growth Curves, Technology Monitoring- Normative: Relevance Tree, Morphological Analysis, Mission Flow Diagram.

UNIT-III

Diffusion of Technology- Rate of Diffusion; Innovation Time and Innovation CostSpeed of Diffusion- Technology Indicators- Various Indicators- Organizational Implications of Technology- Relationship between Technical Structure and Organizational Infrastructure- Flexible Manufacturing Management System (FMMS).

UNIT-IV

Financial Aspects in Technology Management- Improving Traditional Cost - Management System- Barriers to the Evaluation of New Technology- Social Issues in Technology Management- Technological Change and Industrial Relations- Technology Assessment and Environmental Impact Analysis.

UNIT-V

Human Aspects in Technology Management- Integration of People and Technology Organizational and Psychological Factors- Organizational Outcome- Technology Transfer-Technology Management Scenario in India.

Text Books

1. Sharif Nawaz: Management of Technology Transfer & Development, APCFT, Bangalore, 1983.
2. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,New Delhi.

References

1. Betz Fredrick: Managing Technology, Prentice Hall, New Jersey.
2. Gaynor: Handbook of Technology Management, McGraw Hill.
3. Tarek Khalil: Management of Technology, McGraw Hill International, 2000.
4. "Managing Technology and Innovation", Robert & Roland, 1st Edition, Routledge.

B. TECH V SEMESTER

	L	T	P	C
OEC	3	0	0	3

FOUNDATIONS OF DATA SCIENCE
20AD5T07 (OPEN ELECTIVE –I)

Course Objective: *This* ***course*** explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

UNIT-1: Data science in a big data world: Benefits and uses of data science and big data, Facets of data, The data science process, The big data eco system and data science, An introductory working example of Hadoop.

UNIT-2:

The data science process: Overview of the data science process, Step 1: Defining research goals and creating a project charter, Step 2: Retrieving data, Step 3: Cleansing, integrating, and transforming data, Step 4: Exploratory data analysis, Step 5: Build the models, Step 6: Presenting findings and building applications on top of them. Machine learning: What is machine learning and why should you care about it?, The modeling process, Types of machine learning, Semi-supervised learning.

UNIT-3:

Handling large data on a single computer: The problems you face when handling large data, General techniques for handling large volumes of data, General programming tips for dealing with large data sets, Case study 1: Predicting malicious URLs, Case study 2: Building a recommender system inside a database.

UNIT-4: First steps in big data: Distributing data storage and processing with frameworks, Case study: Assessing risk when loaning money, Join the NoSQL movement: Introduction to NoSQL, ACID: the core principle of relational databases,

CAP Theorem: the problem with DBs on many nodes, The BASE principles of NoSQL databases, NoSQL database types, Case study: What disease is that?

UNIT-5: The rise of graph databases: Introducing connected data and graph databases , Introducing Neo4j: a graph database, Connected data example: a recipe recommendation engine, Text mining and text analytics: Text mining in the real world, Text mining techniques, Case study: Classifying Reddit posts.

Text Book:

Introducing Data Science by Davy Cielen, Arno D. B. Meysman, and Mohamed Ali

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

20AM5T07 INTRODUCTION TO MACHINE LEARNING (OPEN ELECTIVE –I)

Pre-requisite: Probability and Statistics, Linear Algebra

Course Objective: *This* ***course*** explains basic concepts of Machine Learning and teaches you to use recent machine learning software for solving problems and understanding supervised and unsupervised learning methods

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the characteristics of machine learning.

CO2: Summarize the Model building and evaluation approaches.

CO3: Apply Bayesian learning and regression algorithms for real-world Problems.

CO4: Apply supervised learning algorithms to solve the real-world Problems.

CO5: Apply unsupervised learning algorithms for the real world data.

SYLLABUS

Unit-1: Introduction to Machine Learning and Preparing to Model:

Introduction to Machine Learning- Introduction, What is Human Learning? Types of Human Learning, What is Machine Learning? Types of Machine Learning, Problems Not To Be Solved Using Machine Learning, Applications of Machine Learning.

Preparing to Model- Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

Modeling & Evaluation, Basics of Feature Engineering:

Modeling & Evaluation - Introduction, Selecting a Model, Training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model.

Basics of Feature Engineering - Introduction, Feature Transformation, Feature Subset Selection.

Unit-2: Bayesian Concept Learning and Regression:

Bayesian Concept Learning - Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network.

Regression: Introduction, Regression Algorithms - Simple linear regression, Multiple linear regression, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

Unit-3: Supervised Learning: Classification, Ensemble Learning: Classification-Introduction, Example of Supervised Learning, Classification Model, Classification

Learning Steps, Common Classification Algorithms - k-Nearest Neighbour (KNN), Decision tree, Random forest model, Support vector machines.

Ensemble Learning- Boosting, Bagging

Unit-4: Basics of Neural Network

Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network, Learning Process in ANN, Backpropagation, Deep Learning

Unit-5: Unsupervised Learning:

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning.

Principle Component Analysis: Introduction, Probabilistic PCA- Maximum Likelihood PCA, EM Algorithm for PCA, Bayesian PCA, Factor Analysis; Kernel PCA

Clustering: Clustering as a Machine Learning task, Different types of clustering techniques, Partitioning methods, Hierarchical clustering, Density-based methods: DBSCAN.

Finding Pattern using Association Rule - Definition of common terms, Association rule, Apriori algorithm.

Text Books:

1. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, “Machine Learning”, Pearson Education India ,1st edition.
2. Christopher M. Bishop, “Pattern Recognition and Machine Learning”. New York :Springer, 2006.

Reference Books:

1. Tom M. Mitchell, “Machine Learning’, MGH, 1997.
2. Shai Shalev-Shwartz, ShaiBen David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge.
3. Peter Harington, “Machine Learning in Action” , Cengage, 1st edition, 2012.

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20CE6T08 REMOTE SENSING AND GIS (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Learn various types of sensors and platforms
- learn concepts of visual and digital image analyses
- Understand the principles of spatial analysis
- Appreciate application of RS and GIS to Civil engineering

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Be familiar with ground, air and satellite based sensor platforms.

CO2: Interpret the aerial photographs and satellite imageries

CO3: Create and input spatial data for GIS application

CO4: Apply RS and GIS concepts in water resources engineering

SYLLABUS

UNIT–I:

Introduction to remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems. Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

UNIT–II:

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT–III:

Geographic Information System: Introduction, key components, application areas of GIS, map projections. Data entry and preparation: spatial data input, raster data models, vector data Models.

UNIT – IV:

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT–V:

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications. Application to Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management.

Text Books:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

Reference Books:

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A KW Yeung, Prentice Hall (India), 2006
3. 'Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. 'Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE6T09 ENVIRONMENTAL IMPACT ASSESSMENT (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- impart knowledge on different concepts of Environmental Impact Assessment
- know procedures of risk assessment
- learn the EIA methodologies and the criterion for selection of EIA methods
- pre-requisites for ISO 14001 certification
- know the procedures for environmental clearances and audit
- appreciate the importance of stakeholder participation in EIA

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Prepare EMP, EIS, and EIA report

CO2: Identify the risks and impacts of a project

CO3: Selection of an appropriate EIA methodology

CO4: Evaluation the EIA report

CO5: Estimate the cost benefit ratio of a project

CO6: Know the role of stakeholder and public hearing in the preparation of EIA

SYLLABUS

UNIT–I:

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA.

UNIT–II:

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP.

UNIT-III:

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV:

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with

reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT–V:

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

Reference Books:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20EE6T08 RENEWABLE ENERGY SOURCES (OPEN ELECTIVE-II)

Course Objective:

- To give sufficient knowledge about the promising new and renewable sources of energy
- Explain the concept of various forms of renewable energy
- Learn the present energy scenario
- Analyse the environmental aspects of renewable energy resources.

Course Outcomes:

CO1: Know the need of various renewable energy systems

CO2: understand the concepts of bio-energy,

CO3: Acquire the knowledge of OTEC, tidal,

CO4: Acquire the knowledge of geothermal and Alternative energy sources

SYLLABUS

UNIT-I

Introduction: Introduction to energy sources, reserves and estimates, global energy scenario, renewable energy -environment implications, global warming and climate change, limitations of conventional energy sources, classification of non-conventional energy sources - solar energy, wind energy, bio-energy, Ocean Thermal Energy Conversion (OTEC), tidal, geothermal and hydro.

UNIT-II

Bio-energy: Biomass and its sources, energy plantation, production of fuel wood, bio-conversion processes, bio-gas, bio-diesel and ethanol production and utilization, thermo-chemical processes, biomass gasification, process, types of reactors, utilization of producer gas for thermal and electricity generation.

UNIT-III

Ocean thermal energy conversion, tidal, geothermal: Tidal energy, wave energy, data, technology options; open and closed *Ocean thermal energy conversion* cycles, geothermal energy sources, power plant and environmental issues.

UNIT-IV

Fuel Cells: Hydrogen generation-storage, transport and utilization, applications, power generation. Fuel cells-Technologies, types, economics and power generation.

UNIT-V

Solar Energy Storage and Applications:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2006
2. Renewable Energy Resources – Twidell&Wier, CRC Press(Taylor & Francis), 2012
3. *Y. W. B. Charles*, *B.H. Essel*, *―Biomass Conversion and Technology‖*, John Wiley, Latest Edition

Reference Books:

1. Renewable energy resources by G. N. Tiwari, M. K. Ghosal, Alpha Science International, 2005.
2. Renewable Energy Technologies by R. Ramesh, K. Uday Kumar, M. Anandakrishnan, Narosa Publishing House, 1997
3. Non-Conventional Energy Systems by K Mittal, A. H. Wheeler Publishing Company Limited, 01-Jan-1999.
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, P.H.I.
5. Godfrey Boyle, ―Renewable Energy- Power for a Sustainable Future‖, Oxford University Press, U.K.,
6. Twidell, J.W. & Weir, A., ―Renewable Energy Sources‖, E.F.N Spon Ltd., UK.

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE6T09 ENERGY AUDIT, CONSERVATION AND MANAGEMENT (OPEN ELECTIVE-II)

Course Objective:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Course Outcomes:
At the end of the course student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

SYLLABUS

UNIT-I

Basic Principles of Energy Audit and management: Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Piecharts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions –Language – Questionnaire – Check list for top management.

UNIT-II

Lighting: Modification of existing systems – Replacement of existing systems – Priorities**:** Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level –Illumination of inclined surface to beam – Luminance or brightness – Types of lamps –Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT-III

Power Factor and energy instruments: Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters– Tong testers – Power analyzer.

UNIT-IV

Space Heating and Ventilation: Ventilation – Air–Conditioning (HVAC) and Water Heating**:** Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning –Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

UNIT-V

Economic Aspects and Financial Analysis: Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems.

Computation of Economic Aspects

Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment –Numerical examples.

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd– 2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevierpublications. 2012
2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
4. Energy management hand book by W.C.Turner, John wiley and sons.
5. Energy management and conservation –k v

B.TECH VI SEMESTER **OEC**

L	T	P	C
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20ME6T07 INDUSTRIAL ROBOTICS (OPEN ELECTIVE-II)

Pre-requisite: Kinematics and Mathematics

Course Objective:

1. The student will be exposed to the concepts of automation and fundamentals of robotics
2. The students will be exposed to the concepts of transformations and robot kinematics,
3. The students will understand the functioning of sensors and actuators
4. The students will be exposed to robot programming languages and Programming.
5. The student will be exposed to the applications of robotics in manufacturing.

Course Outcomes: At the end of the course, student will be able to

CO1 Understand various applications of robotics and classification of coordinate system and control systems.

CO2 Build the concepts of components of industrial robotics.

CO3 Apply kinematic analysis with D-H notation, forward and inverse kinematics and Solve dynamic analysis with Lagrange – Euler and Newton – Euler formulations.

CO4 Model trajectory planning for a manipulator by avoiding obstacles.

CO5 Understand different types of actuators and applications of robots in manufacturing.

SYLLABUS

UNIT-I:

Introduction: Automation and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT-II: MOTION ANALYSIS AND CONTROL:

Motion Analysis: Basic Rotation Matrices, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT-III:

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion straight line motion.

UNIT-IV:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools.

UNIT-V:

Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.

Text Book(s)

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson, 3rd edition.

References

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
4. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley

5. Introduction to Robotics by SK Saha, The McGrah Hill Company, 6th, 2012
6. Robotics and Control / Mittal R K &Nagrath I J / TMH

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
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20ME6T08 **3D PRINTING (OPEN ELECTIVE-II)**

Pre-requisite: Manufacturing Process

Course Objective:

The course aims at the importance of Additive Manufacturing, Classifications, models, specifications of various Additive Manufacturing Techniques. To learn the different tools, soft-wares required and the applications of Additive Manufacturing

Course Outcomes: At the end of the course, student will be able to

CO1:	Understand the working principle and process parameters of AM processes
CO2:	Explore the applications of AM processes in various fields
CO3:	Apply the suitable process and material for fabricating a given product
CO4:	Use the suitable post process based on product application
CO5:	Design and develop a product for AM Process

SYLLABUS

UNIT-I:

Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT-II:

Machines for Rapid Prototyping: Overview of Polymerization: Stereolithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT-III:

Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive Manufactured Tools, Indirect Rapid

UNIT-IV:

Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture of Metal Components

UNIT-V:

Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2015, 2nd Edition.
2. 3D Printing and Additive Manufacturing: Principles & Applications, Chua Chee Kai, Leong Kah Fai, World Scientific, 2015, 4th Edition.

References:

1. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venuvinod and Weiyin Ma, Springer, 2004.
2. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.
3. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006.

B.TECH VI SEMESTER	OEC	L	T	P	C
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20EC6T07 **ELECTRONIC CIRCUITS AND NETWORKS (OPEN ELECTIVE-II)**

Course Objectives:

At the end of the course, student will be able to

1. To understand the Differentiator and Integrator circuits
2. To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
3. To Introduce to Time-base Generators and Principles of Synchronization and Frequency division.
4. To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.
5. To understand and Design gates using various logic families.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand the basic concepts of Optoelectronic Devices

CO2: Design linear wave shaping circuits.

CO3: Design Non- linear wave shaping circuits.

CO4: Design Different Time Base Generators

CO5: understand the concepts of one port networks

SYLLABUS

UNIT-I: Optoelectronic Devices

Introduction, Photo sensors, Photoconductors, Photodiodes, Phototransistors, Light-Emitting Diodes, Liquid Crystal Displays, Cathode Ray Tube Displays, Emerging Display Technologies, Opto couplers.

UNIT-II: LINEAR WAVE SHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT-III: NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of

voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT-IV: VOLTAGE TIME BASE GENERATORS

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator.

UNIT-V: Synthesis of one port networks

Synthesis of one port networks
Synthesis of reactive one-ports by Foster's and Cauer methods (forms I and II) - Synthesis of LC, RC and RL driving-point functions.

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.

2. K. S. Suresh Kumar, ―Electric Circuit Analysis‖, Pearson Publications, 2013.

Reference Books:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC6T08 PRINCIPLES OF COMMUNICATIONS (OPEN ELECTIVE – II)

Course Objectives:

At the end of the course, student will be able to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Familiarize with the fundamentals of digital communication systems
4. Familiarize with various techniques for digital modulation and demodulation of signals
5. Distinguish the figure of merits of various analog modulation methods

Course Outcomes:

At the end of this course the student will able to:

CO1: Differentiate various Analog modulation schemes

CO2: Analyze demodulation schemes and their spectral characteristics

CO3: Analyze demodulation schemes and their spectral characteristics

CO4: Analyze demodulation schemes and their spectral characteristics

CO5: Analyze noise characteristics of various analog modulation methods

SYLLABUS

UNIT-I: Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver

UNIT-II: Angle Modulation, Frequency and Phase modulation, frequency deviation, Bandwidth, FM Modulators and Demodulators, Narrow band and wide band FM, FM Broadcasting.

UNIT-III: Pulse digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Generation and Demodulation, Frequency Division Multiplexing, Time Division Multiplexing

UNIT-IV: Digital Representation of Analog Signals, Pulse Code Modulation (PCM), Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Mathematical Representation of Noise.

UNIT-V: Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops.

Text Book:

1. Herbert Taub and Donald L. Schilling, ―Principles of Communication Systems., Tata McGrawHill.

2. Rishabh Anand, Communication Systems, Khanna Publishers

Reference Books:

1. B.P.Lathi,―Modern Digital and Analog communication Systems, 3rd Edition, Oxford University Press.

2. Simon Haykin, ―Communication Systems, 4th Edition, Wiley India

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20EC6T09 MICROCONTROLLERS & ITS APPLICATIONS (OPEN ELECTIVE-II)

Course Objectives:

At the end of the course, student will be able to

1. To understand the basics of 8051 Microcontroller and its functionalities
2. To understand the 8051 family instruction set
3. To develop machine language programming in microprocessors.
4. Todesign and develop microcontroller based interfacing for real time applications using low level language like ALP.
5. To understand the basics of ARM architectures and its functionalities.

Course Outcomes:

At the end of this course the student will able to:

CO1: To be able to understand the overview of 8051 Micro controller in general.

CO2: To be able to understand the instruction set of 8051 microcontroller

CO3: To be able to understand the Assembly Language Programming in microcontrollers.

CO4: To be able to understand the microcontroller is interfacing with I/O devices, memory, and serial communication using ALP.

CO5: To be able to understand the overview of ARM Architecture in general.

SYLLABUS

UNIT-I: Introduction to 8051 Microcontrollers

Overview of 8051 microcontrollers, Architecture**,** I/O ports, Memory organization, Addressing modes, SFRs, Counters and timers, Synchronous serial-cum, Asynchronous serial communication, Interrupts and priorities.

UNIT-II: 8051 FAMILY MICROCONTROLLERS INSTRUCTION SET

Basic assembly language programming, Data transfer instructions, Data and bit- manipulation instructions, Arithmetic instructions, Instructions for logical operations on the test among the registers, Program flow control instructions, Interrupt control flow.

UNIT-III: 8051 REAL TIME CONTROL

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the serial communication Interrupts, programming Timers and Counters, serial port and its programming,

UNIT-IV: I/O and Memory Interface and Serial Communication and Bus Interface

I/O and Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer, USART, External Communication Interfaces-RS232,USB

UNIT-V: ARM Architecture:

ARM processor fundamentals, ARM Architecture –Register, exceptions and interrupts, interrupt vector table, ARM instruction set- Data processing, Branch, load and store instructions; Software instructions, Program status register instructions loading constants

TEXTBOOKS:

1. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System
Design, 2/e, Pearson Education, 2005.
2. Kenneth. J. Ayala, The 8051 Microcontroller, 3/e, Cengage Learning, 2004.

REFERENCE:

1. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems, 2/e, Pearson Education, 2007
2. ARM system Developers guide, Andrew N Sloss, Dominic Symes, Chris Wright, Elsevier,2012

B. TECH VI SEMESTER

OEC	L	T	P	C
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INTRODUCTION TO MACHINE LEARNING
20CS6T07 (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

INFORMATION SECURITY
20CS6T08 (OPEN ELECTIVE –II)

Course Objectives:

- Understand the concepts of classical encryption techniques and concepts of finite fields and number theory
- Understand Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Understand the Design issues and working principles of various authentication protocols, PKI standards
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications.

Course Outcomes:

CO1: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

CO2: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO3: Apply different digital signature algorithms to achieve authentication and create secure applications

CO4: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

CO5: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

SYLLABUS

UNIT - I: Classical Encryption Techniques:

The OSI Security Architecture, Security Attacks, Services & Mechanisms, Symmetric Cipher Model, Substitution Techniques: Caesar Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques: Rail fence, Row Transposition cipher, Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT - II:

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Block Cipher Modes of Operations.

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem

UNIT – III:

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security.

Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution

UNIT - IV:

User Authentication: Remote User Authentication Principles, Kerberos.

Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.

UNIT - V:

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS)

Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration

TEXT BOOKS:

1. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition. [Units 1,2,3,4,5]
2. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition. [Units 1,2,3,4,5]

REFERENCES:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

B. TECH VI SEMESTER

OEC	L	T	P	C
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AGILE TECHNOLOGIES
20CS6T09 (OPEN ELECTIVE –II)

COURSE OBJECTIVES:

1. To have an understanding of the Agile Manifesto and Principles
2. To Apply Agile based techniques in each of the development phases.

COURSE OUTCOMES:

CO1: Understand the Agile Manifesto and Principles.
CO2: Apply agile software development practices to create high-quality software.
CO3: Acquire Knowledge on software design, set of software technologies and APIs.
CO4: Examine and demonstrate knowledge of Agile development
CO5: Demonstrate the Agile Approach to estimate project variables, control and Risk Management

SYLLABUS

UNIT-I

Agile Software Development: Genesis of Agile, Introduction and Background, Traditional Model Vs Agile Model, Values of Agile, Agile Manifesto and Principles, Stakeholders, Challenges.

UNIT-II

Lean Approach: Waste Management, Kaizen and Kanban, Add process and products add Value, Roles related to life cycle, Differences between Agile and Traditional Plans, Differences at different life cycle phases, Key techniques, Principles, Understand as a means of assessing the initial status of the project, How agile helps to build quality.

UNIT-III

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, **Agile Requirements:** User story definition, Characteristics and contents of user stories, Acceptance tests and verifying stories, Product Velocity, Burn down chart, Sprint planning and retrospective, Daily Scrum, Scrum roles- Product Owner, Scrum Master, Scrum Team, Scrum Case Study, Tools for Agile Project Management.

UNIT-IV

Agile Software Design and Development: Agile Design practices, Role of design principles including Single Responsibility principle, Open Closed Principle, Liskov Substitution principle, Interface Segregation principles, Dependency Inversion principle in Agile Design, Refactoring- Need and significance, Refactoring techniques, Continuous Integration, Automated Build tools, Version Control.

UNIT-V

Agile Testing and Review: Agile Testing Techniques, Test Driven Development, User Acceptance Test, Agile Metrics and Measurements, The Agile Approach to estimate project variables, Agile control- The 7 control parameters, Agile Approach to Risk, Agile approach to Configuration Management, Atern Principles and Philosophy, Best practices to manage Scrum.

TEXT BOOKS:

1. Robort C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013(Units 1, 3, 5)

2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson(Units 3,4)

3. Mike Cohn, Succeeding with Agile: Software Development Using Scrum, Addison Wesley Series.(Units 3, 4)

REFERENCES:

1. David J. Anderson and Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer,.

3. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley.

4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and management, Butterworth-Heinemann.

B. TECH VI SEMESTER

OEC	L	T	P	C
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20IT6T07 FUNDAMENTALS OF MACHINE LEARNING (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
4. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

20IT6T08 DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE –II)

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases

Course Outcomes:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT-I: Database System Applications:

A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT-II: Introduction to the Relational Model:

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III: SQL:

QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL.

UNIT-IV: Schema Refinement (Normalization):

Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.

UNIT-V: Transaction Management and Concurrency Control:

Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL” by Shashan k Tiwari, 2011, WROX Press.

REFERENCE:

1. Peter Rob & Carlos Coronel, “Data base Systems design, Implementation, and Management”, 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, “Data base System Concepts”, 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
4. C.J.Date, “Introduction to Database Systems”, 7th Edition, Pearson Education, 2002

B. TECH VI SEMESTER

OEC	L	T	P	C
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OPERATIONS RESEARCH
20HS6T01 (OPEN ELECTIVE –II)

Course Objectives:

1) Identify and develop operational research models from the verbal description of the real system.
2) Understand the mathematical tools that are needed to solve optimization problems.
3) Use mathematical software to solve the proposed models.
4) Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

Course Outcomes:

CO1: Understand the methodology of Operations Research& concepts of linear programming

CO2: Formulate the solutions to transportation problems

CO3: Explain the solutions for various sequencing problems

CO4: Illustrate the solutions to different replacement policies

CO5: Apply game theory to solve real world problems

SYLLABUS

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions**.**

UNIT-II

Transportation Problem. Formulation, Solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.

UNIT-III

Assignment model. Formulation. Hungarian Method for optimal solution. Solving Unbalanced problem. Sequencing Models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines Processing n Jobs through m Machines.

UNIT-IV

Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

UNIT-V

Game Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

Inventory models. Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

TEXT BOOKS:

1) P. SankaraIyer,”Operations Research”, Tata McGraw-Hill, 2008.
2) A.M. Natarajan, P. Balasubramani, A. Tamilarasi, “Operations Research”, Pearson Education, 2005.

REFERENCES:

1) J K Sharma. “Operations Research Theory & Applications, 3e”, Macmillan India Ltd, 2007.
2) P. K. Gupta and D. S. Hira, “Operations Research”, S. Chand & co., 2007.

B. TECH VI SEMESTER

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OEC	3	0	0	3

20MB6T01 ORGANIZATIONAL BEHAVIOUR (OPEN ELECTIVE –II)

Course Objectives

1. To understand the fundamentals of Organizational Behaviour.
2. For the understanding and balancing of Values and Emotions at work place.
3. To improve the student's Personality and Attitude.
4. To understand and improve the skill of perception and Group Behaviour.
5. Understanding and managing organizational culture, leadership and conflict.

Course Outcomes

Learning Organizational Behavior enables engineers:

CO1: To understand the psychology of workers and other members in the organization.

CO2: To be equipped with the right knowledge and skills regarding organizational processes, group behavior, organizational structure and culture.

CO3: To build up strategies for development at their work place.

CO4: To motivate and control employees.

CO5: To resolve organizational conflict effectively.

SYLLABUS

UNIT I

Fundamentals of OB: Definition, Scope and Importance of OB, Relationship between OB and the individual, Evolution of OB, Models of OB (Autocratic, Custodial, Supportive, Collegial & SOBC), Limitations of OB.

Unit II

Values, Attitudes and Emotions: Introduction, Values, Attitudes, Definition and Concept of Emotions, Emotional Intelligence - Fundamentals of Emotional Intelligence, The Emotional Competence Framework, Benefits of Emotional Intelligence, difference between EQ and IQ. Stress at workplace: Work Stressors – Prevention and Management of stress – Balancing work and Life, Workplace spirituality.

Unit III

Personality & Attitude: Definition Personality, importance of personality in Performance, The Myers-Briggs Type Indicator and The Big Five personality model, Johari Window, Transaction Analysis. Attitude – Definition, Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude.

Unit IV

Perception: Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). Motivation:

Definition & Concept of Motive & Motivation. Group and Team Dynamics: Meaning Group Dynamics, Types of Groups, Group Development, Team Effectiveness & Team Building.

Unit V

Organizational Culture: Types of Culture, Creating and Maintaining Organization Culture, Managing Cultural Diversity. Organizational Change: Types of Organizational change, Forces that acts as stimulants to change, overcome the Resistance to Change, Developing a Learning Organization. Leadership: Introduction, Managers V/s Leaders. Overview of Leadership- Traits and Types. Conflict Management: Sources of Conflict, Types of Conflict, Conflict Management Approaches.

Text Books

1. Pareek Udai: "Understanding Organizational Behavior", Oxford University Press, New Delhi, 2007.

1. K.Aswathappa: "Organizational Behavior-Text, Cases and Games", Himalaya Publishing House, New Delhi,2008.

2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "Organizational Behavior", Tata McGraw Hill Education, New Delhi, 2008.

References

1. Jerald Greenberg and Robert A Baron: "Behavior in Organizations", PHI Learning Pvt Ltd, New Delhi, 2009.

2. Robbins, Stephen P. Organizational behavior, 14/E. Pearson Education India, 2001.

B. TECH VI SEMESTER

OEC	L	T	P	C
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20MB6T02 PROJECT MANAGEMENT (OPEN ELECTIVE –II)

Course Objectives

The objective of this course is to enable the students to gain basic knowledge about the concept of project, project management, project life-cycle, project appraisal; to acquaint the students about various issues of project management.

SYLLABUS

Unit -I

Basics of Project Management –Concept– Project environment – Types of Projects – Project life cycle – Project proposals – Monitoring project progress – Project appraisal and Project selection – Causes of delay in Project commissioning– Remedies to avoid overruns. Identification of Investment opportunities – Sources of new project ideas, preliminary screening of projects – Components for project feasibility studies.

Unit- II

Market feasibility -Market survey – Categories of Market survey – steps involved in conducting market survey– Demand forecasting techniques, sales projections.

Unit- III

Technical and Legal feasibility: Production technology, materials and inputs, plant capacity, site selection, plant layout, Managerial Feasibility Project organization and responsibilities. Legalities – Basic legal provisions. Development of Programme Evaluation & Review Technique (PERT) –Construction of PERT (Project duration and valuation, slack and critical activities, critical path interpretation) – Critical Path Method (CPM)

Unit- IV

Financial feasibility – Capital Expenditure – Criteria and Investment strategies – Capital Investment Appraisal Techniques (Non DCF and DCF) – Risk analysis – Cost and financial feasibility – Cost of project and means of financing — Estimation of cash flows – Estimation of Capital costs and operating costs; Revenue estimation – Income – Determinants – Forecasting income –Operational feasibility - Breakeven point – Economics of working.

Unit -V

Project Implementation and Review: Forms of project organization – project planning – project control – human aspects of project management – prerequisites for successful project implementation – project review – performance evaluation – abandonment analysis.

Text Books

1. Prasanna Chandra, ―Projects, Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill Company Pvt. Ltd., New Delhi 1998.

2. Gido: Effective Project Management, 2e, Thomson, 2007.

References

1. Singh M.K, ―Project Evaluation and Management‖.

2. Vasanth Desai, Project Management, 4th edition, Himalaya Publications 2018.

3. Clifford F. Gray, Erik W. Larson, ―Project Management, the Managerial Emphasis, McGraw Hill, 2000.

B. TECH VI SEMESTER

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OEC	3	0	0	3

20AM6T07 BIG DATA ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: Data Base Management System

Course objectives:

In this course student will learn about

1. To understand the need of Big Data, challenges and different analytical architectures
2. Installation and understanding of Hadoop Architecture and its ecosystems
3. Processing of Big Data with Advanced architectures like Spark.
4. Describe graphs and streaming data in Spark.

Course Outcomes: At the end of the course, student will be able to

CO1: Discuss the challenges and their solutions in Big Data

CO2: Understand and work on Hadoop Framework and eco systems.

CO3: Explain and Analyze the Big Data using Map-reduce programming in Both Hadoop and Spark framework.

CO4: Demonstrate spark programming with different programming languages.

CO5: Demonstrate the graph algorithms and live streaming data in Spark.

SYLLABUS

Unit-I:

Introduction to big data: Data, Types of digital data, Evolution and Definition of big data, Challenges of big data, Characteristics and Need of big data.

Introduction to Hadoop: Introducing Hadoop, need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Hadoop Distributors.

HDFS (Hadoop Distributed File System): HDFS Daemons, Anatomy of file read, Anatomy of file write, working with HDFS commands.

Unit-II:

Introduction to MAPREDUCE Programming: Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Mapper, Reducer, Combiner, Partitioner, Searching, Sorting , Compression, Hadoop EcoSystem.

Unit-III:

Introduction to Pig: Key Features of pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, Relational Operators.

Introduction to HIVE: HIVE features, HIVE architecture, HIVE datatypes, HIVE File Formats, HIVE Query Language.

Unit-IV:

NoSQL: Introduction to NOSQL, Types of NoSQL Databases, and Advantages of NoSQL databases, CAP Theorem, BASE, SQL versus NoSql.

NoSQL databases: Introduction to MongoDB, Data types in MongoDB, MongoDB query language.

Unit-V:

Spark: Introduction to data analytics with Spark, Spark Stack, Programming with RDDS, Working with key/value pairs, Spark SQL, Schema RDDs,

Sparking Streaming: High level architecture of Spark Streaming, DStreams, Transformations on DStreams, Different Types of Transformations on DStreams.

Text Books:

[1].SeemaAcharya, SubhashiniChellappan, Big Data and Analytics, Wiley Publishers

[2].Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia, "Learning Spark: Lightning-Fast Big Data Analysis", O'Reilly Media, Inc.

Reference Books:

[1]. TomWhite, Hadoop,“TheDefinitiveGuide”,3rdEdition,O’ReillyPublications, 2012.

[2].David Loshin, "BigDataAnalytics: From Strategic Planning to Enterprise IntegrationwithTools,Techniques,NoSQL,andGraph”,MorganKaufmannPublishers, 2013

[3].Hadoopin PracticebyAlexHolmes, MANNING

[4].Hadoop in Action byChuckLam, MANNING

[5] Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , “Understanding Big Data Analytics for Enterprise ClassHadoopandStreamingData”, 1st Edition, TMH,2012.

[6] HienLuu, Beginning Apache Spark 2

E-resources and Other digital materials:

[1].Big Data Use cases for Beginners | Real Life Case Studies | Success Stories https://www.youtube.com/watch?v=HHR0-iJp2sM

[2]. Alexey Grishchenko, Hadoopvs MPP, https://0x0fff.com/hadoop-vs-mpp/

[3]. Random notes on bigdata- SlideShare: Available www.slideshare.net/yiranpang/random-notes-on-big-data-26439474

B. TECH VI SEMESTER

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20AD6T07 VISUAL ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: There is no prerequisite to learn this course.

Course Objective: *This **course*** explains apply the fundamentals of Tableau tool, Use all the basic functionality to visualize their data, Connect to various data sources, Build a variety of basic charts, Combine insights into a useable dashboard, Share and publish visualizations.

Course Outcomes: At the end of the course, student will be able to

CO1: Examine, navigate, and learn to use the various features of Tableau

CO2: Create and design visualizations and dashboards for your intended audience

CO3: apply predicative analytics to improve business decision making

CO4: Assess the quality of the data and perform exploratory analysis

CO5: Combine the data to and follow the best practices to present your story

SYLLABUS

UNIT-1:

Introduction: Tableau Application Suite, Installing and Activating Tableau Desktop, Data Preparation, Finding the Dataset, Understanding the Data, The Tableau Workspace, Saving, Opening, and Sharing Your Workbooks, Setting Up a Data Connector, Adding a Table to a Data Model, Data Extracts and Live Connections, Data Protection and Data Governance, Data Types, Data Collection with IFTTT and Google Sheets, Website Analysis with Google Analytics, Performance Optimization.

UNIT-2:

Data Visualizations and Aggregate Functions: Chart Types, Scatter Plots, Bar Charts, Legends, Filters, and Hierarchies, Line Charts, Straight Lines, Step Charts, Continuous Date Fields, Highlight Tables, Heat maps, Bullet Charts, Aggregate Functions, Calculated Fields, Aggregations in Calculated Fields, Text Operators, Splits, Date Fields, and Formats, Working with NULL Values, Parameters

UNIT-3:

Table Calculations and Maps: Different Types of Calculations, Quick Table Calculations, Customized Table Calculations, Bump Charts, Dual Axis Charts, Keywords and Syntax, Cohort Analysis, Regional Averages, Different Types of Maps, Map Layers, Maps with Pie Charts: Creating a Pie Chart Map, Dual Axis Map Embedding the Chart in Tooltips, Mapbox Maps, Mapbox in Tableau, Using the Background Map, Spatial Data.

UNIT-4:

Advanced Analytics and Interactive Dashboards: Overview of the Tableau Analytics Pane, Constant, Average, and Reference Lines, Trend Lines, Forecasts, Model Description, Cluster Analysis, Clustering in Tableau, Python, R, and MATLAB Integration, Connecting Tableau with TabPy, Security, The Dashboard Pane, Placing Charts on the Dashboard, Dashboard Actions, Filter Actions, Adding Web Content via URL Actions, Design Tips for Creating a Dashboard

UNIT-5:

Data Preparation with Tableau: Connecting to Data, Wildcard Unions, Inspecting the Data, Removing Unneeded Fields, Data Cleaning and Formatting, Cleaning Steps and Built-in Cleaning Features, Unions, Joins, Splits Grouping, Running the Flow and Outputting the Data, Saving Flows.

Text Book:

Alexander Loth, "**Visual Analytics with Tableau**", ISBN: 978-1-119-56020-3, Wiley 2019

Reference Books:

1. "**Visual Thinking for Design"** by Colin Ware
2. "**Storytelling With Data: A Data Visualization Guide for Business Professionals"** by Cole Nussbaumer Knaflic
3. "**Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics"** by Nathan Yau

B.TECH VII SEMESTER **OEC**

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20CE7T13 CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE-III)

Course Objectives:

- To introduce to the student the concept of project management including network drawing and monitoring
- To introduce various equipments like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
- to introduce the importance of safety in construction projects

Course Outcomes:

CO1: appreciate the importance of construction planning

CO2: understand the functioning of various earth moving equipment

CO3: the methods of production of aggregate products and concreting and usage of machinery required for the works.

CO4: apply the gained knowledge to project management and construction techniques

SYLLABUS

UNIT-I:

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts– critical Path Method – Applications

UNIT-II:

Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT-III:

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types

UNIT–IV:

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers –graders – scrapers– draglines - clamshell buckets

UNIT –V:

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers– selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality

control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder, Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

Reference Books:

1. Construction Project Management - An Integrated Approach, Peter Fewings, Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

B.TECH VII SEMESTER **OEC**

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20CE7T14 GREEN BUILDINGS
(OPEN ELECTIVE-III)

Course Objectives:

- To introduce the different concepts of green building techniques and how they may be synthesized to best fit a construction.
- To Know the importance of Green buildings
- To know and implement energy conservation and renewable resources
- To understand the knowledge of ECBC, LEED, GRIHA etc.

Course Outcomes:

CO1: Able to describe the importance and necessity of green building.

CO2: Able to suggest materials and technologies to improve energy efficiency of building.

CO3: Able to assess a building on the norms available for green building.

SYLLABUS

UNIT-I:

Introduction of Green Buildings, Salient features of green buildings, Advantages of Green Buildings- Sustainable site selection and planning of buildings to improve comfort, day lighting, ventilation, planning for drainage.

UNIT-II:

ENERGY EFFICIENT BUILDINGS Passive cooling and day lighting – Active solar and photovoltaic, building energy analysis methods, Lighting system design, Lighting economics and aesthetics, Impacts of lighting efficiency, Technological options for energy management.

UNIT-III:

ENERGY CONSERVATION Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings, waste to energy management in residential complexes or gated communities.

UNIT-IV:

RENEWABLE ENERGY RESOURCES Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar, windand hydro power appliances, success case studies of fully solar, wind and hydro power energies.

UNIT-V:

ENERGY REQUIREMENT AND GREEN BUILDING RATING SYSTEMS Energy

Conservation Building Code (ECBC) requirement for green buildings, Requirement for green rating systems - Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment (GRIHA), Building automation and building management systems.

Text Books:

1. 'Handbook on Green Practices published by Indian Society of Heating Refrigerating and Airconditioning Engineers', 2009
2. 'Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddyand K.S. Nanjunda Rao.
3. 'Green Building Handbook' by Tomwoolley and Samkimings, 2009

Reference Books:

1. 'Complete Guide to Green Buildings' by Trish riley.
2. 'Non-Conventional Energy Resources' by G. D. Rai, Khanna Publishers.
3. 'Standard for the design for High Performance Green Buildings' by Kent Peterson, 2009
4. Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.

B.TECH VII SEMESTER **OEC**

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20EE7T13 CONCEPT OF POWER SYSTEM ENGINEERING (OPEN ELECTIVE-III)

Course Objective: To develop problem solving skills and understanding of Power System concepts through the application of techniques and principles of electrical Power Generation methods.

Course Outcomes: At the end of the course, student will be able to

CO1: Various electrical Power System Components, Supply systems

CO2: Thermal Power Station working procedure, each module path directions

CO3: Hydro Power Station working procedure, classifications

CO4: Nuclear Power Station working procedure, Chain Reaction

CO5: Solar power generation & Wind Power Generation, Applications

SYLLABUS

UNIT-I: Power System Components

Single line Diagram of Power system, Different kinds of supply system, conventional and Non-conventional energy sources, Applications.

UNIT-II: Thermal Power Stations

Choice of site Selection, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super, heaters, Economizers, electrostatic precipitators

UNIT-III: Hydro & Nuclear Power Stations

Choice of site, arrangement of hydroelectric installations, Hydrology. Mass curve, flow duration curve, classification of Hydro Power Plants, Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components

UNIT-IV: Solar power generation & Wind Power Generation

Solar radiation spectrum. Radiation measurement. Applications of solar thermal systems Solar Photovoltaic (SPV) systems, Introduction to wind energy, basic principles of wind energy conversion.

UNIT-V: Transmission & Distribution

Transmission structure, classifications, types of conductors, primary & secondary distribution, Substation Equipments , layout.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagarand, A Chakrabarti, DhanpatRai& Co. Pvt. Ltd.

2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers
3. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006

B.TECH VII SEMESTER **OEC**

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20EE7T14 INSTRUMENTATION (OPEN ELECTIVE-III)

Course Objectives:

1 To study the basics of measuring system.

2 To study various Electrical transducers and to measure the various types of Non–electrical quantities

3 To study various types of digital voltmeters

4 To study the working principles of various types of oscilloscopes and their applications.

5 To study various types of signal analyzers

Course Outcomes:

CO1: Able to study the basics of measuring system.

CO2: Acquire proper knowledge to use various types of Transducers and able to monitor and measure various parameters such as strain, Fow, temperature and pressure

CO3: Acquire proper knowledge and working principle of various types of digital voltmeters.

CO4: Able to measure various parameters like phase and frequency of a signal with the help of CRO.

CO5: Acquire proper knowledge and able to handle various types of signal analyzers.

SYLLABUS

UNIT-I

Basics of Measuring System: Measuring Systems, Performance Characteristics – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors and Random Errors, Statistical analysis of random errors.

UNIT-II

Transducer Basics and Applications: Definition of transducers – Classification of transducers – Advantages of Electrical transducers –Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers. Measurement of Temperature, Pressure, Strain and Flow.

UNIT-III

Digital Voltmeters: Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type DVM, digital frequency meter – Digital phase angle meter.

UNIT-IV

Oscilloscope: Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns – Sampling oscilloscope, data logger, Transient recorder.

UNIT-V

Signal Analyzers: Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co

Reference Books:

1. Measurement and Instrumentation theory and application, Alan S.Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doeblin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson/Prentice Hall ofIndia
4. Modern Electronic Instrumentation and Measurement techniques – by A.D HelfrickandW.D.Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

B.TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME7T10 GREEN ENGINEERING SYSTEMS (OPEN ELECTIVE -III)

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: The course aims to highlight the significance of alternative sources of energy, green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

Course Outcomes: At the end of the course, student will be able to

CO1: Evaluate the impact of technology on environment

CO2: Compare biological ecology to industrial ecology

CO3: Design eco-friendly product

CO4: Create sustainable products, facilities, processes and infrastructure

CO5: Asses the life cycle of a product to evaluate its impact on energy and materials use. Determine the effects of air and water quality

SYLLABUS

UNIT-I:

INTRODUCTION: SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT-III:

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV: ENERGY EFFICIENT SYSTEMS:

(A) ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V: ENERGY EFFICIENT PROCESSES:

Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/ TMH
2. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3. Green Manufacturing Processes and Systems, Edited / J. Paulo Davim/Springer 2013

References:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international

2. Principles of Solar Engineering / D.YogiGoswami, Frank Krieth& John F Kreider / Taylor & Francis
3. Non-Conventional Energy / Ashok V Desai /New Age International (P) Ltd
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Non conventional Energy Source/ G.D Roy/Standard Publishers
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd
7. Fuel Cell Technology –Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T11 HYBRID ELECTRIC VEHICLES (OPEN ELECTIVE -III)

Pre-requisite: Internal-Combustion engines.

Course Objective:

The main objective of this course is to provide the knowledge on architecture of Hybrid Electric Vehicles, Fuel cells and their sub-systems. The focus is as well on explaining the requirements of hybrid electric vehicles and Fuel-cells for automobile applications. At the same time, various design considerations in fuel cell vehicles and electric vehicles will be explained.

Course Outcomes: At the end of the course, student will be able to

CO1:	Compare and contrast the working of Conventional and Electric Vehicles.
CO2:	Comprehend the use of Series and Hybrid Electric vehicle drive trains
CO3:	Apply the fundamentals of to develop the propulsion and storage systems for Hybrid Electric Vehicles.
CO4:	Perform a case study on Hybrid Electric vehicle drive trains for different parameters
CO5:	Describe the working principle of various types of fuel-cells.

SYLLABUS

UNIT-I:

ELECTRIC VEHICLES: Introduction, Electric Vehicle Principle- Components of Electric Vehicle Constituents of a conventional vehicle-Drive cycles and Drive Terrain, Operating principle of Fuel Cell, Differences between conventional battery and Electric battery, Transmission differences between conventional and Electric Vehicles, Differences between conventional lighting system and Electric vehicle lighting system.

UNIT-II:

HYBRID ELECTRIC VEHICLES: Introduction, A Brief history of Hybrid Electric vehicles (HEVs),Basics of Hybrid Electric Vehicles (HEVs), Architecture of HEVs-Series HEVs, Parallel HEVs, Series-Parallel HEVs.

HYBRID ELECTRIC VEHICLE DRIVE TRAINS: Parallel Hybrid Drive trains with Torque coupling, Parallel Hybrid Drive trains with both Speed coupling, Parallel Hybrid Drive trains with both speed Torque coupling.

UNIT-III:

ELECTRIC PROPULSION SYSTEMS: DC Motors- Operating principle and control of DC motors, Induction Motor Drives: Operating principle and Control Mechanisms, Brushless Motor Drives-Principle and Construction, Switched Reluctance Motor (SRM) Drives- Basic structure, Drive Convertor, Modes of Operation.

ENERGY STORAGE SYSTEMS: Electrochemical Batteries, Lead-Acid Batteries, Nickel Based Batteries, Lithium Based Batteries, Ultra Capacitors- Basic Principles and Performance, Ultrahigh-speed flywheels- Basic Principle and Power Capacity, Fly Wheel technologies.

UNIT-IV:

DESIGN OF SERIES HYBRID ELECTRIC VEHICLE DRIVES: Design of Series Hybrid Electric Vehicle Drive- Control Strategies, Sizing of Major Components and Case Study for designing for various parameters.

DESIGN OF PARALLEL HYBRID ELECTRIC VEHICLE DRIVES: Design of Parallel Hybrid Electric Vehicle Drive- Control Strategies of Drive Train and Design of Drive Train Parameters.

UNIT-V:

FUEL CELL ELECTRIC VEHICLES: Operating principles of fuel cells, Fuel and oxidant consumption, Fuel cell system characteristics, Fuel cell technologies- Proton Exchange membrane fuel cells, Alkaline Fuel cells, Phosphoric acid fuel cells, Molten carbonate fuel cells, Solid oxide fuel cells, Fuel supply- Hydrogen storage-Hydrogen production, Ammonia as hydrogen carrier, Non-Hydrogen fuel cells, Fuel Cell Hybrid Vehicle Drive Train.

Text Books:

1) MehrdadEhsani, YiminGao, Ali Emadi, 2nd edition, Modern Electric, Hybrid Electric and Fuel cell vehicles, CRC Press, Taylor and Francis Group, 2010.
2) Chris Mi, M.AbulMasrur and David WenzhongGao, 1st Edition, Hybrid Electric Vehicles, John Wiley & Sons, Ltd, 2011.

B. TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC7T10 DATA COMMUNICATIONS (OPEN ELECTIVE-III)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To focus on information sharing and networks.
2. To Introduce flow of data, categories of network, different topologies.
3. To focus on different coding schemes.
4. To brief the students regarding protocols and standards.
5. To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices, etc.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1:	Know basic knowledge of data Communication
CO2:	Know basic knowledge of Analog & Digital Signals
CO3:	Understand the basic knowledge of Analog Transmission
CO4:	know Different types of transmission media
CO5:	Focus on DTE-DCE Interface

SYLLABUS

UNIT-I:

Introduction to data communication and networking: Reason to study data communication, Data Communication, Networks, Protocols and Standards, Standards Organizations. Line Configuration, Topology, Transmission Modes, Categories of Networks Internet works. Study of OSI and TCP/IP protocol suit: The Model, Functions of the layers, TCP/IP Protocol Suites

UNIT-II:

Study of Signals: Analog and Digital, Periodic and Aperiodic Signals, Analog Signals, Time and Frequency Domains, Composite Signals, Digital Signals. Study of Digital transmission: Digital to Digital Conversion, Analog to Digital Conversion.

UNIT-III:

Study of Analog transmission: Digital to Analog Conversion, Analog to Analog Conversion. Study of Multiplexing: Many to one/one to Many, Frequency division Multiplexing, Wage division Multiplexing, Time division Multiplexing, Multiplexing applications.

UNIT-IV:

Types of transmission media: Guided Media, Unguided Media, Transmission Impairments, Performance Wavelength, Shannon Capacity, Media Comparison, PSTN, Switching. Error Detection and Correction: Types of Errors, Detection, Parity Check, Vertical Redundancy Check, Longitudinal Redundancy Check, Cyclic Redundancy Check, Checksum, Error Correction.

UNIT-V:

Study of DTE-DCE in brief: Digital data transmission, DTE-DCE Interface, Modems, 56K Modems, Cable Modems. Introduction to networks and devices: Network classes, Repeaters, Hub, Bridges, Switches, Routers, Gateways Routers, Routing Algorithms, Distance Vector Routing, Link State Routing.

Text Books:

1. Data communication & Networking by Bahrouz Forouzan.

2. Computer Networks by Andrew S. Tanenbaum

Reference Books:

1. Data and Computer Communications by William Stallings

2. Kleinrock, Leonard. Queueing Systems, Vol 1: Theory. New York, NY: Wiley J., 1975. ISBN: 0471491101.

B. Tech VII Semester **OEC**

L	T	P	C
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20EC7T11 MECHATRONICS (OPEN ELECTIVE III)

Course Objective: The main objective of this course is

- To introduce the integrative nature of Mechatronics.
- To describe the basic programming, different components and devices of mechatronics systems.

Course Outcomes:
At the end of this course the student will able to:

CO1: Basic concepts of mechatronics

CO2: To design mechatronics system with the help of Microprocessor

CO3: To design PLC and other electrical and Electronics Circuits

CO4: To understand the concept of solid state Devices

CO5: To know Dynamic models & controllers

SYLLABUS

UNIT-I:

Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors.

UNIT-II:

Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontrollers – Block diagram

UNIT-III:

Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC, Basic programming in PLC.

UNIT-IV:

Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning, operational amplifiers, noise reduction, filtering.

UNIT-V:

Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trend

TEXT BOOKS:

1. Bolton, ―Mechatronics‖, Printice Hall, 2000

2. Ramesh S Gaonkar, ―Microprocessor Architecture, Programming, and Applications with the 8085‖, 5th Edition, Prentice Hall, 2008.

REFERENCE BOOKS:

1. Mechatronics System Design / Devdas shetty/Richard/Thomson.

2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

BIOMEDICAL INSTRUMENTATION.
20EC7T12 (OPEN ELECTIVE III)

Course Objectives:
1. To introduce student to basic biomedical engineering technology
2. To understand the anatomy & physiology of major systems of the body in designing equipment for medical treatments.
3. To impart knowledge about the principle and working of different types of bio-medical electronic equipment/devices.

Course- Outcomes:
After going through this course the student will able

CO1.To understand Physiological System of the Body and Bioelectric Potentials.

CO2.To understand Electrodes, Transducer and Sensors used in Biomedical field.

CO3 To understand the problem and identify the necessity of equipment for diagnosis and therapy.

CO4 To understand the importance of electronics engineering in medical field.

CO5 To understand the importance of telemetry in patient care

SYLLABUS

UNIT-1: INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT-II: ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output**.**

UNIT-III: CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV: PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids, Laparoscope, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention,

UNIT-V: DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring.

Text Books:

1. Bio-Medical Instrumentation‖, Cromwell , Wiebell, Pfeiffer
2. Hand Book of Bio-Medical Instrumentation‖, Instrumentation‖, Kandahar. McGraw-Hill

References

1. Introduction to Bio-Medical Equipment Technology‖, 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. “Bio-Medical Electronics and Instrumentation”, Onkar N. Pandey, Rakesh Kumar, Katson Books.

B. TECH VII SEMESTER

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ARTIFICIAL NEURAL NETWORKS.

20CS7T10 (OPEN ELECTIVE III)

Course Objectives:

- To deal with the historical developments of artificial intelligence leading to artificial neural networks (ANN).
- To introduce the basic concepts and models of ANN for solving real world problems.

Course Outcomes:

At the end of this course the student will be able to:

CO1- Understand biological neuron & artificial neuron and basic building blocks of ANN.

CO2-Understand different single layer/multiple layer Perceptron learning algorithms.

CO3- Understand and analyze Adaline and Madeline Networks and their applications

CO4- Learning algorithms based on basic gradient descent, backpropagation and their modifications.

CO5- Understand self-organization learning, ART, Radial basis Functions.

SYLLABUS

UNIT - I: Introduction to Artificial Neural Networks:

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT - II: Fundamental Models of Artificial Neural Networks:

Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS)Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.

Perceptron Networks: Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks

UNIT – III: Adaline and Madaline Networks:

Introduction, Adaline, Madaline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

UNIT - IV: Feedback Networks:

Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets.

Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT - V: Self Organizing Feature Map:

Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

Adaptive Resonance Theory: Introduction, ART Fundamentals, ART 1, ART2.

TEXT BOOKS:

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL : 2005.

REFERENCES:

1. “Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

CYBER SECURITY
20CS7T11 (OPEN ELECTIVE III)

Course Objective:

- Understand the importance of Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

Course Outcomes:

CO1: Understand and classify various forms of Cybercrimes

CO2: Interpret the reasons for Cyber offence

CO3: Detect and analyze vulnerabilities in Mobile and Wireless devices

CO4: Analyze tools used to perform cyber crimes

CO5: Understand cyber security Laws

SYLLABUS:

UNIT-I: Introduction, Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes

UNIT-II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT-III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT-IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-V: Cybercrimes and Cyber security:

The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

B. TECH VII SEMESTER

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SOFTWARE TESTING METHODOLOGIES
20CS7T12 (OPEN ELECTIVE III)

Course Objectives:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To Understand different levels of Testing
- Apply Black Box and White Box Testing Techniques
- To learn how to plan a test project, design test cases and data, conduct testing operations, and generate a test report.
- To understand software test automation problems and solutions.

Course Outcomes:

CO1: Have an ability to apply software testing knowledge and engineering methods.

CO2: Ability to identify the needs of software test automation, and define a test tool to support test automation.

CO3: Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

CO4: Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

CO5: Apply techniques and skills to use modern software testing tools to support software testing projects.

SYLLABUS

UNIT-I: Software Testing:

Introduction, Evolution, Dichotomies, Goals & Typical Objectives of Testing, Model for testing, Software Testing Principles, **Software Testing Terminology and Methodology:** Software Testing Terminology, Errors, Defects, Failures, Root Causes and Effects, Software Testing Life Cycle, Software Testing Methodology.

UNIT-II: Verification and Validation:

Verification & Validation Activities, Categories of Test Techniques: Dynamic Testing,

Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing,

White-Box Testing: Need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT-III: Static Testing:

Inspections, Structured Walkthroughs, Technical reviews, Benefits of Static Testing, Static Vs Dynamic Testing.

Levels of Testing: Unit testing, Integration Testing,. Function testing, System testing and Acceptance testing.

Regression testing: Progressive Vs Regressive testing, Objectives of regression testing, Regression testing techniques

UNIT-IV: Test Management:

Test Organization, Test Planning, Test Design and Test case specifications, Structure of a Testing Group, Reasons for the growth of a Test suite, Test suite Minimization, Test suite prioritization, Types of test case prioritization, prioritization techniques, Measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models

Debugging: Debugging process, Debugging Techniques, Correcting Bugs, Debuggers

UNIT-V: Automation and Testing Tools:

Need for automation, Testing Tool Considerations, Test Tool Classification, Benefits and Risks of Test automation, Special Considerations for Test execution and Test Management Tools, Principles for tool selection, Testing tools- success factors, Guidelines for automated testing, overview of some commercial testing tools.

Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web **engineering**, testing of web based systems, Testing mobile systems.

TEXT BOOKS:

1. Software testing techniques - Baris Beizer, International Thomson computer press, second edition. (Unit 1)
2. Software Testing, Principles and Practices, Naresh Chauhan, Oxford Publishers(Unit 2,3,4,5)

REFERENCES:

Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

1. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
2. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

B. TECH VII SEMESTER

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OEC	3	0	0	3

INTERNET OF THINGS
20IT7T10 (OPEN ELECTIVE III)

Course Objectives:

- Understand the architecture of Internet of Things and connected world.
- Explore on use of various hardware, communication and sensing technologies to build IoT applications
- Develop the real time IoT applications to make smart world.
- Understand challenges and future trends in IoT.

Course Outcomes:

CO1: Design and Deployment of IoT.

CO2: Design and comparing M2M with IoT.

CO3: Understand Platform design and modeling of IoT

CO4: Apply IoT in different devices using Python

CO5: Implement IoT and cloud platforms.

SYLLABUS

UNIT-I: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT Enabling Technologies, IoT levels and deployment, domains Specific IoTs.

UNIT-II: IoT and M2M :

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

UNIT-III: IoT Platforms Design Methodology:

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data Structures, control flow, functions, modules, packages, file handling. Raspberry PI with Python, other IoT devices.

UNIT-IV: IoT Protocols:

Messaging Protocols- MQ Telemetry Transport (MQTT), Constrained Application Protocol (CoAP) Transport Protocols-Light Fidelity (Li-Fi), Bluetooth Low Energy (BLE) IoT Protocols: Addressing and Identification: Internet Protocol Version 4 (IPV4), Internet Protocol Version 6(IPV6), Uniform Resource Identifier (URI)

UNIT-V: IoT Physical Servers And Cloud Offerings: Introduction to cloud storage models and communication APIs, WAMP –Auto Bahn for IoT, Xively cloud for IoT, case studies illustrating IoT design –home automation, smart cities, smart environment.

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-on-Approach", VPT, 1st Edition, 2014. (Units1,2,3,5)
2. Matt Richardson, Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 3rd Edition, 2014. (Unit 3)
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram " Internet of Things" Wiley (Unit 4).

REFERENCE BOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons2014.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

COMPUTER VISION
20IT7T11 (OPEN ELECTIVE III)

Course Objectives:

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand motion analysis.
- To study some applications of computer vision algorithms

Course Outcomes:

CO1: Implement fundamental image processing techniques required for computer vision.

CO2: Perform shape analysis.

CO3: Apply Hough Transform for line, circle, and ellipse detections.

CO4: Apply 3D vision techniques.

CO5: Develop applications using computer vision techniques

SYLLABUS

UNIT - I:

IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology –texture.

UNIT - II: SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT – III: HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT - IV: 3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

.**UNIT - V: APPLICATIONS**

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

TEXT BOOKS:

1.D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.

2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.
2. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
3. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
4. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

FUZZY SETS
20HS7T01 (OPEN ELECTIVE III)

COURSE OBJECTIVES:

1) Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
2) Explain different types operations performed on fuzzy sets.
3) Provide the knowledge of Arithmetic operations on fuzzy numbers.
4) Emphasis on different kinds of crisp and fuzzy relations
5) Enable students to know the validity of arguments by fuzzy logic.

COURSE OUTCOMES:

CO1: Understand basic knowledge of fuzzy sets and fuzzy logic.
CO2: Apply various kinds of operations on fuzzy sets.
CO3: Understand the concepts of fuzzy arithmetic to solve fuzzy equations.
CO4: Illustrate the properties of fuzzy sets to design modeling software system.
CO5: Apply fuzzy logic to solve the problems in neural networks.

SYLLABUS

UNIT-I

Fuzzy Sets(all theorems without proofs): Introduction, Crisp sets, Fuzzy sets: Basic types and basic concepts, additional properties of α-cuts, representations of Fuzzy sets, extension principle for Fuzzy sets.

UNIT-II

Operations on Fuzzy Sets(all theorems without proofs): Types of operations, Fuzzy complements, Fuzzy intersections: t-norms, Fuzzy unions: t-conorms, Combinations of operations, Aggregation operations.

UNIT-III

Fuzzy Arithmetic(all theorems without proofs): Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations.

UNIT-IV

Fuzzy Relations(all theorems without proofs): Crisp versus Fuzzy relations, Projection and cylindrical extensions, Binary Fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations, Fuzzy compatibility relations, Fuzzy ordering relations, Fuzzy morphisms.

UNIT-V

Fuzzy Logic(all theorems without proofs): Classical logic: an over view, multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic hedges, Inference from conditional Fuzzy propositions, Inference from conditional and qualified propositions, Inference from quantified propositions.

TEXT BOOKS:

1. George J. Klir& Bo Yuan, Fuzzy Sets & Fuzzy Logic, Pearson Education, PHI, 1995.
2. H. J. Zimmermann, Fuzzy Set Theory and its Applications, 4th edition, Springer.

REFERENCES:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd edition, Wiley, 2010.
2. John Yen & Reza Langari, Fuzzy Logic, Pearson.

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20MB7T01 DIGITAL MEDIA MANAGEMENT (OPEN ELECTIVE III)

Course Objective

Digital marketing channels that can helps the students to understand the increased business visibility and brand awareness. Moreover, having a professional presence on social media helps them to reach a broader target audience to secure more leads and convert them into loyal customers.

SYLLABUS

Unit – I

Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

Unit – II

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How different segments use Digital Media –

Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

Unit – III

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Writing the Marketing Plan and Implementing the Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget.

Unit – IV

Search Engine Marketing and Online Advertising: Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

Unit – V

Social Media Marketing: Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

TEXT BOOKS

1 Richard Gay, Alan Charles worth and Rita Essen, Online Marketing, Oxford University Press, 2016.

REFERENCES

1. Dave Chaffey, Fiona Ellis-Chadwick, Richard Mayer, Kevin Johnston. Internet Marketing Strategy, Implementation and Practice,3rd Ed .Prentice Hall.

2. Rob Stokes e-Marketing: The essential guide to marketing in a digital world. 5th Ed. Quirk e-Marketing (Pty) Ltd.

B. TECH VII SEMESTER

		L	T	P	C
	OEC	3	0	0	3

20MB7T02 ENTREPRENEURSHIP DEVELOPMENT (OPEN ELECTIVE III)

SYLLABUS

UNIT –I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

B. TECH VII SEMESTER

		L	T	P	C
	OEC	3	0	0	3

20AD7T10 **DATA ANALYSIS AND VISUALIZATION WITH PYTHON (OPEN ELECTIVE III)**

Pre-requisite:

Course Objective: *This course* explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

Unit-1:

Preliminaries: What Kinds of Data?, Why Python for Data Analysis?, Python as Glue, Solving the "Two-Language" Problem, Why Not Python?, Essential Python Libraries, Installation and Setup.

Python Language Basics, IPython, and Jupyter Notebooks: The Python Interpreter, IPython Basics, Python Language Basics.

NumPy Basics: Arrays and Vectorized Computation:

The NumPy ndarray: A Multidimensional Array Object, Universal Functions: Fast Element-Wise Array Functions, Array-Oriented Programming with Arrays, File Input and Output with Arrays, Linear Algebra, Pseudorandom Number Generation.

Unit-2:

Introduction to pandas Data Structures: Series, DataFrame, Index Objects

Essential Functionality: Reindexing, Dropping Entries from an Axis, Indexing, Selection, and Filtering, Integer Indexes, Arithmetic and Data Alignment, Function Application and Mapping, Sorting and Ranking, Axis Indexes with Duplicate Labels, Summarizing and Computing Descriptive Statistics: Correlation and Covariance, Unique Values, Value Counts, and Membership.

Unit-3:

Data Loading, Storage, and File Formats Reading and Writing Data in Text Format: Reading Text Files in Pieces, Writing Data to Text Format, Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping

Binary Data Formats: Using HDF5 Format, Reading Microsoft Excel Files

Data Cleaning and Preparation:

Handling Missing Data: Filtering Out Missing Data, Filling In Missing Data

Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, Computing Indicator/Dummy Variables

Unit-4:

Data Wrangling: Join, Combine, and Reshape:

Hierarchical Indexing: Reordering and Sorting Levels, Summary Statistics by Level, Indexing with a DataFrame's columns.

Combining and Merging Datasets: Database-Style DataFrame Joins, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap.

Reshaping and Pivoting: Reshaping with Hierarchical Indexing, Pivoting "Long" to "Wide" Format, Pivoting "Wide" to "Long" Format.

Unit-5:

Plotting and Visualization

A Brief matplotlib API Primer: Figures and Subplots, Colors, Markers, and Line , Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, matplotlib Configuration.

Plotting with pandas and seaborn: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots, Facet Grids and Categorical Data, Other Python Visualization Tools.

Text Book:

"Python for Data Analysis" Data Wrangling With Pandas, Numpy, And Ipython Second Edition by Wes McKinney, Oreilly Publications.

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20AM7T10 NoSQL DATABASES (OPEN ELECTIVE III)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This **course*** explains define, compare and use the four types of NoSQL Databases, demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases, explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases, ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the type of NoSQL database to implement based on business requirements

CO2: Apply NoSQL data modeling from application specific queries

CO3: Understand NoSQL Storage Architecture

CO4: Use Atomic Aggregates and denormalization as data modeling techniques to optimize query processing

CO5: Apply indexing and ordering of data sets

SYLLABUS

Unit-1:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented
Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

Unit-2:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

Unit-3:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value
Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

Unit-4:

NoSQL Stores: Similarities between Sql and Mongodb Query Features, Accessing Data

From Column-Oriented Databases like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution in Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

Unit-5:

Indexing and Ordering Data Sets: Essential Concepts behind a Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Reference Books:

1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional,2012.

2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications,2013.

3) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN:978-0-470-94224-6

4) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE7T15 WASTE WATER TREATMENT
(OPEN ELECTIVE-IV)

Course Objectives: To study about waste water treatment

Course Outcomes: Able to provide waste management techniques

SYLLABUS

UNIT–I:

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

UNIT–II:

Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems, Industrial waste water discharges into streams. Lakes and oceans- consequent problems.

UNIT–III:

Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries, Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods. Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT-IV:

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT–V:

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

Text Books:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

Reference Books:

1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

B.TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20CE7T16 REPAIR AND REHABILITATION OF CONCRETE STRUCTURES
(OPEN ELECTIVE-IV)

Course Objectives:

- Familiarize Students with deterioration of concrete in structures
- Equip student with concepts of NDT and evaluation
- To evaluate the performance of the materials for repair
- To strategize different repair and rehabilitation of structures.

Course Outcomes:

CO1: Explain deterioration of concrete in structures

CO2: Carryout analysis using NDT and evaluate structures

CO3: Students must gain knowledge on quality of concrete

CO4: Examine how the Concrete repair industry equipped with variety of repair Material sand techniques .

SYLLABUS

UNIT–I:

Maintenance and Repair Strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT-II:

Causes of Damage To Structures Causes of Distress in Structures - Extrinsic and Intrinsic causes for damage of structures; Effect of Chemical and Marine Environment on structures.

UNIT-III:

Semi Destructive Tests for Damage Assessment Core Test, LOK test, CAPO test, Penetration Tests Non-Destructive Tests for Damage Assessment Rebound Hammer Test, Ultrasonic Pulse Velocity test, Resistivity Test, Carbonation Test, Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

UNIT-IV:

Materials for Repair: Criteria for durable concrete repair, selection of repair materials, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete, FRP sheets.

UNIT-V:

Techniques for Repair: Crack repair techniques – Crack Stitching, Mortar and dry pack, vacuum concrete, Shotcreting, Epoxy injection, Mortar repair for cracks Methods of Strengthening: Repairs to overcome low member strength – Jacketing, blanketing

Text Books:

1. 'Maintenance & Repair of Civil Structures' by B.L. Gupta & Amit Gupta.
2. 'Rehabilitation of Concrete Structures' by B. Vidivelli, Standard Publishers.
3. 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation' by V. K. Raina

Reference Books:

1. 'Concrete Structures- protection Repair and Rehabilitation' by R. Doodge Woodson, BH Publishers
2. ShettyM.S., "Concrete Technology – Theory and Practice", S. Chand and Company, 2008.
3. Dov Kominetzky. M. S., "Design and Construction Failures", Galgotia Publications Pvt.Ltd., 2001
4. Ravishankar.K., Krishnamoorthy. T. S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
5. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008,
6. Gambhir. M. L., "Concrete Technology", McGraw Hill, 2013

B.TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20EE7T15 POWER QUALITY
(OPEN ELECTIVE-IV)

Course Objective:

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

Course Outcome:

At the end of this course the student should be able to

CO1: Differentiate between different types of power quality problems.

CO2: Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.

CO3: Analyze power quality terms and power quality standards.

CO4: Explain the principle of voltage regulation and power factor improvement methods.

CO5: Explain the power quality monitoring concepts and the usage of measuring instruments.

SYLLABUS

Unit-I

Introduction to Power Quality: Terms and definitions of transients, Long Duration Voltage Variations: Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching DC offset; waveform distortion; voltage fluctuation; power frequency variations.

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction-capacitor switching

transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics, measurement of harmonics, THD; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices" Kluwer Academic Publishers
3. Sankaran, " Power Quality" CRC Press.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis) Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE7T16 ELECTRIC VEHICLES

(OPEN ELECTIVE-IV)

Course Objective:

- To study the different drive train configurations of electric vehicles
- To propose the various propulsion and energy storage systems for EHVs
- To know the sizing of propulsion motors and other systems involved in EH vehicles
- To carry out different design case studies of EHv and BEVs

Course Outcomes: At the end of the course, the student will be able to:

CO1: Assess the performance, societal and environmental impact of EHVs having known their past history

CO2: Implement various drive train topologies and control strategies in Electric and Hybrid vehicles

CO3: Recommend, Design/Size and Control different electric propulsion units and other components of EHVs and BEVs

CO4: Appropriately select the energy storage system and strategize its management in EHVs

CO5: Define Ancillary Service Management and explain different ancillary services.

SYLLABUS

UNIT-I INTRODUCTION TO ELECTRIC VEHICLES:

History of electric vehicles (EV) and hybrid electric vehicle (EHV), need and importance of EV and HEV, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Power/energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics.

UNIT-II HYBRID ELECTRIC DRIVE-TRAINS: Basic architecture and concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

UNIT-III ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, and Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV BATTERY ENERGY STORAGE SYSTEMS:

Battery Basics - Lead-Acid Battery -Cell Discharge Operation - Cell Charge Operation-Construction-Battery Parameters - Battery Capacity-Discharge Rate - State of Charge- State of Discharge- Depth of Discharge-Technical Characteristics - Practical Capacity -Battery Energy -Constant Current Discharge -Specific Energy - Battery Power -Specific Power -Batteries for EV applications.

UNIT-V MODELLING OF EV/HEV:

Modelling and analysis of EV/HEV drive train sizing of motor, and design of traction power electronics, various vehicle subsystems.

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2010.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,2009.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

REFERENCES:

1. Jefferson, C.M., Barnard and R.H., Hybrid Vehicle Propulsion, WIT Press, Boston, 2002
2. Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012
3. SerefSoylu “Electric Vehicles - The Benefits and Barriers”, InTech Publishers, Croatia, 2011
4. Jack Erjavec and Jeff Arias, “Alternative Fuel Technology – Electric, Hybrid and Fuel Cell Vehicles”, Cengage Learning Pvt. Ltd., New Delhi, 2007
5. Seth Leitman, “Build Your Own Electric Vehicle” McGraw hill, New York, USA, 2013

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20ME7T12 **MICRO-ELECTRO- MECHANICAL SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Calculus and Differential Eq., Fundamentals of Physics (Mechanics, Optics, Electricity and magnetism), Fundamentals of Inorganic Chemistry.

Course Objective: The main objective of this course is to introduce the integrative nature of Micro Electro Mechanical systems. To describe the different components and devices of Micro Electro Mechanical systems.

Course Outcomes: At the end of the course, student will be able to

CO1: Explain MEMS and Principles of sensing and actuation

CO2: Explain Thermal Sensors and Actuators & Magnetic Sensors and Actuators

CO3: Explain Micro-Opto-Electro Mechanical Systems

CO4: Explain Radio Frequency (RF) MEMS & Micro Fluidic Systems

CO5: Explain Chemical And Bio Medical Micro Systems

SYLLABUS

UNIT-I:

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT-II:

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, magnetic MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT-III: MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS:

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT-IV:

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

UNIT-V: CHEMICAL AND BIO MEDICAL MICRO SYSTEMS:

Sensing mechanism & principle, membrane transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (Enose), mass sensitive chemosensors, fluroscence detection, calorimetric spectroscopy.

Text Books:

1. MEMS, NitaigourPremchandMahalik, TMH Publishing co.

References:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. Bio-MEMS (Micro systems), Gerald Urban, Springer.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.

B.TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME7T13 **SOLAR ENERGY SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: To impart knowledge on non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

Course Outcomes: At the end of the course, student will be able to

CO1: Significance of renewable energy and describe the principles of solar radiation. Analyze various solar collectors.

CO2: Know the various storage methods and application of solar energy.

CO3: Understand the concept of converting wind energy into electrical energy using both horizontal and vertical axis wind machines.

CO4: Know biomass disasters, functional operation of geothermal systems. Generalize the operation of ocean, tidal and wave energy systems.

CO5: understand the operating principle of direct energy conversion systems .and to recognize the need and ability to engage in lifelong learning for further developments in this field.

SYLLABUS

UNIT-I: FUNDAMENTALS OF SOLAR RADIATION:

Energy conservation principle, Energy scenario (world and India), Solar angles, Solar time, Solar radiation: Outside earth's atmosphere, Earth surface, measurements of solar radiation: Pyrometer, Sunshine recorder, Pyro heliometer.

UNIT-II: ENERGY STORAGE SYSTEMS:

Energy –Environment-Economy Necessity of energy storage, Specifications of energy storage devices, energy storage Methods-Mechanical Energy Storage-Thermal Energy Storage-Sensible Heat Storage-Solid media storage.

UNIT-III: SOLAR COLLECTORS:

Classifications, comparison of concentrating and non-concentrating types – Liquid flat plate collectors, Evacuated tube collectors. Modified flat plate collectors: Compound parabolic concentrator(CPC), Cylindrical parabolic Concentrator, Fixed mirror solar concentrator, Paraboloid Dish Collector.

UNIT-IV: SOLAR THERMAL DEVICES:

Solar water heater, Solar space heating and cooling systems, Solar industrial heating systems, Solar refrigeration and air conditioning systems, Solar Desalination – Solar cooker: domestic, community – Solar pond – Solar drying.

UNIT-V: SOLAR PHOTOVOLTAIC SYSTEMS:

Solar cell fundamentals, Energy band model of semiconductors, Working Principle of photovoltaic cell, solar cell classification, solar cell technologies, solar PV systems-classification. Solar cell –module-array Construction.

Text Books:

1. Goswami D.Y., Kreider, J. F. and Francis., “Principles of Solar Engineering’, Taylor and Francis, 2000.
2. Chetan Singh Solanki, “Solar Photovoltatics – Fundamentals, Technologies and Applications”, PHI Learning Private limited, 2011.
3. Sukhatme S.P., Nayak.J.P, ‘Solar Energy – Principle of Thermal Storage and collection”, Tata McGraw Hill, 2008.
4. Solar Energy International, “Photovoltaic – Design and Installation Manual” – New Society Publishers, 2006.
5. Roger Messenger and Jerry Vnetre, “Photovoltaic Systems Engineering”, CRC Press, 2010.

Reference Books:

1. B.H.Khan “Non – conventional Energy Resources” Tata McGraw Hill education Pvt. Ltd.
2. G.D. Rai, “Non-Conventional Energy Sources”, Dhanpat Rai and Sons .

B. TECH VII SEMESTER

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INTRODUCTION TO EMBEDDED SYSTEMS

20EC7T13 (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained
3. Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed
4. Embedded system implementation and testing tools are introduced and discussed.
   Technology capabilities and limitations of the hardware, software components
5. Design Methodologies

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the basic concepts of an embedded system and able to know an embedded system design Approach to perform a specific function.

CO2: The various embedded firmware design approaches on embedded environment.

CO3: Identify the unique characteristics of real-time systems

CO4: Design, implement and test an embedded system.

CO5: Define the unique design problems and challenges of real-time systems

SYLLABUS

UNIT-I: Introduction to Embedded systems

What is an embedded system Vs. General Computing system, history, classification, major application areas, and purpose of embedded systems, Core of embedded system, Characteristics and Quality Attributes of Embedded systems

UNIT-II: Embedded Hardware Design

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real-time clock, Application specific and Domain specific embedded systems-Examples

UNIT-III:

Embedded Firmware design approaches, Embedded Firmware Development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA,Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV:

Factors to be considered in selecting a controller, 8051 Architecture, RTOS and Scheduling Operating basics, types, RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Types of multitasking, Non preemptive Scheduling, Preemptive Scheduling.

UNIT-V: Design and Development

Embedded system development Environment – IDE, Simulators, Emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry

Text books:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.

2. Embedded Systems, Rajkamal, TMH, 2009.

References:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE

2. Embedded Systems: A Contemporary Design Tool Paperback by James K. Peckol

B. Tech VII Semester

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20EC7T14 INTERNET OF THINGS (OPEN ELECTIVE –IV)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To introduce the terminology, technology and its applications
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language which is used in many IoT devices
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To introduce the implementation of web-based services on IoT devices

COURSE OUTCOMES:

At the end of this course the student will able to:

At the end of the course, student will be able to

CO1: Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.

CO2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on Bwireless, energy, power, and sensing modules

CO3: Market forecast for IoT devices with a focus on sensors

CO4: Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

SYLLABUS

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Sensors, Actuators,
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II: IoT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT-III: IoT Physical Devices and Endpoints

Introduction to Arduino and Raspberry Pi- Installation,
Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT-IV: Controlling Hardware-

Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors

Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

UNIT-V: IoT Physical Servers and Cloud Offerings–

Introduction to Cloud Storage models and
communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

B. TECH VII SEMESTER **OEC**

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20EC7T15 ANALOG AND DIGITAL IC APPLICATIONS (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1. To understand the analysis & design of different types of active filters using op-amps
2. To learn the internal structure, operation and applications of different analog ICs
3. In this course, students can study Integrated circuits for all digital operational designs like adder, subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM.
4. Design and to develop the internal circuits for different digital operations and simulate them using hardware languages using integrated circuits.
5. Understand the concepts of Latches and Flip-Flops and Design of Counters using Digital ICs, modeling of sequential logic integrated circuits using VHDL

Course Outcomes:

At the end of the course, student will be able to

CO1: Design circuits using operational Amplifier for various applications

CO2: Understand the concept of A/D & D/A Converters

CO3: Analyze and design amplifiers and active filters using Op-amp.

CO4: Understand the concepts of Combinational logic circuits in digital system

CO5: Understand the concepts of sequential logic circuits in digital system

SYLLABUS

UNIT-I: OPERATIONAL AMPLIFIER

The Ideal Operational Amplifier; Operational Amplifier Internal Circuit. Op-Amp parameters & Measurement, DC Characteristics, input & output off set voltages & currents, slew rate, CMRR, PSRR, drift, AC Characteristics and Compensation Techniques.

UNIT-II: OPERATIONAL AMPLIFIER APPLICATIONS

Basic Op-Amp Applications; Inverting and Non-inverting amplifier,. Integrator and differentiator, Difference amplifier, Instrumentation Amplifier; AC Amplifier; V to I and I to V Converters. Op-Amp Circuits using Diodes, Sample and Hold Circuit, Comparator, Regenerative Comparator (Schmitt Trigger).

D-A AND A-D CONVERTERS Introduction; Series Op-Amp Regulator; Basic DAC Techniques Weighted Resistor DAC,R-2R DAC ; AD Converters, Flash ADC and Successive approximation Converter.

UNIT-III: FILTERS USING OP-AMP & 555 TIMERS

Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Description of Functional Diagram of 555 Timer; Monostable Operation; Astable Operation and its Applications and PLL, Applications PLL. VCO and its applications.

UNIT-IV: Digital Design Using HDL

Design flow, program structure, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Objects and Classes, Subprograms, Comparison of VHDL and Verilog HDL.

UNIT-V: Combinational And sequential Logic Design

Combinational Logic Design: Adders & Sub tractors, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Barrel Shifter, Simple Floating-Point Encoder, Dual Priority Encoder.

Sequential Logic Design: Flip-Flops, Counters, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Register. Linear feedback shift register and applications.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGrawHill,4th Edition,2005
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.

REFERENCES:

1. "Fundamentals of Digital logic design with VHDL". Stephen Brown & Zvonko Vranesic, Tata McGraw Hill, 2nd edition.2004
2. Designing with TTL Integrated Circuits: Robert L. / John R. Morris & Miller.

B. TECH VII SEMESTER **OEC**

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20CS7T13 DATA ANALYTICS (OPEN ELECTIVE –IV)

Course Objectives:

1. To understand Data Analytics lifecycle and Business Challenges.
2. To understand Analytical Techniques
3. To understand various tools and technologies to handle big data

Course Outcomes:

CO1: Understand big data and data analytics life cycle.
CO2: Explore various supervised learning methods.
CO3: Explore various unsupervised learning methods.
CO4: Understand and apply ARIMA model on time series data.
CO5: Learn various technology and tools in big data analytics.

SYLLABUS

UNIT-I

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the new big data Ecosystem, Examples of Big Data Analytics. Data Analytics Life Cycle: Data Analytics life cycle Overview, Discovery, Data Preparation, Model,Planning, Model Building, Communicate Results, Operationalize, Case Study.

UNIT-II

Supervised Learning: Decision Trees – Overview of Decision Trees, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree. Naive Bayes: Baye's Theorem, Naïve Baye's Classifier, Diagnostics of Classifiers.
Regression –Linear Regression, Logistic Regression.

UNIT-III

Unsupervised Learning: Association Rule Mining–Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules. Cluster Analysis – Overview of Clustering, k-means

UNIT IV

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model
Text Analysis: Text Analysis Steps, Example, Collecting Raw Data, Representing Text, TFIDF, Categorizing Documents by Topics, Determining Sentiments, Gaining Insights.

UNIT-V

Technology and Tools: MapReduce and Hadoop- Analytics for Unstructured Data, The Hadoop Ecosystem In-DataBase Analytics: SQL Essentials, In-Database Text Analysis, Advanced SQL.

TEXT BOOKS:

1. David Dietrich, Barry Hiller, "Data Science and Big Data Analytics", EMC education services, Wiley publications, 2012.

REFERENCE BOOKS:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with
advanced analytics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O"
Reilly, 2011.
3. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

B. Tech VII Semester	OEC	L	T	P	C
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20CS7T14 BLOCK CHAIN TECHNOLOGY (OPEN ELECTIVE –IV)

Course Objectives

By the end of the course, students will be able to

- Understand how major block chain systems work.
- To securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

Course Outcomes

CO 1: Understand the design principles of Bitcoin and Ethereum.

CO 2: Understand and apply Nakamoto consensus.

CO 3: Analyze the differences between proof-of-work and proof-of-stake consensus.

CO 4: Understand cryptocurrency

CO 5: Understand cryptocurrency Regulations

SYLLABUS

Unit I: Basics:

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Unit II: Blockchain:

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Unit III: Distributed Consensus:

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV: Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Unit V: Cryptocurrency Regulation:

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.

Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Text Book

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,”Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

B. TECH VII SEMESTER **OEC**

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20CS7T15 SOFTWARE PROJECT MANAGEMENT (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

CO1: Apply the process to be followed in the software development life-cycle models.

CO2: Apply the concepts of project management & planning.

CO3: Implement the project plans through managing people, communications and change

CO4: Conduct activities necessary to successfully complete and close the Software projects

CO5: Implement communication, modeling, and construction & deployment practices in software development.

SYLLABUS

UNIT I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

TEXT BOOKS:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

REFERENCES:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH VII SEMESTER **OEC**

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20IT7T13 CLOUD COMPUTING (OPEN ELECTIVE –IV)

Course Objectives:

- Explain the technology and principles involved in building a cloud environment
- To implement Virtualization
- Understand various types of cloud and its services
- Contrast various programming models used in cloud computing

Course Outcomes:

CO1: Describe the principles of parallel and distributed computing and evaluation of cloud computing from existing technologies

CO2: Illustrate Virtualization for Data-Center Automation.

CO3: Explain and characterize different cloud deployment models and service models

CO4: Program data intensive parallel applications in cloud.

CO5: Understand commercial cloud computing technologies such as AWS, AZURE and AppEngine

SYLLABUS

UNIT-I: Introduction:

Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Microsoft Aneka.

UNIT-II: Virtualization:

Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen, VMware, Microsoft Hyper – V.

UNIT-III: Cloud Computing Architecture:

Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy.

UNIT-IV: Data Intensive Computing: Map-Reduce Programming:

What is Data-Intensive Computing? Characteristics, Challenges, Historical Perspective. Technologies for Data Intensive Computing: Storage Systems, Programming Platforms.

Cloud Applications: Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.

UNIT-V: Cloud Platform in Industry and Cloud Applications:

Cloud Platforms in Industry: Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

TEXTBOOKS:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud Computing McGraw Hill Education.

REFERENCES:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.
3. Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan Kaufmann, 2013.

B. TECH VII SEMESTER **OEC**

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20IT7T14 BUSINESS INTELLIGENCE (OPEN ELECTIVE –IV)

Course Objectives:

- Introduce the concepts and components of Business Intelligence (BI)
- Evaluate the technologies that make up BI (data warehousing, OLAP)
- Identify the technological architecture that makes up BI systems

Course Outcomes:

CO1: Understand concepts and components of Business Intelligence.

CO2: Explain the complete life cycle of BI development.

CO3: Illustrate technology and processes associated with Business Intelligence framework.

CO4: Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

CO5: Ability to design expert system using AI tools.

SYLLABUS

UNIT-I:

Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence

Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

UNIT-II:

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics. **Getting started with business intelligence:** Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

UNIT-III:

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete BI professional, Popular BI tools.

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart,OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

UNIT-IV:

Business Intelligence Applications:

Marketing models: Relational marketing, Sales force management,

Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.

Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices

UNIT-V:

Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management

Artificial Intelligence and Expert Systems:

Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems

TEXT BOOKS:

1. Fundamental of Business Intelligence" Grossmann W, Rinderle-Ma Springer, 2015
2. "Fundamentals of Business Analytics" – By R N Prasad and SeemaAcharya, Publishers: Wiley India.

REFERENCE BOOKS:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : TheCompleteProject Lifecycle for Decision Support Applications, Addison WesleyInformation Technology
2. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann.

B. Tech VII Semester **OEC**

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20HS7T02 POLYMER CHEMISTRY (OPEN ELECTIVE –IV)

PREREQUISITES: Chemistry I and Chemistry II of AICTE syllabus

Course Outcomes

CO1: After studying this course, the learners are expected to: Relate polymer properties to their structure and conformation

CO2: Analyse different mechanisms of polymer formation and use this information in the synthesis of different polymers.

CO3: Distinguish between enthalpic and entropic contributions to polymerisation/crystallization.

CO4: Distinguish between absolute and relative methods for molecular weight determination.

CO5: Determine the flow properties of polymer melts and solutions.

CO6: Interpret experimental data and determine parameters such as polymerization ratesand copolymer composition.

CO7: Estimate the solubility of a given polymer in various solvents and blends.

CO8: Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.

CO9: Assess the effect of synthetic polymers on the environment.

SYLLABUS

Unit 1. Definitions, origin, nomenclature, classification and types of macromolecules; molecular weight (MW) and its distribution; Determination of molecular weight – methods for measuring number average, weight average, viscosity average MW; gel permeation chromatography; spectroscopic techniques to determine chemical composition and molecular microstructure, thermal transitions; melting temperature and glass transition temperature. Colligative properties, osmotic pressure, light scattering, refractive index, viscosity, small angle X-ray scattering (6)

Unit 2tep-Growth Polymerization: Reactivity of functional groups; kinetics; molecular weight in open and closed system cyclization vs. linear polymerization, cross-linking and gel point; process condition; step-copolymerization, examples of step polymers (3)

Unit 3. Free radical Polymerization: Nature of chain polymerization and its comparison with step polymerization; radical vs. ionic polymerizations; structural arrangements of monomer units; kinetics of chain polymerization; molecular weight and its distribution; chaintransfer, inhibition, retardation, auto-acceleration; energetic characteristics; techniques of radical polymerization – bulk, solution, emulsion, suspension polymerization; examples of polymers made by radical chain polymerization (4)**.** Ionic Polymerization: Propagation and termination of cationic polymerization, anionic and ring opening polymerization, active polycarbanions (2)

Unit 4. Copolymerization: types of copolymers, copolymer compositions, reactivity ratio; radical and ionic co-polymerizations; Block and Graft copolymer synthesis, examples (2). Thermodynamics of polymer solutions; Flory-Huggins theory, theta conditions; solubility parameters; fractionation of macromolecules, osmotic pressure, lower criticalsolution temperature (3)

Unit 5. Naturally occurring polymers, biodegradability, biosynthesis, polymers frombio/renewable resources (2)

Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography, Electron beam, X-ray and ion sensitive resists, Conducting polymers, types, properties and applications, electroluminescence, molecular basis of electrical conductivity, Photonic applications and non-linear optics, optical information storage (3)

Text Books:

1. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur
2. Polymer chemistry and Physics of Modern Materials, 2nd edn, J. M. G. Cowie, Stanley Thornes, UK, 1998
3. Contemporary Polymer Chemistry, 3rd edn. H. R. Allcock, F. W. Lampe and J. E.Mark, Pearson
4. Polymers: Chemistry and Physics of Modern Materials, J.M.G. Cowie, CRC Press
5. Introduction to Physical Polymer Science, L. H. Sperling, Wiley
6. Introduction to Soft matter, I. W. Hamley, John Wiley and Sons, 2007
7. Polymer Chemistry, 2nd edn, P. C. Hiemenz and T. P. Lodge, CRC Press (2007)

B. TECH VII SEMESTER	OEC	L	T	P	C
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20MB7T03 TOTAL ENGINEERING QUALITY MANAGEMENT (OPEN ELECTIVE –IV)

Course Objective

To understand the Engineering and Management aspects of Planning, Designing, Controlling and Improving Quality in Manufactured products.

Course Outcome

1. To understand the fundamentals of quality
2. To understand the role of TQM tools and techniques in elimination of wastages and reduction of defects
3. To develop quality as a passion and habit
4. To Facilitate the understanding of Quality Management principles and process.
5. The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

SYLLABUS

UNIT I

Quality Gurus And TQM Kitemarks: Definition, Need & Evolution of TQM – Contributions of Quality Guru's – Edward Deming – Joseph Juran – Philip Crosby – Genichi Taguchi – Walter Shewart – Criteria for Deming's Prize.

UNIT II

Product Design & Analysis : Dimensions of product and service quality, Basic Design Concepts and TQM – Design Assurance – Design Validation –Failure Mode Effect Analysis – Fault Tree Analysis – Design for Robustness – Value Analysis.

UNIT III

Process Improvement & Modern Production Management Tools

Control Charts – Process Capability, -Bench Marking, Six Sigma Approach – Total Productive Maintenance – Just-In-Time – Lean Manufacturing Paradigms.

UNIT IV

Quality Improvement Tools & Continuous Improvement

Traditional Q-7Tools, New Q-7 Tools, Quality Function Deployment (QFD), Kaizen 5S, Poka-Yoke, Failure Mode and Effects Analysis(FMEA) – Stages, Types, Taguchi Quality Loss Function(QFD) – Total Productive Maintenance (TPM).

UNIT V

Quality Management Systems ISO 9000, ISO 9001: 2008, QS 9000, ISO 14000, TS16949:2002 and EMS14001 certifications of quality systems- Elements, Documentation, Quality Auditing — Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.

TEXT BOOKS

1. Total Engineering Quality Management, Sunil Sharma, 1st Edition, MacMillan India Limited.
2. Total Quality Management, Poornima M. Charantimath, 2nd Edition, Pearson Education.
3. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint 2006.

REFERENCES

1. "Quality and Performance Excellence", James R Evans, Edition, 7th Edition, Cengage Learning.
2. "Quality Management", Howard S Gitlow, Alan J Oppenheim, Rosa Oppenheim, David M Levine,3rd Edition , Tata McGraw Hill Limited.
3. "Fundamentals of Quality Control & Improvement", Amitava Mitra, 3rd Edition, Wiley Publications, 2012.
4. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.

B. TECH VII SEMESTER **OEC**

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20MB7T04 STRESS MANAGEMENT (OPEN ELECTIVE –IV)

OBJECTIVES

This course examines different sources from where individuals experience a stress response. Through diligent individual and group study, students will be able to learn to apply stress management principles in order to achieve high levels of performance and understand the role of relationships to the management of stress and health.

Course Outcomes

1. Understand the physiological systems that are affected by stressors and the long-term effects and illnesses that can result from stressors.
2. Understand the specific applications of stress as it relates to the workplace and different target groups.
3. Create effective stress management plans for individual clients and for workplace environments. Enhancing significance of training and development, performance evaluation

SYLLABUS

UNIT I: UNDERSTANDING STRESS

Meaning – Symptoms – Work Related Stress – Individual Stress – Reducing Stress - Sources of stress –Consequence of stress-Burnout-symptoms of Burnout- Stress vs Burnout-Model of stress-strategies for coping stress (individual and organizational strategies)

UNIT II: TIME MANAGEMENT

Techniques – Importance of Planning the day –developing concentration – Prioritizing, Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say "No."

UNIT III:CAREER PLATEAU

Career plateau – Identifying Career plateaus – Structural and Content - Plateauing – Making a fresh start – Importance of Sabbaticals – Counseling out – Executive leasing – Sustaining a marketable Career.

UNIT IV:CRISIS MANAGEMENT

Implications – People issues – Structure issues – Environmental issues –Learning to keep calm - Preventing interruptions – Controlling crisis – Pushing new ideas – Empowerment – Work place Humour, Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit.

UNIT V: SELF DEVELOPMENT

Improving personality – Leading with Integrity – Enhancing Creativity – Effective Decision Making – Sensible Communication – The Listening Game – Managing Self – Mediation for peace – Yoga for Life

TEXT BOOKS

1. Bhatia R.L., The Executive Track: An Action Plan for Self Development Wheeler Publishing, New Delhi
2. Charavathy. S.K, "Human Values for Manager", McGraw Hill/Henely Management Series

REFERENCES

1. Jeffr Davison, Managing Stress, Prentice Hall of India, New Delhi
2. Jerrold S Greenberg, Comprehensive Stress Management, Jain Books, 2009

B. TECH VII SEMESTER	OEC	L	T	P	C
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20AD7T13 **NATURAL LANGUAGE PROCESSING (OPEN ELECTIVE –IV)**

Pre-requisite: Nil

Course Educational Objective: The Objective of the course is to make learn the basic elements of C programming, control structures, derived data types, Modular programming, user defined structures, basics of files and its I/O operations.

Course Outcomes: At the end of this course, the student will be able to

CO1: Familiar with the basic components of NLP.

CO2: Applying N-gram models to predict a sequence of text.

CO3: Build a basic language understanding system using preliminary concepts of NLTK library.

CO4: Exposure on advanced techniques for understanding patterns in text

CO5: Understand the semantics of linguistic components in a natural dialogue

Syllabus

UNIT – I:

Introduction

Knowledge in Speech and Language Processing; Ambiguity; Models and Algorithms; Language, Thought and Understanding; History Regular Expressions Regular Expression; Words; Corpora; Text Normalization; Minimum Edit Distance

UNIT – II

N-gram Language Models

N-Grams; Evaluating Language Models, Generalization and Zeros, Smoothing: Laplace Smoothing; Add-k Smoothing; Backoff and Interpolation; Kneser-Ney Smoothing

UNIT – III

Natural language processing tools in Python (NLTK Package)

Part-I: Introduction to NLTK; Tokenizing; Filtering Stop words; Stemming; Tagging parts of speech; Lemmatizing; Chunking; Chinking

Part-II: Using Named Entity Recognition (NER); Getting Text to Analyze; Using a Concordance; Making a Dispersion Plot;

UNIT – IV

Information Extraction:

Relation Extraction Algorithms; Using Patterns to extract relations; Relation extraction via supervised learning; Semi supervised relation extraction via

bootstrapping; Distant Supervision for Relation Extraction; Evaluation of Relation Extraction; Extracting Times; Extracting Events and their Times; Template Filling

UNIT – V

Word Senses and WordNet

• Defining Word Senses; How many senses do words have?

• Relations between senses

WordNet: Sense relations in WordNet; Word Sense Disambiguation; Alternate WSD algorithms and Tasks

Text Books:

1. Daniel Jurafsky, James H. Martin ,"Speech and Language Processing" , Third Edition, PHI, 2020.
2. https://realpython.com/nltk-nlp-python/#getting-text-to-analyze

Reference Books:

1. Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, 2011
2. Applied Text Analysis with Python: Enabling Language-Aware Data Products with Machine Learning, Benjamin Bengfort, Rebecca Bilbro, 2018
3. Speech and Language Processing, 2nd Edition, Daniel Jurafsky, James H. Martin, 2009

B. TECH VII SEMESTER	OEC	L	T	P	C
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20AM7T13 DEEP LEARNING (OPEN ELECTIVE –IV)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains understanding basics of deep neural networks, CNN architectures of deep neural networks, concepts of Artificial Neural Networks, basics of Data science in Deep learning, applications of deep learning in AI and Data Science

Course Outcomes: At the end of the course, student will be able to

CO1: Explain the basics in deep neural networks

CO2: Apply Convolution Neural Network for image processing

CO3: Explain the basics of Artificial Intelligence using deep learning

CO4: Apply deep learning algorithms for data science

CO5: Apply deep learning algorithms for variety applications

SYLLABUS

Unit-1:

DEEP NETWORKS BASICS

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization – Machine Learning Basics: Capacity – Over fitting and under fitting – Hyper parameters and validation sets -- Estimators -- Bias and variance -- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization -- Optimization .

Unit-2:

CONVOLUTIONAL NEURAL NETWORKS

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.

Unit-3:

DEEP LEARNING ALGORITHMS FOR AI

Artificial Neural Networks – Linear Associative Networks – Perceptrons -The Back propagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Auto encoders - Deep Backprop Networks- Auto encoders

Unit-4:

DATA SCIENCE AND DEEP LEARNING

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

Unit-5:

APPLICATIONS OF DEEP LEARNING

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion -NLP tasks - dimensionality estimation - time series forecasting - building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016

2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019

3. Vance, William, Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science (Hardcover - 2020), Joiningthedotstv Limited

4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022

5. Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018.

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B. TECH HONORS	**HN**	**4**	**0**	**0**	**4**

20ECHN01 **MICRO ELECTRONIC DEVICES**
(Honors Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. Explain and apply basic concepts of semiconductor physics relevant to devices.
2. Describe, explain, and analyze the operation of important semiconductor devices in terms of their physical structure.
3. Explain, describe, and use physics-based device and circuit models for semiconductor devices of varying levels of complexity, select models appropriate to a specific need, and apply those models to analyze multi-component circuits.
4. Analyze and design microelectronic circuits for linear amplifier and digital applications.
5. Confront integrated device and/or circuit design problems, identify the design issues, and develop solutions.

COURSE OUTCOMES:

At the end of the course, student will be able to

CO1: Explain and apply the semiconductor concepts of drift, diffusion, donors and acceptors, majority and minority carriers, excess carriers, low level injection, minority carrier lifetime, quasi-neutrality, and quasi-statics

CO2: Explain the underlying physics and principles of operation of p-n junction diodes, Metal oxide-semiconductor (MOS) capacitors, bipolar junction transistors (BJTs),and MOS field effect transistors (MOSFETs), and describe and apply simple large signal circuit models for these devices which include charge storage elements.

CO3: Create an incremental (small signal) linear equivalent circuit (LEC) model for a multi terminal non-linear electronic device knowing its large signal characteristics, and understand and apply standard LEC models for p-n diodes, BJTs, and MOSFETs, including capacitances.

CO4: Explain how devices and integrated circuits are fabricated and describe discuss modern trends in the microelectronics industry.

SYLLABUS

UNIT-I: IC FABRICATION TECHNOLOGY

Material properties; crystal growth and doping; diffusion; oxidation; epitaxial; ion implantation; deposition of films using CVD, LPCVD and sputtering techniques; wet and dry etching and cleaning; lithographic process; device and circuit fabrication; process modeling and simulation.

UNIT-II: VLSI DESIGN

Introduction to NMOS and CMOS circuits; NMOS and CMOS processing technology; CMOS circuits and logic design; circuit characterization and performance estimation; structured design and testing; symbolic layout systems; CMOS subsystem design; system case studies.

UNIT-III: PHYSICS AND MODELLING OF MICROELECTRONIC DEVICES

Physics and properties of semiconductor - a review; PN junction diode; bipolar transistor; metal semiconductor contacts; JFET and MESFET; MOSFET and scaling; CCD and photonic devices.

UNIT-IV: ANALOG IC DESIGN

Basic concepts; BICMOS process and technology; current and voltage sources; differential and operational amplifiers; multipliers and modulators; phase-lock techniques; D-to-A and A- to-D converters; micro power circuits; high voltage circuits; radiation resistant circuits; filter design considerations.

UNIT-V: VLSI ARCHITECTURES

Overview of CISC processor architectures; Instruction set architecture of CISC processor; hardware flow-charting methods; implementing microprocessor logic from hard-ware flowcharts; RISC instruction set architecture; Pipelined execution of RISC instructions; pipeline execution unit design; control hazards; design of memory hierarchy.

Text Books:

1. Howe, R. T., and C. G. Sodini, Microelectronics: An Integrated Approach, Upper Saddle River, NJ: Prentice Hall, 1996.

2. Behzad Razavi, RF Microelectronics, Pearson Education.

Reference Books:

1. Fonstad, C. G. Microelectronic Devices and Circuits. New York, NY: McGraw-Hill, 1994.

2. Sedra, A. S., and K. C. Smith. Microelectronic Circuits, 4th edition.

B. TECH HONORS	**HN**	**L**	**T**	**P**	**C**
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20ECHN02 WIRELESS SENSOR NETWORKS (Honors Engineering Course)

Course Outcomes:

At the end of the course, student will be able to

1. To know the basic concepts of Sensor Networks
2. To understand the concept of Deployment and Configuration
3. To know Routing protocols
4. To understand the concept of Transport Layer And Security Protocols
5. To know Data storage & Manipulations

SYLLABUS

UNIT-I: INTRODUCTION

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks ,Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC, Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.

UNIT-II: DEPLOYMENT AND CONFIGURATION

Localization and positioning, Coverage and connectivity, Single-hop and multi hop localization, self-configuring localization systems, sensor management Network Protocols: Issues in designing MAC protocol for WSNs, Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and Zig Bee, Dissemination protocol for large sensor network.

UNIT-III: ROUTING PROTOCOLS

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with

Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing

UNIT-IV: TRANSPORT LAYER AND SECURITY PROTOCOLS

Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT-V: DATA STORAGE AND MANIPULATION

Data centric and content based routing, storage and retrieval in network, compression technologies for WSN, Data aggregation technique. Applications: Detecting unauthorized activity using a sensor network, WSN for Habitat Monitoring.

Text Books:

1. Holger Kerl, Andreas Willig, ―Protocols and Architectures for Wireless Sensor Network‖, John Wiley and Sons, 2005 (ISBN: 978-0-470-09511-9)
2. Raghavendra, Cauligi S, Sivalingam, Krishna M., ZantiTaieb, ―Wireless Sensor Network‖, Springer 1st Ed. 2004 (ISBN: 978-4020-7883-5).

Reference Books:

1. Kazem, Sohraby, Daniel Minoli, TaiebZanti, ―Wireless Sensor Network: Technology, Protocols and Application‖, John Wiley and Sons 1st Ed., 2007(ISBN: 978-0-471-74300-2).
2. B. Krishnamachari, ―Networking Wireless Sensors‖, Cambridge University Press.

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B. TECH HONORS	**HN**	**4**	**0**	**0**	**4**

20ECHN03 CMOS DIGITAL IC APPLICATIONS (Honors Engineering Course)

Course Outcomes:

At the end of the course, student will be able to

CO1: To know the basic concepts of MOS Design

CO2: To understand the concept of Combinational MOS Logic Circuits

CO3: To understand the concept of Sequential MOS Logic Circuits

CO4: To understand the concept of Dynamic Logic Circuits:

CO5: To know Semiconductor Memories

SYLLABUS

UNIT-I: MOS Design

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II: Combinational MOS Logic Circuits

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III: Sequential MOS Logic Circuits

Behavior of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch, and edge triggered flip-flop.

UNIT-IV: Dynamic Logic Circuits:

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-V: Semiconductor Memories

Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

TEXT BOOKS:

1. Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 2011.
2. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", TMH, 3rd Edition, 2011.

REFERENCE BOOKS:

1. Ming-BO Lin, "Introduction to VLSI Systems: A Logic, Circuit and System Perspective", CRC Press, 2011
2. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, "Digital Integrated Circuits – A Design Perspective", 2nd Edition, PHI.

B. TECH HONORS	**HN**	**L**	**T**	**P**	**C**
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20ECHN04 IMAGE AND VIDEO PROCESSING
(Honors Engineering Course)

Course objectives:

At the end of the course, student will be able to

1. To Analyse how the Transformation Techniques used in Image processing.
2. To Understand the different Enhancement Methods to improve Image Quality and Perception.
3. To Obtain Compression standards and Application of techniques.
4. To Define Video formation and processing of Video.
5. To Describe the estimation of Motion with different processing steps.

Course Outcomes:

At the end of the course, student will be able to

CO1: Identify transformations on image for specific purpose.

CO2: Develop various Enhancement methods for better perception by human or machine.

CO3: Understand various Compression approaches.

CO4: Analyse Video formation and methods to process video.

CO5: Define Different Motion estimation approaches and Different Resolutions in video considerations.

SYLLABUS

UNIT-I: Fundamentals of Image processing and Image Transforms:

Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms.

UNIT-II: Image Processing Techniques

Image Enhancement: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering Image Segmentation: Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation

UNIT-III: Image Compression

Image compression fundamentals – coding Redundancy, spatial and temporal redundancy. Compression models: Lossy and Lossless, Huffman coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding , wavelet coding, JPEG standards

UNIT-IV: Basic Steps of Video Processing

Analog video, Digital Video, Time varying Image Formation models: 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals, filtering operations

UNIT-V: 2-D Motion Estimation

Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.

TEXT BOOKS:

1. Gonzaleze and Woods , "Digital Image Processing", 3rd edition , Pearson education publications.

2. Yao wang, Joem Ostarmann and Ya – quin Zhang, "Video processing and communication" ,1st ed , PHI

REFERENCE TEXT BOOK:

1. M. Tekalp "Digital video Processing", Prentice Hall International, 2011.

B. TECH HONORS	**HN**	**L**	**T**	**P**	**C**
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20ECHN05 ANALOG VLSI DESIGN (Honors Engineering Course)

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the concept of Single stage Amplifier

CO2: Know the concept of Differential Amplifier

CO3: Able to analyze the frequency response of CS Stage

CO4: Understand the concept of Operational Amplifier

CO5: Understand the concept of PLL

SYLLABUS

UNIT-I: Single stage Amplifier

General considerations, MOS I/V Characteristics, second order effects, MOS device models.

Single stage Amplifier: CS stage with resistance load, divide connected load, current source load, triode load, CS stage with source degeneration, source follower, common-gate stage, cascade stage, choice of device models.

UNIT-II: Differential Amplifiers

Basic difference pair, common mode response, Differential pair with MOS loads, Gilbert cell.

Passive and active Current mirrors: Basic current mirrors, Cascade mirrors, active current mirrors.

UNIT-III: Frequency response of CS stage

source follower, Common gate stage, Cascade stage and Difference pair. Noise in CS stage, C- G stage, source follower, cascade stage, differential pair.

UNIT-IV: Operational Amplifiers

One Stage OP-Amp. Two Stage OP-Amp, Gain boosting, Coommon Mode Feedback, Slew rate, PSRR. Compenastion of 2stage OP-Amp, Other compensation techniques.

Oscillators: Ring Oscillators, LC Oscillators, VCO, Mathematical Model of VCO.

UNIT-V: PLL

Simple PLL, Charge pump PLL, Non-ideal effects in PLL, Delay locked loops and applications. **Band gap References** and Switched capacitor filters.

Text Books:

1. "Analog Integrated Circuit Design", David. A. Johns and Ken Martin, John Wiley and Sons, 2001.
2. "Design of Analog CMOS Integrated Circuit", Behzad Razavi, Tata McGraw HILL, 2002.

References:

1. "Analog VLSI – Signal Information and Processing", Mohammed Ismail &Feiz , John Wiley and Sons.
2. "CMOS Analog Circuit Design", Philip Allen & Douglas Holberg, Oxford University Press, 2002.

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B. TECH HONORS	**HN**	**4**	**0**	**0**	**4**

20ECHN06 SPREAD SPECTRUM COMMUNICATIONS (Honors Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. Understand the concept of Spread Spectrum and study various types of Spread spectrum sequences and their generation.
2. Understand various Code tracing loops for optimum tracking of wideband signals via spread spectrum signals.
3. Understand the procedure for synchronization of receiver for receiving the Spread spectrum signal.
4. Understand the principles of Code Division Multiple Access (CDMA) and use of Spread spectrum concept in CDMA.
5. Understand the performance of Spread spectrum systems in Jamming environment and systems with Forward Error Correction.

Course Outcomes:

At the end of the course, student will be able to

CO1: Generate various types of Spread spectrum sequences and can simulate CDMA system.

CO2: Understand various Code tracing loops for optimum tracking of wideband signals via spread spectrum signals.

CO3: Understand the procedure for synchronization of receiver for receiving the Spread spectrum signal

CO4: Can provide detection and cancellation schemes for Multiuser in CDMA cellular radio.

CO5: Analyze the performance of Spread spectrum systems in Jamming environment and systems with Forward Error Correction

SYLLABUS

UNIT-I:

Introduction to Spread Spectrum Systems

Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access. Binary Shift Register Sequences for Spread Spectrum Systems: Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.

UNIT-II:

Code Tracking Loops

Introduction, Optimum Tracking of Wideband Signals, Base Band Delay-Lock Tracking Loop, Tau-Dither Non- Coherent Tracking Loop, Double Dither Non Coherent Tracking Loop.

UNIT-III:

Initial Synchronization of the Receiver Spreading Code

Introduction, Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization using a Matched Filter, Synchronization by Estimated the Received Spreading Code.

UNIT-IV:

Cellular Code Division Multiple Access (CDMA) Principles

Introduction, Wide Band Mobile Channel, the Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity. Multi-User Detection in CDMA Cellular Radio: Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes, Interference Cancellation Techniques.

UNIT-V:

Performance of Spread Spectrum Systems in Jamming Environments

Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding. Performance of Spread Spectrum Systems with Forward Error Correction: Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts, Viterbi Algorithm, Decoding and Bit-Error Rate.

TEXT BOOKS:

1. Rodger E Ziemer, Roger L. Peterson and David E Borth - ―Introduction to Spread Spectrum Communication- Pearson, 1st Edition, 1995.

2. Mosa Ali Abu-Rgheff – ―Introduction to CDMA Wireless Communications.‖ Elsevier Publications, 2008.

REFERENCE BOOKS:

1. George R. Cooper, Clare D. Mc Gillem - ―Modern Communication and Spread Spectrum,‖ McGraw Hill, 1986.
2. Andrew j. Viterbi - ―CDMA: Principles of spread spectrum communication, ‖ Pearson Education, 1st Edition, 1995

B. TECH HONORS	**HN**	**L**	**T**	**P**	**C**
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20ECHN07 ADVANCED DIGITAL SIGNAL PROCESSING (Honors Engineering Course)

Pre-requisite: Basic knowledge about transformation techniques, random variables differentiation and integration

Course Objectives:

At the end of the course, student will be able to

1. To learn and understand the concepts of stationary and non-stationary random signals and analysis & characterization of discrete-time random processes
2. To enunciate the significance of estimation of power spectral density of random processes
3. To introduce the principles of optimum filters such as Wiener and Kalman filters
4. To introduce the principles of adaptive filters and their applications to communication engineering
5. To introduce the concepts of multi-resolution analysis

Course Outcomes:

At the end of the course, student will be able to

CO1: Articulate and apply the concepts of special random processes in practical applications

CO2: Choose appropriate spectrum estimation techniques for a given random process

CO3: Apply optimum filters appropriately for a given communication application

CO4: Apply appropriate adaptive algorithm for processing non-stationary signals

CO5: Apply and analyse wavelet transforms for signal and image processing based applications

SYLLABUS

UNIT-I: DISCRETE-TIME RANDOM PROCESSES

Random variables - ensemble averages a review, random processes - ensemble averages, autocorrelation and autocovariance matrices, ergodic random process, white noise, filtering random processes, spectral factorization, special types of random processes - AR, MA, ARMA

UNIT-II: SPECTRUM ESTIMATION

Bias and consistency, Non-parametric methods - Periodogram, modified-Periodogram - performance analysis. Bartlett's method, Welch's method, Blackman-Tukey method. Performance comparison. Parametric methods - autoregressive (AR) spectrum estimation - autocorrelation method, Prony's method, solution using Levinson Durbin recursion.

UNIT-III: OPTIMUM FILTERS

Wiener filters - FIR Wiener filter - discrete Wiener Hopf equation, Applications - filtering, linear prediction. IIR Wiener filter - causal and non-causal filters. Recursive estimators - discrete Kalman filter.

UNIT-IV: ADAPTIVE FILTERS

Principles and properties of adaptive filters - FIR adaptive filters. Adaptive algorithms - steepest descent algorithm, the LMS algorithm - convergence. Applications of adaptive filtering - noise cancellation, channel equalization.

Unit-V MULTIRESOLUTION ANALYSIS

Short-time Fourier transform - Heisenberg uncertainty principle. Principles of multi-resolution analysis - sub-band coding, the continuous and discrete wavelet transform - properties. Applications of wavelet transform - noise reduction, image compression.

Text Books:

1.Monson H. Hayes, "Statistical digital signal processing and modeling", John Wiley and Sons Inc. New York, Indian reprint

2.P. P. Vaidyanathan, "Multirate systems and filter banks", Prentice Hall Inc. 1993

Reference Books:

1. .John G. Proakis & Dimitris G.Manolakis, ―Digital Signal Processing – Principles, Algorithms & Applications‖, Fourth Edition, Pearson Education/ Prentice Hall, 2007.
2. Sophoncles J. Orfanidis, "Optimum signal processing", McGraw Hill, 2000

B. TECH HONORS	**HN**	**L**	**T**	**P**	**C**
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20ECHN08 OPTICAL NETWORKS (Honors Engineering Course)

Course Objective:

At the end of the course, student will be able to

1. To impart knowledge on
2. To be well-versed in functionalities of various optical components and networking architectures like SONET /SDH used in Optical Networking
3. To be prepared for cost effective laying Access Networks like Fiber to the Home in India.
4. To Understand Wavelength routing and networking.
5. To Understand Packet switching and Access networks

Course Outcome:

At the end of the course, student will be able to

CO1: Apply knowledge of basic optical components for realizing any optical function

CO2: Identify and formulate different networking Topologies.

CO3: Design Optical Network Routing Algorithms.

CO4: Apply the basic Networking knowledge to realize any sort of end to end communication and Analyze the Time division multiplexing in optical domain

CO5: Manage the optical networks in its configuration, fault and performance

SYLLABUS

UNIT-I: OPTICAL SYSTEM COMPONENTS

Light propagation in optical fibers – Loss & bandwidth, Dispersion effects, Non-Linear effects; Solitons- Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters

UNIT-II: OPTICAL NETWORK ARCHITECTURES

Introduction to Optical Networks: SONET / SDH standards, Metro politon Area Networks, Layered Architecture- Broadcast and Select Networks– Topologies for Broadcast Networks, Media Access Control Protocols, Test beds for WDM; Outline of Wavelength Routing Architecture.

UNIT-III: WAVELENGTH ROUTING NETWORKS

Optical layer, Node Designs, Routing and Wavelength Assignment, Virtual topology design problem, Regular virtual topology design- Predetermined Virtual topology and Light path routes-Architectural variations.

UNIT-IV: PACKET SWITCHING AND ACCESS NETWORKS

Photonic Packet Switching – OTDM, Multiplexing and De multiplexing, Synchronisation, Broadcast OTDM networks, Switch-based networks- Access Networks – Network Architecture overview, OTDM networks- Optical Access Network Architectures- Future Access Networks, FTTH Scenario in India and Foreign Countries.

Unit-V NETWORK DESIGN AND MANAGEMENT

Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion- Wavelength stabilization ; Overall design considerations- Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety.

Text Books:

1. Rajiv Ramaswami, Kumar N. Sivarajan and Galen H. Sasaki "Optical Networks: A Practical Perspective", Harcourt Asia Pvt. Ltd., Third Edition 2010.

2. Mohammad Ilyas, Hussein T. Mouftah, "Handbook of Optical Communication Networks", Taylor and Francis, First edition, 2007.

Reference Books:

1. Biswanath Mukherjee, "Optical Communication Networks", McGrawHill Revised Edition 2006.
2. C.Siva Ram Moorthy and Mohan Gurusamy, "WDM Optical Networks :Concept, Design and Algorithms",Prentice Hall of India, First Edition, 2002.

B. TECH HONORS **HN**

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20ECHN09 **VLSI SIGNAL PROCESSING**
(Honors Engineering Course)

Course Objective:

At the end of the course, student will be able to

1. Introduce students to the fundamentals of VLSI signal processing and expose them to examples of applications.
2. Design and optimize VLSI architectures for basic DSP algorithms.
3. Design and optimize VLSI architectures for basic DSP algorithms.
4. Introduce students to the fundamentals of VLSI signal processing and expose them to examples of applications.

Course Outcomes:

At the end of the course, student will be able to

CO1: Ability to modify the existing or new DSP architectures suitable for VLSI.
CO2: Understand the concepts of folding and unfolding algorithms and applications.
CO3: Ability to implement fast convolution algorithms.
CO4: Low power design aspects of processors for signal processing and wireless applications.
CO5: Ability to implement Digital filter structures.

SYLLABUS

UNIT-I: Introduction to DSP

Typical DSP algorithms, DSP algorithms benefits, Representation of DSP algorithms Pipelining and Parallel Processing Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power Retiming Introduction, Definitions and Properties, Solving System of Inequalities, Retiming Techniques

UNIT-II: Folding and Unfolding

Folding- Introduction, Folding Transform, Register minimization Techniques, Register minimization in folded architectures, folding of Multirate systems Unfolding- Introduction, An Algorithm for Unfolding, Properties of Unfolding, critical Path, Unfolding and Retiming, Applications of Unfolding

UNIT-III: Systolic Architecture Design

Introduction, Systolic Array Design Methodology, FIR Systolic Arrays, Selection of Scheduling Vector, Matrix Multiplication, and 2D Systolic Array Design, Systolic Design for Space Representations contain Delays.

UNIT-IV: PACKET SWITCHING AND ACCESS NETWORKS

Cook-Toom Algorithm – Winogard algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

Unit-V Fast Convolution: Introduction

Digital lattice filter structures, bit level arithmetic, architecture, redundant arithmetic. Numerical strength reduction, synchronous, wave and asynchronous pipe lines, low power design.

Low Power Design: Scaling Vs Power Consumption, Power Analysis, Power Reduction techniques, Power Estimation Approaches

Text Books:

1. Keshab K. Parthi[A1] , VLSI Digital signal processing systems, design and implementation[A2] , Wiley, Inter Science, 1999.
2. Mohammad Isamail and Terri Fiez, Analog VLSI signal and information processing, McGraw Hill, 1994

Reference Books:

1. S.Y. Kung, H.J. White House, T. Kailath, VLSI and Modern Signal Processing, Prentice Hall, 1985.
2. Jose E. France, Yannis T sividls, Design of Analog Digital VLSI Circuits for Telecommunications and Signal Processing' Prentice Hall, 1994.

B. TECH HONORS	**HN**	**L**	**T**	**P**	**C**
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20ECHN10 WIRELESS COMMUNICATIONS (Honors Engineering Course)

Course Objectives:

S.No.	At the end of the course, student will be able to
1.	To study the characteristic of wireless channel
2.	To understand the design of a cellular system
3.	To study the various digital signalling techniques and multipath mitigation techniques
4.	To understand the concepts of multiple antenna techniques

Course Outcomes:

S.No.	At the end of the course, student will be able to
CO1:	Characterize a wireless channel and evolve the system design specifications
CO2:	Design a cellular system based on resource availability and traffic demands
CO3:	Identify suitable signalling and multipath mitigation techniques for the wireless channel and system under consideration.
CO4:	Understand The Concept Of Multipath Mitigation Techniques
Co5:	Understand The Concept Of Multiple Antenna Techniques

SYLLABUS

UNIT-I: WIRELESS CHANNELS

Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – fading due to Multipath time delay spread – flat fading – frequency selective fading ,fast fading – slow fading.

UNIT-II: CELLULAR ARCHITECTURE

Multiple Access techniques – FDMA, TDMA, CDMA – Capacity calculations– Cellular concept- Frequency reuse – channel assignment- hand off- interference & system capacity, Coverage and capacity improvement.

UNIT-III: DIGITAL SIGNALING FOR FADING CHANNELS

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels

UNIT-IV: MULTIPATH MITIGATION TECHNIQUES

Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception.

Unit-V MULTIPLE ANTENNA TECHNIQUES

MIMO systems – spatial multiplexing -System model -Pre-coding – Beam forming – transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

TEXT BOOKS:

1. Rappaport,T.S., ―Wireless communications‖, Pearson Education, Second Edition, 2010.(UNIT I, II, IV)
2. Andreas.F. Molisch, ―Wireless Communications‖, John Wiley – India, 2006. (UNIT III,V)

REFERENCES:

1. Wireless Communication –Andrea Goldsmith, Cambridge University Press, 2011
2. Van Nee, R. and Ramji Prasad, ―OFDM for wireless multimedia communications, Artech House, 2000

B. TECH HONORS	**HN**	**L**	**T**	**P**	**C**
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20ECHN11 **ADAPTIVE SIGNAL PROCESSING**
(Honors Engineering Course)

Course Objectives:

S.No.	**At the end of the course, student will be able to**
1.	To Analyse Statistical information of Random signals.
2.	To understand the different Estimations of Adaptive signals.
3.	To Design Adaptive filters.
4.	To Define Optimum filters for Non stationary information.

Course Outcomes:

	At the end of the course, student will be able to
CO1:	Determine different Statistics of Random information.
CO2:	Develop Estimation parameters of adaptive data.
CO3:	Understand various adaptive filtering approaches.
CO4:	Analyse Optimization Process.
CO5:	Design Kalman filters for Random Process

SYLLABUS

UNIT-I: Review of random variables

Distribution and density functions, moments, independent, uncorrelated and orthogonal random variables; Vector-space representation of Random variables, Schwarz Inequality Orthogonality principle in estimation, Central Limit theorem, Random processes, wide-sense stationary processes, autocorrelation and auto covariance functions, Spectral representation of random signals, Wiener Khinchin theorem Properties of power spectral density, Gaussian Process and White noise process. Random signal modeling: MA(q), AR(p) , ARMA(p, q) models.

UNIT-II: Parameter Estimation

Theory Principle of estimation and applications, Properties of estimates, unbiased and consistent estimators, Minimum Variance Unbiased Estimates (MVUE), Cramer Rao bound, Efficient estimators; Criteria of estimation: the methods of maximum likelihood and its properties ; Bayesian estimation : Mean square error and MMSE, Mean Absolute error, Hit and Miss cost function and MAP estimation.

UNIT-III: Estimation of signal in presence of white Gaussian Noise

Linear Minimum Mean-Square Error (LMMSE) Filtering: Wiener Hoff Equation, FIR Wiener filter, Causal IIR Wiener filter, Noncausal IIR Wiener filter, Linear Prediction of Signals, Forward and Backward Predictions, Levinson Durbin Algorithm, Lattice filter realization of prediction error filters.

UNIT-IV: Adaptive Filtering

Principle and Application, Steepest Descent Algorithm Convergence characteristics; LMS algorithm, convergence, excess mean square error, Leaky LMS algorithm; Application of Adaptive filters ;RLS algorithm, derivation, Matrix inversion Lemma, Intialization, tracking of nonstationarity.

Unit-V Kalman filtering

State-space model and the optimal state estimation problem, discrete Kalman filter, continuous-time Kalman filter, extended Kalman filter.

TEXT BOOKS

1.Discrete Random Signals and Statistical Signal Processing, By Charles W. Therrien, Prentice Hall Signal Processing Series

2. 4.J. G. Proakis et. al., Algorithms for Statistical Signal Processing, Pearson Education, 2002.

REFERENCE TEXT BOOK

1.M. H. Hayes, Statistical Digital Signal Processing and Modeling, John Wiley & Sons, Inc.,

2.D.G. Manolakis, V.K. Ingle and S.M. Kogon: Statistical and Adaptive Signal Processing, McGraw Hill, 2000.

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B. TECH HONORS	**HN**	**4**	**0**	**0**	**4**

20ECHN12 **SOFTWARE DESIGN RADIO (Honors Engineering Course)**

Prerequisite: Basic knowledge digital signal processing, communication systems, and wireless communication systems is desirable.

Course Objectives:

At the end of the course, student will be able to

1. The course gives students knowledge of fundamental and state of the art concepts in software-defined radio.
2. To understand the Principles of software defined radio.
3. To study the Multi rate signal processing and Digital generation of signals
4. To know the Smart antennas with applications.

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the systems required by a software-defined radio to function.

CO2: Make system level decisions and trade-offs for software-defined radio technology and products.

CO3: Understand the basics of designing antenna systems to accommodate the needs of software defined radio.

CO4: Understand how analog and digital technologies are used for software-defined radio.

SYLLABUS

UNIT-I: INTRODUCTION TO SOFTWARE RADIO CONCEPTS

The Need for Software Radios, What Is a Software Radio, Characteristics and Benefits of a Software Radio, Design Principles of a Software Radio.

UNIT-II: RADIO FREQUENCY IMPLEMENTATION ISSUES

The Purpose of the RF Front-End, Dynamic Range: The Principal Challenge of Receiver Design, RF Receiver Front-End Topologies, Enhanced Flexibility of the RF Chain with Software Radios, Importance of the Components to Overall

Performance, Transmitter Architectures and Their Issues, Noise and Distortion in the RF Chain, ADC and DAC Distortion

UNIT-III: MULTIRATE SIGNAL PROCESSING

Introduction Sample Rate Conversion Principles, Poly-phase Filters, Digital Filter Banks. Timing Recovery in classical Analog Receiver, Timing Recovery in Digital Domain, Early-Late gate Synchronizer.

UNIT-IV: DIGITAL GENERATION OF SIGNALS

Introduction, Comparison of Direct Digital Synthesis with Analog Signal Synthesis, Approaches to Direct Digital Synthesis, Analysis of Spurious Signals, Spurious Components due to Periodic Jitter, Band pass Signal Generation, Performance of Direct Digital Synthesis Systems, Hybrid DDS-PLL Systems, Applications of direct Digital Synthesis, ROM compression Techniques, Sine-Phase Difference algorithm approach.

Unit-V SMART ANTENNAS

Introduction, Vector Channel Modeling, Benefits of Smart Antennas, Structure for Beam Forming Systems, Smart Antenna Algorithms, Diversity and Space time Adaptive signal Processing, Algorithms for Transmit STAP, Hardware Implementation of Smart Antenna

Text Books:

1. Jeffrey Hugh Reed, “Software Radio: A Modern Approach to Radio Engineering,” Prentice Hall Professional, 2002.
2. Paul Burns, “Software Defined Radio for 3G,” Artech House, 2002.

Reference Books:

1. Software Radio: A Modern Approach to Radio Engineering By Jeffrey H. Reed Pearson Education Low Price Edition.
2. Telecommunication Breakdown by C. Richard Johnson Jr., William A. Sethares, 2003, Prentice Hall

B. TECH HONORS	HN	L	T	P	C
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20ECHN13 FPGA Design (Honors Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. Be able to understand and design complex digital systems & use the design flow for using FPGA.
2. Be able to create circuits that realize specified digital functions.
3. Be able to identify logic and technology-specific parameters to control the functionality, timing, power, and parasitic effects.
4. Be able to complete a significant VLSI design project having a set of objective criteria & design constraints..

Course Outcomes:

At the end of the course, student will be able to

CO1: To Know The Basic Concepts of Pld's

CO2: Understand The Basic Concepts of Fpga

CO3: Understand The Basic Concepts of Sram Programmable Fpga

CO4: Understand The Basic Concepts of Anti-Fuse Programmed Fpgas

CO5: To Analyze The Design Applications

SYLLABUS

UNIT-I: INTRODUCTION TO PROGRAMMABLE LOGIC DEVICES

Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

UNIT-II: FIELD PROGRAMMABLE GATE ARRAYS

Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, and Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, and Applications of FPGAs

UNIT-III: SRAM PROGRAMMABLE FPGA

Introduction, Programming Technology, Device Architecture, the Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT-IV: ANTI-FUSE PROGRAMMED FPGAs

Introduction, Programming Technology, Device Architecture, the Actel ACT1, ACT2 and ACT3 Architectures.

Unit-V DESIGN APPLICATIONS

General Design Issues, Counter Examples, A Fast Video Controller, and A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

Text Books:

1. Stephen M. Trimberger, "Field Programmable Gate Array Technology", Springer International Edition.
2. Charles H. Roth Jr, Lizy Kurian John, "Digital Systems Design", Cengage Learning.

Reference Books:

1. John V. Oldfield, Richard C. Dorf, "Field Programmable Gate Arrays", Wiley India.
2. Wayne Wolf, "FPGA based System Design", Prentice Hall Modern Semiconductor Design Series.

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B. TECH HONORS	HN	L	T	P	C
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20ECHN14 DSP PROCESSORS & ARCHITECTURES (Honors Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. To Understand Signal Processing methods.
2. To Analyse Accuracy while performing Signal Processing.
3. To have Knowledge about Processing with Digital Systems.
4. To Understand PDSP functional units.

Course Outcomes:

At the end of the course, student will be able to

CO1: compute DFT, Design filters and analyse multirate signals.

CO2: Develop Accurate Processing Units.

CO3: Understand various Functional Modules of PDSPs.

CO4: Analyse Processors Instruction sets and Different families of PDSPs.

CO5: Gain Knowledge of Analog Devices Family of DSP Devices.

SYLLABUS

UNIT-I: Introduction to Digital Signal Processing

Introduction, a Digital signal processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

UNIT-II: Computational Accuracy in DSP Implementations

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-III: Architectures for Programmable DSP Devices

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation

UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-IV: Programmable Digital Signal Processors

Commercial Digital signal processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX Instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

Unit-V Analog Devices Family of DSP Devices

Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.

2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009

3. Embedded Signal Processing with the Micro Signal Architecture: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007

REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Programming and Applications- B. Venkataramani and M. Bhaskar, 2002, TMH.

2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.

B. TECH HONORS	HN	L	T	P	C
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20ECHN15 SOFT COMPUTING TECHNIQUES (Honors Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineering perspective.
3. Understand Soft Computing concepts, technologies, and applications.
4. Understand the underlying principle of soft computing with its usage in various applications.
5. Understand different soft computing tools to solve real life problems.

Course Outcomes:

At the end of the course, student will be able to

CO1: Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.

CO2: Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic

CO3: To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations

CO4: Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications

CO5: Reveal different applications of these models to solve engineering and other problems.

SYLLABUS

UNIT-I: Introduction

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, and Knowledge representation - Expert systems.

UNIT-II: Artificial Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network.

UNIT-III: Data Processing

Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT-IV: Fuzzy Logic System

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

Unit-V Genetic Algorithm

Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search techniques for solving optimization problems, Applications.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. & Folger T.A., Prentice-Hall of India Pvt. Ltd.,

2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994.

B. TECH HONORS	**HN**	**L**	**T**	**P**	**C**
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20ECHN16 RF & MIXED SIGNAL CIRCUITS (Honors Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. Understand the concepts of Switched capacitors Circuits
2. Able to know the concepts of PLLS
3. To study concepts of Data Converter Fundamentals.
4. Understand the concepts of Nyquist Rate A/D Converters ,and applications
5. Understand concepts of the Oversampling Converters and Continuous-Time Filters

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the concepts of Switched capacitor circuits.
CO2: Design and analysis of Nyquist Rate A/D Convertors.
CO3: Extend the Mixed Signal Design to Different Applications.
CO4: Concepts of Oversampling Convertors
CO5: Concepts of Continuous-Time Filters.

SYLLABUS

UNIT-I: Switched Capacitor Circuits

Introduction to Switched Capacitor circuits basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, Biquad filters.

UNIT-II: Phased Lock Loop (PLL)

Basic PLL topology, Dynamics of simple PLL, Charge pump PLLsLock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT-III: Data Converter Fundamentals

DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters-Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT-IV: Nyquist Rate A/D Converters

Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters. Electronics & Communication Engineering.

Unit-V Continuous-Time Filters

Introduction to Gm-C Filters, Bipolar Trans conductors , CMOS trans conductors Using Triode and Active Transistors, Bi CMOS Tran conductors, MOSFET-C Filters.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

Reference Books:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.
2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

B. TECH MINOR	**MN**	**L**	**T**	**P**	**C**
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20ECMN01 SYSTEMS AND SIGNAL PROCESSING (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. To introduce the terminology of signals and systems.
2. To study the periodic signals.
3. To study the non-periodic signals.
4. To analyze the continuous time signals.
5. To understand the relationships among the various representations of LTI systems.

Course Outcomes:

At the end of the course, student will be able to

CO1: Characterize the signals and systems.
CO2: Analyze the Fourier series.
CO3: Analyze the Fourier transform.
CO4: Understand the concept of ROC.
CO5: Analyze the linear systems in time and frequency domains.

SYLLABUS

UNIT-I: INTRODUCTION

Definition of Signals and Systems, Elementary signals, Operations on signals, classification and characteristics of Signals, Classification of Systems.

UNIT-II: FOURIER SERIES

Fourier series representation of continuous time periodic signals, properties of Fourier series.

UNIT-III: Data Converter Fundamentals

Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transform.

UNIT-IV: LAPLACE TRANSFORMS

Laplace transform of arbitrary signal, concept of ROC, Laplace transform of standard signals, properties of Laplace transform, Inverse Laplace transform.

Unit-V ANALYSIS OF LINEAR SYSTEMS

Linear system, impulse response, Concept of convolution in time domain and frequency domain, Transfer function of a LTI system, Distortion less transmission through a system, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization.

TEXT BOOKS

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edition, 2002.

REFERENCE BOOKS

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition, 2002.
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015.

B. TECH MINOR	MN	L	T	P	C
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20ECMN02 NETWORKS AND TRANSMISSION LINES (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. To understand the basic concepts on RLC circuits.
2. To know the behavior of the steady states and transients states in RLC circuits.
3. To understand the two port network parameters.
4. To study the propagation, reflection and transmission of plane waves in bounded and unbounded media.

Course Outcomes:

At the end of the course, student will be able to

CO1: Gain the knowledge on basic RLC circuits behavior.
CO2: Analyze the Steady state and transient analysis of RLC Circuits.
CO3: Know the characteristics of two port network parameters.
CO4: Analyze the transmission line parameters and configurations.
CO5: To Know the propagation, reflection and transmission of plane waves in bounded and unbounded media.

SYLLABUS

UNIT-I: TRANSIENT ANALYSIS (FIRST AND SECOND ORDER CIRCUITS)

Introduction to transient response and steady state response, Transient response of series –RL, RC RLC Circuits for sinusoidal, square, ramp and pulse excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform method.

UNIT-II: TWO PORT NETWORKS

Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one of parameter to another, Conditions for Reciprocity and Symmetry, Interconnection of two port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems. DVR & Dr. HS MIC College of Technology

UNIT-III: LOCUS DIAGRAMS

Resonance and Magnetic Circuits: Locus diagrams – Series and Parallel RL, RC, RLC circuits with variation of various parameters – Resonance-Series and Parallel circuits, Concept of band width and quality factor. Magnetic Circuits- Faraday's laws of electromagnetic induction, Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Composite magnetic circuits, Analysis of series and parallel magnetic circuits.

UNIT-IV: TRANSMISSION LINES

I Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristics Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortion lessness and Minimum Attenuation, Illustrative Problems.

Unit-V TRANSMISSION LINES

II SC and OC Lines, Input Impedance Relations, Reflection Coefficient, VSWR, $\lambda/4$, λ 2, λ /8 Lines – Impedance Transformations, Significance of Zmin and Zmax, Smith Chart – Configuration and Applications, Single Stub Matching, Illustrative Problems

Text Books:

1. Transmission Lines and Networks – Umesh Sinha, Satya prakashan, 2001.
2. A Text book of Electrical Technology by B.L Theraja and A.K Theraja, S.Chand publications.

Reference Books:

1. Engineering Circuits Analysis – William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 7th Edition.
2. Principles of Electrical Engineering by V.K Mehta, Rohit Mehta, S.Chand publications.

B. TECH MINOR	**MN**	**L**	**T**	**P**	**C**
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20ECMN03 MODULATION TECHNIQUES (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Distinguish the figure of merits of various analog modulation methods
4. Familiarize with the fundamentals of digital communication systems
5. Familiarize with various techniques for digital modulation and demodulation of signals

Course Outcomes:

At the end of the course, student will be able to

CO1: Differentiate various Analog modulation schemes

CO2: Analyze demodulation schemes and their spectral characteristics

CO3: Analyze noise characteristics of various analog modulation methods

CO4: Differentiate various Digital modulation schemes

CO5: Basic Knowledge on demodulation schemes

SYLLABUS

UNIT-I: AMPLITUDE MODULATION

Introduction to communication system, Need for modulation, Amplitude Modulation – definition, time domain and frequency domain representation, Power calculation of AM, Generation of AM waves - Square law modulator, Detection of AM Waves - Envelope detector.

UNIT-II: DSBSC & SSB MODULATION

DSBSC (Double side band suppressed carrier) modulation – definition, time domain and frequency domain representation, Generation of DSBSC Waves - Balanced Modulator, Detection of DSB-SC waves – Coherent detection.

SSB Modulation – Definition, Time domain and frequency domain representation, Generation of SSB waves- Phase discrimination method, Detection of SSB Waves, compare AM, DSBSC and SSB.

UNIT-III: ANGLE MODULATION

Frequency Modulation – Definition, Narrow band FM, Wide band FM, Transmission bandwidth of FM Wave, Generation of FM Waves - Direct FM, Detection of FM Waves - Balanced Frequency discriminator, zero crossing detector.

UNIT-IV: PULSE DIGITAL MODULATION

Elements of digital communication systems, advantages of digital communication systems, PAM, PWM, PPM, PCM and DM.

Unit-V DIGITAL MODULATION TECHNIQUES

Introduction, ASK, FSK, PSK, DPSK and QPSK generation and reception of each technique.

TEXT BOOKS:

1. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 2007 3rd Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

REFERENCES:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004

B. TECH MINOR	**MN**	**L**	**T**	**P**	**C**
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20ECMN04 ANALOG ELECTRONICS (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1	To introduce circuit realizations with components such as diodes, BJTs and transistors studied earlier.
2	To give understanding of various types of amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
3	To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback.

Course Outcomes:

At the end of the course, student will be able to

CO1:	Design and analyze small signal amplifier circuits applying the biasing techniques learnt earlier.
CO2:	Cascade different amplifier configurations to obtain the required overall specifications like Gain, Bandwidth, Input and Output interfacing Impedances.
CO3:	Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.
CO4:	Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations.
CO5:	Design and analyze small signal amplifier circuits applying the biasing techniques learnt earlier.

SYLLABUS

UNIT-I: Analysis And Design of Small Signal Low Frequency BJT Amplifiers

Review of transistor biasing, Classification of Amplifiers – Distortion in amplifiers, Analysis of CE, CC, and CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors, Design of single stage RC coupled amplifier Different coupling schemes used in amplifiers, Analysis of Cascaded RC Coupled amplifiers, Cascode amplifier, Darlington pair,

UNIT-II: FET Amplifiers

Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOSFET **,** MOSFET structure and I-V characteristics. MOSFET as a switch. small signal equivalent circuits – gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance, high frequency equivalent circuit.

UNIT-III: MULTI-STAGE AND POWER AMPLIFIERS

Direct coupled and RC Coupled multi-stage amplifiers; Differential Amplifiers, Power amplifiers – Class A, Class B, Class C.

FEEDBACK AMPLIFIERS: Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

UNIT-IV: OSCILLATORS

Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

Unit-V OPERATIONAL AMPLIFIERS

Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave and triangular-wave generators.

TEXT BOOK:

1. Bakshi, U. A., & Godse, A. P. (2009). Analog electronics. 2009.
2. "Microelectronic Circuits" (seventh edition) by A.S. Sedra and K.C. Smith, Oxford University Press, 2015.

REFERENCES:

1. Bakshi, U. A., & Godse, A. P. (2009). *Analog and Digital Electronics*. Technical Publications.
2. Neamen, Donald. *Microelectronic Circuit Analysis and Design*. 3rd ed. New York, NY: McGraw-Hill, 2006. ISBN: 9780073285962.

B. TECH MINOR	**MN**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**

20ECMN05 SENSORS AND ACTUATORS (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. To make students familiar with the constructions and working principle of different types of sensors and transducers.
2. To make students aware about the thermal sensors, radiation sensors and measuring instruments and the methods of measurement and the use of different transducers.
3. The objective of the study of aircraft instrumentation is to know the functions of all the flight, gyroscopic and power plant instruments in the aircraft and enable the learners to rectify the problems occurring in the aircraft.

Course Outcomes:

At the end of the course, student will be able to

CO1: Able to learn about sensor Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), and Characterization.

CO2: Able to know about different sensors like Thermal sensors, Magnetic sensors.

CO3: Able to know about Smart Sensors, Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication, Standards for Smart Sensor Interface and the Automation

CO4: Able to know Actuators

CO5: Able to know sensor materials and Processing Techniques

SYLLABUS

UNIT-I: SENSORS

Difference between sensor, transmitter and transducer - Primary measuring elements - selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band. Signal transmission - Types of signal: Pneumatic signal; Hydraulic signal; Electronic Signal.

Principle of operation, construction details, characteristics and applications of potentiometer, Proving Rings, Strain Gauges, Resistance thermometer, Thermistor, Hot-wire anemometer, Resistance Hygrometer, Photo-resistive sensor.

UNIT-II: THERMAL SENSORS

Introduction – Gas thermometric Sensors – Thermal Expansion Type Thermometric Sensors – Acoustic Temperature Sensor – Dielectric Constant and Refractive Index thermosensors – Helium Low Temperature Thermometer – Nuclear Thermometer – Magnetic Thermometer – Resistance Change Type Thermometric Sensors –Thermoemf Sensors– Junction Semiconductor Types– Thermal Radiation Sensors –Quartz Crystal Thermoelectric Sensors – NQR Thermometry – Spectroscopic Thermometry – Noise Thermometry – Heat Flux Sensors Magnetic sensors: Introduction – Sensors and the Principles Behind – Magneto-resistive Sensors – Anisotropic Magnetoresistive Sensing – Semiconductor Magnetoresistors– Hall Effect and Sensors – Inductance and Eddy Current Sensors– Angular/Rotary Movement Transducers – Synchros – Synchro-resolvers - Eddy Current Sensors – Electromagnetic Flowmeter – Switching Magnetic Sensors SQUID Sensors

UNIT-III: RADIATION SENSORS

Introduction – Basic Characteristics – Types of Photosensistors/Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors Electro analytical Sensors: Introduction – The Electrochemical Cell – The Cell Potential - Standard Hydrogen Electrode (SHE) – Liquid Junction and Other Potentials – Polarization – Concentration Polarization-– Reference Electrodes - Sensor Electrodes – Electro ceramics in Gas Media.

UNIT-IV: ACTUATORS

Definition, types and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators, Mechanical actuating system: Hydraulic actuator - Control valves; Construction, Characteristics and Types, Selection criteria.

Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors - AC motors - Single phase & 3 Phase Induction Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator.

Unit-V SENSOR MATERIALS AND PROCESSING TECHNIQUES

Materials for sensors: Silicon, Plastics, metals, ceramics, glasses, nano materials Processing techniques: Vacuum deposition, sputtering, chemical vapour deposition, electro plating, photolithography, silicon micro machining, Bulk silicon micro machining, Surface silicon micro machining, LIGA process.

TEXT BOOKS:

1. Patranabis.D, “Sensors and Transducers”, Wheeler publisher, 1994.
2. Jacob Fraden, “Hand Book of Modern Sensors: Physics, Designs and Application” Fourth edition, Springer, 2010.

REFERENCES:

1. W. Bolton – “Mechatronics” –Pearson Education Limited.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004

B. TECH MINOR	**MN**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**

20ECMN06 ANTENNA THEORY (Minor Engineering Course)

Pre-requisite: Basic knowledge about Electromagnetic Theory, Transmission Lines and Waveguides

Course Objectives:

At the end of the course, student will be able to

1. Know and use standard antenna characterization parameters such as: impedance, far-field radiation pattern, scattering pattern, gain, directivity, bandwidth, beam width, polarization, efficiency, antenna temperature.
2. Understand electromagnetic radiation mechanism and its physics and be able to compute radiation from several common antenna structures.
3. Design simple antennas such as dipoles, micro strip patches, and waveguide horns to achieve specified performance.
4. Design antenna arrays with required radiation pattern haracteristics.
5. Understand self and mutual impedance and the basics of numerical analysis forantennas.

Course Outcomes:

At the end of the course, student will be able to

CO1: Be able to interpret different parameters and properties used to characterize antennas

CO2: Analyze the basic antenna problems.

CO3: Perform and master fundamental descriptions of antenna properties.

CO4: Critically formulate an appropriate model and calculate properties of common antenna types.

CO5: Able to know the concept of printed Antennas

SYLLABUS

UNIT-I: FUNDAMENTAL CONCEPTS

Physical concept of radiation, retarded potentials, Hertzian dipole; Antenna parameters: Radiation pattern, gain, directivity, effective aperture, and reciprocity; Radiation from dipoles ofarbitrary length.

UNIT-II: ANTENNA ARRAYS

Arrays of point sources, end fire and broadside arrays, pattern multiplication, synthesis of binomial and Dolph Chebyshev arrays.

UNIT-III: BROADBAND ANTENNAS

Log-periodic and Yagi antennas, frequency independent antennas, effect of frequency on Linear Arrays, broadcast antennas, Radiation Pattern, RFID Antennas.

UNIT-IV: APERTURE AND REFLECTOR ANTENNAS

Huygens' principle, radiation from apertures in an infinite ground plane, slot and horn antennas, parabolic reflector antennas.

Unit-V PRINTED ANTENNAS

Fundamental wideband printed radiating elements for wireless systems, small printed antennas for wireless systems, Radiation from rectangular and circular patches, feeding techniques.

Text Books:

1. Balanis, C.A., "Antenna Theory and Design", 3rd Ed., John Wiley & Sons, 2005.
2. Kraus, J.D. and Fleisch, D.A., "Electro magnetics with Applications", McGraw-Hill.

Reference Books:

1. Antenna Theory and Design, revised Ed., by Robert S. Elliott, Willey-Interstice & IEEE Press, 2003.
2. Antenna Theory and Design, 2nd Ed., by Warren L. Stutzman, and Gary A. Thiele, John Wiley, 1997.

B. TECH MINOR	MN	L	T	P	C
		4	0	0	4

20ECMN07 DIGITAL ELECTRONICS (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. To represent numbers and conversion between different representations.
2. To analyze logic processes and implement logical operations.
3. To develop the combinational logic circuits.
4. To understand concept of programmable logic devices like PROM, PLA, PAL.
5. To design and analyze the concepts of sequential circuits.

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand different number systems and their conversions.
CO2: Analyze the logical operations and Boolean algebra
CO3: Develop combinational circuits and perform logical operations.
CO4: Understand different programmable logic devices.
CO5: Design the sequential logic functions.

SYLLABUS

UNIT-I: Number Systems

Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r‘s Complement- (r-1)‘s Complement- Subtraction of Unsigned Numbers- Signed Binary Numbers- Problems.

UNIT-II: Logic Gates and Boolean Algebra

Basic Gates- Universal Gates- Ex-Or and Ex-Nor Gates- SOP- POS- Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- K Map Method- Minimization of Boolean Functions.

UNIT-III: Combinational Logic Circuits

Design of Half Adder- Full Adder- Half Subtractor- Full Subtractor- Ripple Adder and Subtractor- Design of Decoders- Encoders- Multiplexers- Demultiplexers- Magnitude Comparator.

UNIT-IV: Introduction to Programmable Logic Devices (PLDs)

PLA- PAL- PROM- Realization of Switching Functions Using PROM- Comparison of PLA, PAL and PROM.

Unit-V Introduction to Sequential Logic Circuits

Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear)- Design of Registers- Universal Shift Register- Ring Counter- Johnson Counter.

TEXT BOOKS

1. Digital Design, M.Morris Mano, Michael D Ciletti, 4thEdition, PEA, 2003.
2. Fundamentals of Logic Design, Roth, 5thEdition, Cengage, 2004

REFERENCE BOOKS

1. Switching and Finite Automata Theory, Kohavi, 3rd Edition, Jha, Cambridge, 2005
2. Digital Logic Design, Leach, Malvino, Saha, TMH, 2000.

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B. TECH MINOR	**MN**	**4**	**0**	**0**	**4**

20ECMN08 MOBILE COMMUNICATIONS (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. To know the evolution of Mobile communication and cell concept to improve capacity of the system.
2. To know the types of channel coding techniques, data transmission modes and services of GSM.
3. To know the types of channel coding techniques, data transmission modes and services of CDMA.
4. Understand Wireless LAN, Bluetooth and WiFi Technologies

Course Outcomes:

At the end of the course, student will be able to

CO1: Demonstrate knowledge on : cellular concepts like frequency reuse, fading, equalization, GSM ,CDMA

CO2: Apply the concept of GSM in real time applications.

CO3: Compare different multiple access techniques in mobile communication.

CO4: Understand the architecture of Wireless LAN technologies

CO5: Understand the concept of mobile TCP

SYLLABUS

UNIT-I: Mobile Communications

Evolution of Mobile Radio Communication, Examples of Wireless Communication Systems. Paging system, Cordless telephones systems, Cellular telephone Systems, Cellular concept: Frequency reuse, Channel Assignment strategies, Hand off strategies. Interference and System capacity, improving coverage and capacity in cellular systems.

UNIT-II: Global System For Mobile (GSM) Historical overview, System overview

The air interface, Logical and physical channels, Synchronization, Coding, Equalizer, Circuit-switched data transmission, Establishing a connection and handover, Services and billing.

CDMA: Historical overview, System overview, Air interface, Coding, Spreading and Modulation, Logical and Physical channels, Handover.

UNIT-III: Wireless LANs and PANs

IEEE 802.11 Standard – Architecture – Services – Blue Tooth- Wi-Fi – WiMAX

UNIT-IV: Mobile IP

DHCP – AdHoc– Proactive and Reactive Routing Protocols – Multicast Routing-Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security

Unit-V Mobile TCP

WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML.

TEXT BOOKS:

1. Andreas F.MOlisch - Wireless Communications,J ohn Wiley, 2nd Edition, 2006
2. William.C.Y.Lee,—Mobile Cellular Telecommunications-Analog and Digital Systems‖, Second Edition,Tata Mc Graw Hill Edition ,2006.

REFERENCES:

1. Dharma Prakash Agarval, Qing and An Zeng, “Introduction to Wireless and Mobile systems”,Thomson Asia Pvt Ltd, 2005.
2. P.Muthu Chidambara Nathan, “Wireless Communication”s, PHI, 2008

B. TECH MINOR	**MN**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**

20ECMN09 ADVANCED MICROCONTROLLERS (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. To provide solid foundation on the fundamentals of microcontrollers and applications,
2. Interfacing the external devices to the Controllers according to the user requirements
3. Enabling to create novel products and solutions for real time problems.

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the fundamentals of Microcontrollers.

CO2: Understand the internal architectures along with the features and their programming.

CO3: Competent with the on chip peripherals of microcontrollers.

CO4: Design different interfacing applications using microcontrollers and peripherals.

CO5: Demonstrate the limitations and strengths of different types of microcontrollers and their comparison.

SYLLABUS

UNIT-I: Overview of Microcomputer systems,

Addresses, General Operation of a computer, Microprocessors in Digital System design, Purpose of microcontroller, differences between microprocessor and microcontroller, Advantages and Disadvantages.

Architecture- RISC and CISC processors, Memory organization, ports, interrupts

UNIT-II: Internal architecture

Introduction to ARM7TDMI processor – Pin Description, Pin functionality, internal architecture, Instruction Set and Instruction Cycle timings, operating modes Types of memory – Code memory, External Memory, Internal memory, Register Set

UNIT-III: PIC16F877

Instructions set, addressing modes, Assembly language Programs. PIC16F877 PERIPHERALS: Timers, , ADC modules, configuration word and programming.

UNIT-IV: SERIAL COMMUNICATION MODULES

UART, EEPROM, Reset, Oscillator modes, configuration word and programming. INTERFACING: Interfacing of keys, Display - LEDs, 7-segment LED (multiplexed display) & LCDs, (Programs in assembly and C).

Unit-V APPLICATIONS OF MICROCONTROLLERS

EX: RPM meter, event counter, temperature, controller (Programs in assembly and C). Development Tools: Simulators, debuggers, cross compilers, in-circuit Emulators for the microcontrollers.

TEXT BOOKS:

1. J.B.PEATMAN Design with PIC microcontrollers-, PHI 1998.
2. Barrnett Cox & Cull, Embedded C programming and the microchip PIC-Thomson Publications 2004.

REFERENCE BOOKS:

1. Ajay .V. Deshmukh Micro Controller theory and Application, TATA McGraw –Hill, 2008, 1st Edition

B. TECH MINOR	**MN**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**

20ECMN10 STATISTICAL SIGNAL PROCESSING (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1. Introduce graduate students to the mathematical ideas that form the basis for modern statistically-based analysis of signals and systems.
2. To study the mathematical background of signal detection and estimation.
3. To study and use classical and Bayesian approaches to formulate problems.
4. To study signal detection and parameter estimation from noisy signals.
5. To study filtering methods for parameter estimation.

Course Outcomes:

At the end of the course, student will be able to

CO1: Generalize the properties of statistical models in the analysis of signals using Stochastic processes.

CO2: Differentiate the prominence of various spectral estimation techniques for Achieving higher resolution in the estimation of power spectral density.

CO3: Outline various parametric estimation methods to accomplish the signal modeling even at higher order statistics.

CO4: Design and development of optimum filters using classical and adaptive algorithms.

CO5: Extrapolate the importance of least squares techniques and ecomposition methods in analyzing the signal estimations.

SYLLABUS

UNIT-I: Review of random variables

Distribution and density functions, moments, independent, uncorrelated and orthogonal random variables; Vector-space representation of Random variables, Schwarz Inequality Orthogonality principle in estimation, Central Limit theorem, Random processes, and wide-sense stationary processes.

UNIT-II: Parameter Estimation

Theory Principle of estimation and applications, Properties of estimates, unbiased and consistent estimators, Minimum Variance Unbiased Estimates (MVUE), Cramer Rao bound, Efficient estimators;

UNIT-III: Estimation of signal in presence of white Gaussian Noise

Linear Minimum Mean-Square Error (LMMSE) Filtering: Wiener Hoff Equation, FIR Wiener filter, Causal IIR Wiener filter, Noncausal IIR Wiener filter

UNIT-IV: Adaptive Filtering

Principle and Application, Steepest Descent Algorithm Convergence characteristics; LMS algorithm, convergence, excess mean square error, Leaky LMS algorithm; Application of Adaptive filters

Unit-V Kalman filtering

State-space model and the optimal state estimation problem, discrete Kalman filter, continuous-time Kalman filter,

TEXT BOOKS

1. Discrete Random Signals and Statistical Signal Processing, By Charles W. Therrien, Prentice Hall Signal Processing Series
2. 2. N. J. Fliege, "Multirate Digital Signal Processing: Multirate Systems -Filter Banks – Wavelets", 1 st Edition, John Wiley and Sons Ltd, 1999.

REFERENCE TEXT BOOK

1. M. H. Hayes, Statistical Digital Signal Processing and Modeling, John Wiley & Sons, Inc.,
2. 4. D. G. Manolakis, V. K. Ingle and S. M. Kogon, "Statistical and Adaptive Signal Processing", McGraw Hill, 2000

B. TECH MINOR	**MN**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**

20ECMN11 MIXED SYSTEM DESIGN (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

1 Understand the concepts of Switched capacitors Circuits
2 Able to know the concepts of PLLS
3 To study concepts of Data Converter Fundamentals.
4 Understand the concepts of Nyquist Rate A/D Converters ,and applications
5 Understand concepts of the Oversampling Converters and Continuous-Time Filters

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the concepts of Switched capacitor circuits.
CO2: Design and analysis of Nyquist Rate A/D Convertors.
CO3: Extend the Mixed Signal Design to Different Applications.
CO4: Concepts of Oversampling Convertors
CO5: Concepts of Continuous-Time Filters.

SYLLABUS

UNIT-I: Switched Capacitor Circuits

Introduction to Switched Capacitor circuits basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, Biquad filters.

UNIT-II: Phased Lock Loop (PLL):

Basic PLL topology, Dynamics of simple PLL, Charge pump PLLsLock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT-III: Data Converter Fundamentals

DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT-IV: Nyquist Rate A/D Converters

Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters. Electronics & Communication Engineering.

Unit-V Continuous-Time Filters

Introduction to Gm-C Filters, Bipolar Trans conductors , CMOS trans conductors Using Triode and Active Transistors, Bi CMOS Tran conductors, MOSFET-C Filters.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

Reference Books:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.
2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

B. TECH MINOR	**MN**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**

20ECMN12 NANO TECHNOLOGY (Minor Engineering Course)

Course Objectives:

At the end of the course, student will be able to

CO1: Know the background of nanotechnology

CO2: know Different classes of Nanomaterials

CO3: know **Synthesis of Nanomaterials**

CO4: know compound semiconductors

CO5: know Applications of Nanotechnology

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the concepts of Switched capacitor circuits.

CO2: Design and analysis of Nyquist Rate A/D Convertors.

CO3: Extend the Mixed Signal Design to Different Applications.

CO4: Concepts of Oversampling Convertors and Continuous-Time Filters.

CO5: Able to know the Applications of nano technology

SYLLABUS

UNIT-I: Nanotechnology

Background to nanotechnology – Definition for Nanotechnology - Scientific Revolutions – Types of nanotechnology – Top-Down and Bottom-Up – Moore's Law – Basic problems and limitations – Opportunities at the Nanoscale

UNIT-II: Different **Classes** of Nanomaterials

Classification based on dimensionality-Quantum Dots,Wells and Wires- Carbon-based nano materials (buckyballs, nanotubes, graphene)-Metalbased nano materials (nanogold, nanosilver and metal oxides) -Nanocomposites-Nanopolymers -Nanoglasses -Nano ceramics -Biological nanomaterials.

UNIT-III: Synthesis of Nanomaterials

Classification of synthesis: Top down and bottom up nanofabrication. Chemical Methods: Metal Nanocrystals by Reduction – Solvothermal Synthesis- Photochemical Synthesis – Sonochemical Routes- Chemical Vapor Deposition (CVD) -Metal Oxide – Chemical Vapor Deposition (MOCVD).Physical Methods:Ball Milling -Electrodeposition – Spray Pyrolysis – Flame Pyrolysis -DC/RF Magnetron Sputtering – Molecular Beam Epitaxy (MBE)

UNIT-IV: Nano MOSFETs

Germanium Nano MOSFETs Strain, Quantization; Advantages of germanium over silicon; PMOS versus NMOS; Compound semiconductors - material properties; MESFETs; Compound semiconductors MOSFETs in the context of channel quantization and strain; Hetero structure MOSFETs exploiting novel materials, strain, quantization.

Unit-V Applications

Solar energy conversion and catalysis – Molecular electronics and printed electronics -Nanoelectronics -Polymers with aspecial architecture – Liquid crystalline systems – Linear and nonlinear optical and electro-optical properties, Applicationsin displays and other devices -Nanomaterials for data storage – Photonics, Plasmonics- Chemical and biosensors -Nanomedicine and Nanobiotechnology -Nanotoxicology challenges.

Text Books:

1. Bhusan, Bharat (Ed), Springer Handbook of Nanotechnology, 2nd Edition, 2007.
2. Hari Singh Nalwa, Nanostructured Materials and Nanotechnology, Academic Press, 2002.

References:

1. Charles P. Poole Jr., Frank J. Ownes, Introduction to Nanotechnology, Wiley Interscience, 2003.
2. Dupas C., Houdy P., Lahmani M., Nanoscience: Nanotechnologies and Nanophysics, Springer-Verlag Berlin Heidelberg, 2007.

ELECTRICAL & ELECTRONICS ENGINEERING
COURSE STRUCTURE
B. TECH I SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EE1T01	BSC	Linear Algebra and Differential Equations	3	-	-	3	3
2	20EE1T02	BSC	Applied Physics	3	-	-	3	3
3	20EE1T03	HSMC	English	3	-	-	3	3
4	20EE1T04	ESC	Basic Mechanical Engineering	3	-	-	3	3
5	20EE1T05	ESC	Engineering Graphics	1	-	4	5	3
6	20EE1L06	HSMC	English Communication Skills Lab	-	-	3	3	1.5
7	20EE1L07	BSC	Applied Physics Lab	-	-	3	3	1.5
8	20EE1L08	ESC	Electrical Engineering Workshop	-	-	3	3	1.5
Total number of credits								**19.5**

B. TECH II SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EE2T01	BSC	Transform Techniques	3	-	-	3	3
2	20EE2T02	BSC	Applied Chemistry	3	-	-	3	3
3	20EE2T03	ESC	Electrical Circuit Analysis – I	3	-	-	3	3
4	20EE2T04	ESC	Power Systems-I	3	-	-	3	3
5	20EE2T05	ESC	Problem Solving Through C	3	-	-	3	3
6	20EE2L06	BSC	Applied Chemistry Lab	-	-	3	3	1.5
7	20EE2L07	ESC	Engineering & IT Workshop	-	-	3	3	1.5
8	20EE2L08	ESC	Problem Solving Through C Lab	-	-	3	3	1.5
9	20EE2M09	MC	Environmental Science	2	-	-	2	-
Total number of credits								**19.5**

B. Tech III SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EE3T01	BSC	Numerical Methods and Vector Calculus	3	-	-	3	3
2	20EE3T02	PCC	Electrical Circuit Analysis – II	3	-	-	3	3
3	20EE3T03	PCC	Analog Electronics-I	3	-	-	3	3
4	20EE3T04	PCC	Electrical Machines -I	3	-	-	3	3
5	20EE3T05	PCC	Electromagnetic Fields	3	-	-	3	3
6	20EE3L06	PCC	Electrical Circuits Lab	-	-	3	3	1.5
7	20EE3L07	PCC	Electrical Machines Lab- I	-	-	3	3	1.5
8	20EE3L08	PCC	Analog Electronics Lab	-	-	3	3	1.5
9	20EE3S09	SC	Python Programming	-	-	4	4	2
Total number of credits								**21.5**

B. Tech IV SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EE4T01	BSC	Complex Variables and Statistical Methods	3	-	-	3	3
2	20EE4T02	PCC	Electrical Machines – II	3	-	-	3	3
3	20EE4T03	PCC	Electrical Measurements	3	-	-	3	3
4	20EE4T04	PCC	Power Systems –II	3	-	-	3	3
5	20EE4T05	HSMC	Managerial Economics and Financial Analysis	3	-	-	3	3
6	20EE4L06	PCC	Electrical Machines Lab-II	-	-	3	3	1.5
7	20EE4L07	PCC	Electrical Measurements Lab	-	-	3	3	1.5
8	20EE4L08	ESC	Data structures through C Lab	-	-	3	3	1.5
9	20EE4S09	SC	Introduction to MATLAB	-	-	4	4	2
10	20EE4M10	MC	Constitution of India	2	-	-	2	-
Total number of credits								**21.5**
Internship 2 Months (Mandatory) during summer vacation								
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B. Tech V SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EE5T01	PCC	Control Systems	3	-	-	3	3
2	20EE5T02	PCC	Switchgear and Protection	3	-	-	3	3
3	20EE5T03	ESC	Analog Electronics - II	3	-	-	3	3
4	**Open Elective – I**			3	-	-	3	3
Professional Elective –I				3	-	-	3	3
5	20EE5T06	PEC-I	AI Techniques in Electrical Engineering					
	20EE5T07		Digital Electronics					
	20EE5T08		Programmable Logic Controllers and Applications					
	20EE5T09		VLSI Design					
6	20EE5L10	PCC	Control Systems Lab	-	-	3	3	1.5
7	20EE5L11	PCC	Electrical Simulation Lab	-	-	3	3	1.5
3	20EE5S12	SC	JAVA Programming	-	-	4	4	2
8	20EE5M13	MC	Essence of Indian Traditional knowledge	2	-	-	2	-
9	20EE5I14	I	Summer internship	-	-	-	-	1.5
Total number of credits								**21.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B. Tech VI SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20EE6T01	PCC	Microprocessors and Micro controllers	3	-	-	3	3
2	20EE6T02	PCC	Power system Operation and Control	3	-	-	3	3
3	20EE6T03	PCC	Power Electronics	3	-	-	3	3
Professional Elective-II				3	-	-	3	3
4	20EE6T04	PEC-II	Digital control systems					
	20EE6T05		Power quality					
	20EE6T06		Renewable and Distributed Energy Technologies					
	20EE6T07		Utilisation of Electrical Energy					
5	**Open Elective – II**			3	-	-	3	3
6	20EE6L10	PCC	Microprocessors and Micro Controllers Lab	-	-	3	3	1.5
7	20EE6L11	PCC	Power Systems Lab	-	-	3	3	1.5
8	20EE6L12	PCC	Power Electronics Lab	-	-	3	3	1.5
9	20EE6S13	SC	Soft Skills	-	-	4	4	2
10	20EE6M14	MC	Disaster Management	2	-	-	2	-
11	20EE6P15	P	Community Service Project	-	-	-	-	4
Total number of credits								**25.5**
Honors/Minor courses				4	-	-	-	4

B. Tech VII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week Lecture	Tutorial	Practical	Contact Hours	Credits
Professional Elective-III								
1	20EE7T01	PEC-III	Power Electronic Control of Electric Drives	3	0	0	3	3
	20EE7T02		High Voltage Engineering					
	20EE7T03		Smart Grid Technologies					
	20EE7T04		Advanced control systems					
Professional Elective -IV								
2	20EE7T05	PEC-IV	Digital Signal Processing	3	0	0	3	3
	20EE7T06		Special electrical machines					
	20EE7T07		HVDC & FACTS					
	20EE7T08		Evolutionary Algorithms and Applications					
Professional Elective -V								
3	20EE7T09	PEC-V	IoT Applications in Electrical Engineering	3	0	0	3	3
	20EE7T10		Switch Mode Power Conversion					
	20EE7T11		Electric Vehicles					
	20EE7T12		Electrical Distribution Systems					
4	**Open Elective-III**			3	0	0	3	3
5	**Open Elective-IV**			3	0	0	3	3
6	20EE7T17	HSMC	Universal Human Values 2: Understanding Harmony	0	0	3	3	3
7	20EE7S18	SC	Electrical CAD	0	0	4	4	2
8	20EE7I19	I	Industrial Internship	-	-	-	-	3
Total number of credits								**23**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B. Tech VIII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week Lecture	Tutorial	Practical	Total Contact Hours	Credits
1	20EE8P01	P	Project work	-	-	-	-	8
Total number of credits								**8**

OPEN ELECTIVE –I:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE5T04	Architecture and Town Planning	3	0	0	3	CE
2	20CE5T05	Elements of Civil Engineering	3	0	0	3	CE
3	20EE5T04	Basics of Control Systems	3	0	0	3	EEE
4	20EE5T05	Special Electrical Machines	3	0	0	3	EEE
5	20ME5T04	Design Thinking & Product Innovation	3	0	0	3	ME
6	20ME5T05	Nanotechnology	3	0	0	3	ME
7	20EC5T04	Linear System Analysis	3	0	0	3	ECE
8	20EC5T05	Digital Logic Design	3	0	0	3	ECE
9	20EC5T06	Solid State Devices	3	0	0	3	ECE
10	20CS5T07	Introduction to Artificial Intelligence	3	0	0	3	CSE
11	20CS5T08	Operating System	3	0	0	3	CSE
12	20CS5T09	Software Engineering	3	0	0	3	CSE
13	20IT5T07	Computer Networks	3	0	0	3	IT
14	20IT5T08	Computer Graphics	3	0	0	3	IT
15	20HS5T01	Quantitative Aptitude and Reasoning	3	0	0	3	BED
16	20MB5T01	Principles of Management	3	0	0	3	DMS
17	20MB5T02	Technology Management	3	0	0	3	DMS
18	20AD5T07	Foundations of Data Science	3	0	0	3	AIDS
19	20AM5T07	Introduction to Machine Learning	3	0	0	3	AIML

OPEN ELECTIVE –II:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE6T08	Remote Sensing and GIS	3	0	0	3	CE
2	20CE6T09	Environmental Impact Assessment	3	0	0	3	CE
3	20EE6T08	Renewable Energy Sources	3	0	0	3	EEE
4	20EE6T09	Energy Audit, Conservation and Management	3	0	0	3	EEE
5	20ME6T07	Industrial Robotics	3	0	0	3	ME
6	20ME6T08	Additive manufacturing	3	0	0	3	ME
7	20EC6T07	Electronic Circuits and Networks	3	0	0	3	ECE

8	20EC6T08	Principles of Communications	3	0	0	3	ECE
9	20EC6T09	Microcontrollers & its Applications	3	0	0	3	ECE
10	20CS6T07	Introduction to Machine Learning	3	0	0	3	CSE
11	20CS6T08	Information Security	3	0	0	3	CSE
12	20CS6T09	Agile Technologies	3	0	0	3	CSE
13	20IT6T07	Fundamentals of Machine Learning	3	0	0	3	IT
14	20IT6T08	Database Management Systems	3	0	0	3	IT
15	20HS6T01	Operations Research	3	0	0	3	BED
16	20MB6T01	Organizational Behaviour	3	0	0	3	DMS
17	20MB6T02	Project Management	3	0	0	3	DMS
18	20AD6T07	Visual Analytics	3	0	0	3	AIDS
19	20AM6T07	Big data Analytics	3	0	0	3	AIML

OPEN ELECTIVE –III:

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CE7T13	Construction Technology and Management	3	0	0	3	CE
2	20CE7T14	Green Buildings	3	0	0	3	CE
3	20EE7T13	Concept of Power System Engineering	3	0	0	3	EEE
4	20EE7T14	Instrumentation	3	0	0	3	EEE
5	20ME7T10	Green Engineering Systems	3	0	0	3	ME
6	20ME7T11	Hybrid Electric Vehicles	3	0	0	3	ME
7	20EC7T10	Data Communications	3	0	0	3	ECE
8	20EC7T11	Mechatronics	3	0	0	3	ECE
9	20EC7T12	Bio Medical Instrumentation	3	0	0	3	ECE
10	20CS7T10	Artificial Neural Networks	3	0	0	3	CSE
11	20CS7T11	Cyber Security	3	0	0	3	CSE
12	20CS7T12	Software Testing Methodologies	3	0	0	3	CSE
13	20IT7T10	Internet of Things	3	0	0	3	IT
14	20IT7T11	Computer Vision	3	0	0	3	IT
15	20HS7T01	Fuzzy sets	3	0	0	3	BED
16	20MB7T01	Digital Media management	3	0	0	3	DMS
17	20MB7T02	Entrepreneurship Development	3	0	0	3	DMS

18	20AD7T10	Data Analysis and Visualization with Python	3	0	0	3	AIDS
19	20AM7T10	NOSQL Databases	3	0	0	3	AIML

OPEN ELECTIVE –IV:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE7T15	Waste water treatment	3	0	0	3	CE
2	20CE7T16	Repair and Rehabilitation of Concrete Structures	3	0	0	3	CE
3	20EE7T15	Power Quality	3	0	0	3	EEE
4	20EE7T16	Electric Vehicles	3	0	0	3	EEE
5	20ME7T12	Micro-Electro- Mechanical Systems	3	0	0	3	ME
6	20ME7T13	Solar Energy Systems	3	0	0	3	ME
7	20EC7T13	Introduction to Embedded Systems	3	0	0	3	ECE
8	20EC7T14	Internet of Things	3	0	0	3	ECE
9	20EC7T15	Analog and Digital IC applications	3	0	0	3	ECE
10	20CS7T13	Data Analytics	3	0	0	3	CSE
11	20CS7T14	Block Chain Technology	3	0	0	3	CSE
12	20CS7T15	Software Project Management	3	0	0	3	CSE
13	20IT7T13	Cloud Computing	3	0	0	3	IT
14	20IT7T14	Business Intelligence	3	0	0	3	IT
15	20HS7T02	Polymer Chemistry	3	0	0	3	BED
16	20MB7T03	Total Engineering Quality Management	3	0	0	3	DMS
17	20MB7T04	Stress Management	3	0	0	3	DMS
18	20AD7T11	Natural Language Processing	3	0	0	3	AIDS
19	20AM7T11	Deep Learning	3	0	0	3	AIML

HONORS/MINOR COURSES OFFERED BY THE DEPARTMENT

Honors/ Minor Course Fulfillments:

- The 20 additional credits need to be acquired, 16 credits can be earned by undergoing specified courses, with each carrying 4 credits.
- The remaining 4 credits must be acquired through two online MOOCs (SWAYAM /NPTEL), which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of Studies.
- Minor Engineering subjects are offered to other branches by CSE Department (except for CSE Students).
- Honors engineering subjects are offered to CSE Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (SWAYAM/NPTEL).

HONORS COURSES

S.No.	Course code	Course Name	L	T	P	C
		Pool-1(Power Systems)				
1	20EEHN01	Distribution System Planning & Automation	4	0	0	4
2	20EEHN02	Substation Automation	4	0	0	4
3	20EEHN03	Advanced Power Systems	4	0	0	4
4	20EEHN04	Economic operation of Power system	4	0	0	4
		Pool-2(Energy Systems)				
5	20EEHN05	Wind and Solar Energy Systems	4	0	0	4
6	20EEHN06	Grid Integration of Renewable Energy Systems	4	0	0	4
7	20EEHN07	SCADA and Energy Management Systems	4	0	0	4
8	20EEHN08	Energy Storage Systems	4	0	0	4
		Pool-3(Control Systems)				
9	20EEHN09	Control Systems Design	4	0	0	4
10	20EEHN10	Modern Control Systems	4	0	0	4
11	20EEHN11	Advanced Control Systems	4	0	0	4
12	20EEHN12	Industrial Process Control	4	0	0	4
		Pool-4(Power Electronics)				
13	20EEHN13	Advanced Power Converters	4	0	0	4
14	20EEHN14	Modelling and Analysis of Electrical Machines	4	0	0	4
15	20EEHN15	Custom Power Devices	4	0	0	4
16	20EEHN16	Automotive Power Electronics	4	0	0	4

MINOR COURSES

S.No.	Course code	Course Name	L	T	P	C	Offered by
1	20EEMN01	Basics of Power Systems	4	0	0	4	EEE
2	20EEMN02	Basics of Power Electronics	4	0	0	4	EEE
3	20EEMN03	Fundamentals of Electrical and Electronic Measurements	4	0	0	4	EEE
4	20EEMN04	Basics of Electrical Machines**(Except ECE & ME)**	4	0	0	4	EEE
5	20EEMN05	Fundaments of Electrical Circuits(**Except ECE**)	4	0	0	4	EEE
6	20EEMN06	Electrical Safety	4	0	0	4	EEE

B.TECH I SEMESTER **BSC**

L	T	P	C
3	0	0	3

20EE1T01 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

Pre-requisite: Basic knowledge about matrices, differentiation and integration

Course Objective: Objective of the course is to impart

- Basic understanding of mathematical methods to solve simultaneous linear systems
- Understanding of formation and solutions of ordinary differential equations
- Knowing the mathematical methods to solve applications of differential equations

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the knowledge to solve a system of homogeneous and non homogeneous linear equations

CO2: Illustrate the methods of computing eigen values and eigen vectors

CO3: Able to analyze the real life situations, formulate the differential equations and then applying the methods

CO4: Determine the solutions of linear differential equations

CO5: Optimize functions of several variables and able to find extreme values of constrained functions

SYLLABUS

UNIT-I: Linear systems of equations:

Rank of a matrix, Echelon form, Normal form, PAQ is in normal form, linear dependence and independence of vectors, Consistency of linear system of equations, System of linear homogeneous equations, Gauss-elimination and Gauss -Jordan methods.

UNIT-II: Eigen values & Eigen vectors:

Eigen values, Eigen vectors, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), finding inverse and powers of a matrix using C-H theorem, Reduction to diagonal form, reduction of quadratic form to canonical form using orthogonal reduction, nature of quadratic forms.

UNIT-III: Ordinary Differential Equations of first order:

Linear equations, Bernoulli's equation, Exact differential equations. Equations reducible to exact equations, Applications: Orthogonal Trajectories, Newton's Law of cooling, Rate of decay & growth., R-L series circuits.

UNIT-IV: Linear Differential Equations higher order:

Definitions, Complete solution (without proof), Operator D, Rules to find complementary function, Inverse operator, Rules to find the particular integral(nonhomogeneous term of the form e^{ax} , sin(ax+b), cos(ax+b), polynomials in x^m, e^{ax} V(x), any other function), Method of variation of parameters.

UNIT-V: Partial Differentiation:

Functions of two variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Jacobian and functional dependence, Taylor's theorem for functions of two variables. **Applications:** Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA**,** Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.

2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH I SEMESTER	BSC	L	T	P	C
		3	0	0	3

20EE1T02 APPLIED PHYSICS

Pre-requisite: Knowledge of basic concepts of waves, Optics, Electricity and Magnetism

Course Objective: Objective of the course is to impart

- ***Knowledge*** of fundamentals of Physics which helps them in the study of advanced topics of Engineering.
- ***Develop*** analytical capability and understand various Engineering concepts.

Course Outcomes:

At the end of the course, student will be able to

CO1: ***Impart*** knowledge of Physical Optics phenomenon Polarization and identify these phenomenon in natural processes

CO2: ***Gain*** knowledge of applications of lasers and optical fibers in various fields .

CO3: ***Classify*** magnetic and dielectric materials and their Engineering applications.

CO4: ***Understand*** basic quantum mechanics and free electron theories.

CO5: ***Obtain*** the concept of concept of holes and electrons in semiconductors.

SYLLABUS

UNIT-I: Wave Optics:

***Interference**:* Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Colors in thin films-Newton's rings-Determination of wave length nd refractive index.

Diffraction: C Introduction- Fresnel and Fraunhofer diffraction - Fraunhofer Diffraction due to Single slit, Double slit, N –slits(Qualitative) - Diffraction Grating – Resolving Power of Grating(Qualitative).

Polarizations: Introduction- Types of polarization-polarization by reflection, refraction and Double refraction-Nicol's prism –Half and Quarter wave plates.

UNIT-II: Lasers and Fiber Optics:

Lasers:: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

***Fiber optics*:** Introduction –Principle of optical fiber-Construction- - Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes .

UNIT-III: Magnetic and Dielectric Materials:

***Magnetic Materials*:** Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para ferro, anti ferro & ferri – Domain concept of Ferromagnetism(Qualitative) - Hysteresis – soft and hard magnetic materials .

***Dielectric Materials*:** Introduction - Dielectic polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation.

UNIT-IV: Quantum Mechanics,Free Electron Theory:

***Quantum Mechanics*:** Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

***Free Electron Theory*:** Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi**-**Dirac distribution- Density of States(3D),Fermi energy.

UNIT-V: Band Theory of Solids and Semiconductors:

Band theory of Solids: Introduction- Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - V vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Semiconductors::Introduction– Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on

carrier concentration and temperature – Drift and Diffusion currents – Einstein's equation-Hall effect- Hall coefficient - Applications of Hall effect.

Text Books

1. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G. Kshirsagar - S. Chand Publications, 2019.
2. "Engineering Physics" by D.K. Bhattacharya and Poonam Tandon, Oxford press (2015).
3. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference Books

1. Applied Physics by P.K. Palanisamy, Scitech publications (2014).
2. Engineering Physics by M. Arumugam, Anuradha Publication (2014).
3. Physics for Engineers by M.R. Srinivasan, New Age international publishers (2009).

B.TECH I SEMESTER	HSMC	L	T	P	C
		3	0	0	3

20EE1T03 ENGLISH

Pre-requisite:

Course Objective:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: At the end of the course, student will be able to

CO1	understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
CO2	ask and answer general questions on familiar topics
CO3	employ suitable strategies to master the art of letter writing and email writing
CO4	recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
CO5	form sentences using proper grammatical structures and correct word forms

SYLLABUS

UNIT-I A Drawer full of happiness (Detailed Study)
Deliverance (Non-detailed Study)

UNIT-II	Nehru's letter to his daughter Indira on her birthday(Detailed Study) Bosom Friend (Non-detailed Study)
UNIT-III	Stephen Hawking-Positivity 'Benchmark' (Detailed Study) Shakespeare's Sister(Non-detailed Study)
UNIT-IV	Liking a Tree, Unbowed: Wangari Maathai-biography (Detailed Study) Telephone Conversation(Non-detailed Study)
UNIT-V	Stay Hungry-Stay foolish (Detailed Study) Still I Rise(Non-detailed Study)

Text Books

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The Individual Society", Pearson Publications.(Non-detailed)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

B.TECH I SEMESTER	ESC	L	T	P	C
		3	0	0	3

20EE1T04 BASIC MECHANICAL ENGINEERING

Course objectives:

- To make the student familiar with systems of forces
- To create awareness on various pumps, turbines and their working principles
- To make the student understand the concept of hydroelectric power plant, its components and principle
- To induce knowledge about thermodynamics, laws and applications
- To make the student familiar with power cycle and refrigeration cycles

Course outcomes: at the end of the course, the student will be able to

CO1: Understand the concept of systems of forces

CO2: Learn about various pumps, turbines and their working principles

CO3: understand the concept of hydroelectric power plant, its components and principle

CO4: learn about thermodynamics, laws and applications

CO5: know with power cycle and refrigeration cycles

SYLLABUS

UNIT-I

Introduction to Engg. Mechanics – Basic Concepts. Systems of Forces: Coplanar Concurrent Forces– Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, analysis of plane trusses.

UNIT-II

Pumps: Types of pumps, Main components, working principle

Hydro Prime Movers: Hydraulic Turbines: Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine, Performance and characteristic curves.

Unit-III

Hydro Power: Components of hydro-electric power plant, Estimation of water power potential, Estimation of load on turbines: load curve, load factor, capacity factor, utilization factor, diversity factor, load-duration curve, firm power, secondary power, prediction of load.

UNIT-IV

Heat and Work: Heat and Work, Point and Path function. Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM I, Problems on heat and work for various processes.

First law of thermodynamics, application of steady flow energy equation to various components of a power plant (boiler, turbine, condenser and pump), Carnot engine.

UNIT-V

Introduction to cycles: Power cycle: Introduction to 2 stroke and 4 stroke engine, Otto cycle, Diesel cycle, problems on Otto and Diesel cycle

Refrigeration cycle: Refrigerant, Vapour compression refrigeration (VCR) cycle, Problems on VCR cycle, vapour absorption refrigeration cycle, domestic refrigerator, window and split AC.

Text books:

1. Engineering Thermodynamics, PK Nag 4th Edn , TMH.
2. Hydraulics & Fluid Mechanics Including Hydraulics Machines, Dr. P.N. Modi & Dr. S.M. Seth, Rajsons Publ, 21st Ed., 2017.
3. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications
4. Strength of materials by Bhavikatti, Lakshmi publications.

References:

1. A Textbook of Elements of Mechanical Engineering", S Trymbaka Murthy, University Press (India) Pvt Ltd, 4th Edition, 2006.6

I B.TECH - I SEMESTER	ESC	L	T	P	C
		1	0	4	3

20EE1T05 : ENGINEERING GRAPHICS

Objective:

1. To introduce the students to use orthographic projections, projections of points & simple lines.
2. To make the students draw the projections of the lines inclined to both the planes.
3. To make the students draw the projections of the plane inclined to both the planes.
4. To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
5. To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the concepts of projections and draw projections for simple entities such as points and lines.
2. Draw orthographic projections of planes and simple solids.
3. Understand the concept of sections and sectional views.
4. Develop the surfaces for various simple solids and understand the concept of intersection of two solids.
5. Analyze the 2D drawings and convert to 3D isometric views.
6. Learn computer aided drafting with AutoCAD and draw simple 2D part drawings and orthographic views using the software.

SYLLABUS

UNIT I

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

UNIT II

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders-Simple positions

UNIT III

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one plane.

Sections of Solids: Sections and sectional views of Right regular solids-Prisms, Pyramids, Cones and Cylinder.

UNIT IV

Interpenetration of right regular solids: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

Development of Surfaces: Development of Surfaces of right regular solids-Prisms, Pyramids, Cones and Cylinder

UNIT V

Conversion of orthographic views to isometric view for Simple Solids such as prism, pyramid, cylinder and cone; Conversion of isometric view to orthographic views.

Computer Aided Drafting: Introduction to AutoCAD, Geometric commands, Modify commands, Annotation, Layers, display control and Properties tool bars. Creation of simple 2D part drawings and orthographic views.

Text books:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers

Reference books:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers

2. Engineering Graphics by PI Varghese, McGrawHill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age
4. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

B.TECH I SEMESTER	HSMC	L	T	P	C
		0	0	3	1.5

20EE1L06 ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

- Facilitate effective usage of functional English through role plays
- Focus on vocabulary enhancement
- Foster various nuances of phonetics and accent neutralization

Course Outcomes: At the end of the course, student will be able to

CO1: Acquire basic proficiency in English by learning functional aspects of English language

CO2: Learn the methods of enhancing vocabulary

CO3: Acquaint himself/herself with nuances of Phonetics

LIST OF EXPERIMENTS

1 Greetings and Introductions
2 Requesting Permission & Giving Directions
3 Inviting/Complaining/Congratulating
4 Root Words
5 Phonetics-Sounds and Symbols
6 Pronunciation Rules

References:

1. Strengthen Your Steps, Maruti Publications

2. Interact, Orient Blackswan

3. Word Power Made Easy, Pocket Books

B.TECH I SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20EE1L07 APPLIED PHYSICS LAB

Pre-requisite: Fundamental understanding of usage of an instrument with proper care.

Course Objective: Objective of the course is to impart

- Training Engineering graduates to handle instruments and their usage methods to improve the accuracy of measurements.

At the end of the course, student will be able to

CO1: **Outcomes**: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

CO2: Implement the basic principles of Mechanics to measure different physical parameters.

CO3: Enhance the knowledge of Usage of electronic devices in various applications

SYLLABUS

1. Newton's rings –Determination of radius of curvature of Plano Convex Lens.
2. Determination of wavelength of spectral lines -Diffraction Grating
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of wavelength of laser source using diffraction grating
5. Determination of Numerical Aperture and bending loss of a given Optical Fiber.
6. Determination of dispersive power of prism.
7. Determination of Rigidity modulus of a material- Torsional Pendulum.
8. Determination of Acceleration due to Gravity and Radius of Gyration-Compound Pendulum.
9. Determination of Young's modulus by method of single cantilever oscillations
10. Verification of laws of vibrations in stretched strings – Sonometer.
11. Estimation of Planck's Constant using Photo electric Effect

12. Study of I /V Characteristics of Semiconductor diode.
13. I/V characteristics of Zener diode.
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
15. Energy Band gap of a Semiconductor using p - n junction diode

Reference Books

1. A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers, 2017.

B.TECH I SEMESTER	ESC	L	T	P	C
		0	0	3	1.5

20EE1L08 ELECTRICAL ENGINEERING WORKSHOP

Course Objectives:

- To demonstrate the usage of measuring equipment
- To train the students in setting up simple wiring circuits
- To impart methods in electrical machine wiring

Course Outcomes: At the end of the course, student will be able to

CO 1:	Explain the limitations, tolerances, safety aspects of electrical systems and wiring.
CO 2:	Select wires/cables and other accessories used in different types of wiring.
CO 3:	Measure current, voltage and power in a circuit.
CO 4:	Make simple lighting and power circuits.

LIST OF EXPERIMENTS

1. Study of various supply systems, electrical symbols, tools and safety aspects.
2. Study of different switches, MCBs, measuring instruments (Ammeter, Voltmeter Wattmeter and Multimeter), wires and cables.
3. Identification and measurement of resistance, inductance & capacitance.
4. Practice house wiring with MCB, 3 pin socket, 2 way control of lamp.
5. Wiring of backup power supply for domestic installations including inverter, battery and load.
6. Practice soldering with simple electronic components on PCB
7. Estimation of Power loads
8. Maintenance /Charging of the Batteries.
9. Testing of Refrigerator and Geyser
10. Understanding the concept of earth pit, importance of earth resistance and it’s measurement.

B.TECH II SEMESTER	BSC	L	T	P	C
		3	0	0	3

20EE2T01 TRANSFORM TECHNIQUES

Pre-requisite: Linear Algebra and Differential Equations

Course Objective: Objective of the course is to impart

- Learning the techniques of Laplace transforms to solve ordinary differential equations
- knowledge of Fourier series & Fourier transforms for piecewise continuous functions
- knowledge of solving boundary valued problems

Course Outcomes: At the end of the course, student will be able to

CO1: Able to analyze a class of integrals in terms of beta and gamma functions

CO2: Provide the techniques of Laplace transformations and able to solve problems related to digital signal processing

CO3: Analyze the general periodic functions in the form of an infinite convergent sine and cosine series

CO4: Illustrate the methods to solve the boundary value problems

CO5: Determine a solution of a discrete system using Z- transforms

SYLLABUS

UNIT-I: Special functions:

Beta function, Properties & problems, Gamma function, properties & problems, Relation between Beta and Gamma functions, Evaluation of improper integrals.

UNIT-II: Laplace Transforms (all properties without proofs):

Definition, Transforms of elementary functions, properties of Laplace transforms, Transforms of periodic functions, Transforms of derivatives and integrals, Multiplication by t^n, Division by t, Evaluation of improper integrals.

Inverse Laplace transforms–Method of partial fractions, other methods of finding inverse transforms, Convolution theorem (without proof). **Application:**

Application to differential equations.

UNIT-III: Fourier Series & Fourier Transforms:

Euler's formulae (without proof), Conditions of Fourier expansion, Functions having points of discontinuity, Change of ineval, Even and odd functions, Half-range series.
Fourier Integral theorem (without proof), Fourier cosine & sine integral, complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, properties of Fourier transforms (without proof), Convolution theorem(without proof), finite & infinite Fourier sine & cosine transforms.

UNIT-IV: Partial Differential Equations:

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of Variables, Applications: One-dimensional wave and heat equations, two-dimensional heat equation.

UNIT-V: Z-Transforms: (all properties without proofs)

Introduction, definition, some standard z-transforms, linearity property, damping rule, some standard results, shifting U_n to the right, multiplication by n, initial and final value theorems, Inverse z-transforms, convolution theorem, evaluation of inverse z-transforms by partial fractions, applications to difference equations.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH II SEMESTER **BSC**

L	T	P	C
3	0	0	3

20EE2T02 APPLIED CHEMISTRY

Pre-requisite: Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the availableresources

Course Objective: Objective of the course is to impart

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of green chemistry and molecular switches

Course Outcomes: At the end of the course, student will be able to

CO1: Analyze the different types of composite plastic materials and interpret the mechanism ofconduction in conducting polymers.

CO2: Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning newengineering products and categorize the reasons for corrosion and study methods to control corrosion.

CO3: Synthesize nanomaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystalsand superconductors.

CO4: Design models for energy by different natural sources.
Analyze the principles of different analytical instruments and their applications.

CO5: Obtain the knowledge of green chemistry and molecular machines

SYLLABUS

UNIT-I: Polymer Technology

Polymerisation: Introduction, methods of polymerization (addition and Condensation), Physical and mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers: Natural rubber-Drawbacks-vulcanization, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics – GFRP and Aramid FRP

Conducting polymers: Intrinsic and extrinsic conducting polymers

Biodegradable polymers: preparation and applications

UNIT-II: Electrochemical Cells And Corrosion

Part I: ELECTROCHEMICAL CELLS: Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Part II: Corrosion: Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings (cathodic coatings, anodic coatings, electroplating and electroless plating)

UNIT-III: Material Chemistry

Part I: Non-elemental semiconducting materials: Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling technique) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Super conductors:-Type –I, Type II-characteristics and applications

Part II: Nano materials: Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and

fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals: Introduction-types-applications.

UNIT-IV: Non-Conventional Energy Sources & Spectroscopy

Part I: NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Part II: **SPECTROSCOPY**

UV spectroscopy- Basic principle-Instrumentation-Applications

IR spectroscopy- Basic principle-Instrumentation-Applications

NMR spectroscopy- Basic principle-Instrumentation-Applications

UNIT-V: Advanced Concepts/Topics In Chemistry

Part-I: Green chemistry: Introduction, Principles of green chemistry, Green synthesis-Aquaeous Phase method-Microwave method-Phase transfer catalysis method, R4M4 principles (Econoburette).

PART-II: Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid- base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor.

Text Books:

1. P.C. Jain and M. Jain “Engineering Chemistry”, 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, “Engineering Chemistry”, Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, “A Textbook of Engineering Chemistry”, S.Chand & Co, (2010).
4. Shashi Chawla, “Engineering Chemistry”, Dhanpat Rai Publicating Co. (Latest edition).

References:

1. K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited,(2009).
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials"Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology",University press (latest edition)

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20EE2T03 ELECTRICAL CIRCUIT ANALYSIS – I

Pre-requisite: Basic introduction to electrical engineering and electrical circuit concepts Linear algebra, vector analysis, matrix analysis and complex calculus, Mathematics-1.

Course Objective: To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems. To develop an understanding of the fundamental laws and elements of electric circuits.

Course Outcomes: At the end of the course, student will be able to

- **CO1:** Various electrical networks in presence of active and passive elements
- **CO2:** R, L, C network with sinusoidal excitation & R, L, network with variation of any one of the parameters i.e R, L, C and f.
- **CO3:** Electrical networks with network topology concepts.
- **CO4:** Any magnetic circuit with various dot conventions.
- **CO5:** Electrical networks by using principles of network theorems.

SYLLABUS

UNIT-I: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Network reduction techniques (series, parallel, series – parallel) Star-to-delta and delta to-star transformation, Source transformation technique, nodal analysis and mesh analysis.

UNIT-II: AC Circuits

Periodic waveforms (determination of rms, average value and form factor), Concept of phase angle and phase difference – Waveforms and phasor diagrams for lagging, leading networks, real power, reactive power, apparent power, power factor ,Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Series and Parallel Resonance.

UNIT-III: Network Topology

Definitions of Graph and Tree, Basic cutset and tieset matrices for planar networks. Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources, Duality

UNIT-IV: Magnetic Circuits

Basic definition of MMF, flux and reluctance. Analogy between electrical and magnetic circuits. Faraday's laws of electromagnetic induction, Concept of self and mutual inductance. Dot convention-coefficient of coupling and composite magnetic circuit, Analysis of series and parallel magnetic circuits

UNIT-V: Network Theorems

Analysis of Superposition theorem, Thevenin theorem, Norton theorem for independent and dependent current and voltage sources. Maximum power transfer theorem, Reciprocity theorem, and Compensation theorem.

Text Book(s)

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.

References

1. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
2. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi, Dhanpat Rai & Co.

B.TECH II SEMESTER **ESC**

L	T	P	C
3	0	0	3

20EE2T04 POWER SYSTEMS-I

Pre-requisite: Basic knowledge about Electrical Circuits, Engineering Physics.

Course Objective: To understand the working of different types of power generation systems and Economic aspects of Power Generation & Tariff

Course Outcomes: At the end of the course, student will be able to

CO1: Determine the significance of various components of the Thermal Power Stations

CO2: Determine the significance of various components of the power generation plants

CO3: Describe the use of solar energy and the various components used in the energy production

CO4: Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.

CO5: Appreciate the Economic Aspects different types of tariff.

SYLLABUS

UNIT-I: Thermal Power Stations

Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super, heaters, Economizers, electrostatic precipitators Steam Turbines: Impulse and reaction turbines, Condensers, feed water circuit, Cooling towers and Chimney.

UNIT-II: Hydel & Nuclear Power Stations

Hydro Power Stations: Choice of site, arrangement of hydroelectric installations, Hydrology. Mass curve, flow duration curve, classification of Hydro Power Plants, pumped storage plants.

Nuclear Power Stations: Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components: Moderators, Control rods, Reflectors and Coolants. Types of

Nuclear reactors and brief description of PWR, BWR and FBR. Radiation: Radiation hazards and Shielding, nuclear waste disposal.

UNIT-III: Solar power generation

Solar radiation spectrum. Radiation measurement. Solar thermal systems, Solar Photovoltaic (SPV) systems- Applications -Numerical problems

UNIT-IV: Wind Power Generation

Introduction to wind energy, basic principles of wind energy conversion, forces on the blade power in the wind – maximum power, wind energy conversion Basic components of wind energy conversion systems. Classification of WECS-HAWT, VAWT. Schemes of electric generation, Site selection considerations. Numerical Problems

UNIT-V: Economic Aspects of Power Generation & Tariff

Economic Aspects - Load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, Base and peak load plants.

Tariff Methods- Costs of Generation and their division into Fixed, Semi-fixed and Running Costs, Desirable Characteristics of a Tariff Method, Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three–part, and power factor tariff methods.

Text Book(s)

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagarand, A Chakrabarti, DhanpatRai& Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers

References

1. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006.
2. Principles of Power Systems by V.K.Mehta and Rohit Mehta, S Chand Publications.

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20EE2T05 PROBLEM SOLVING THROUGH C

Pre-requisite:

Course Objective:

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor. To assimilate about File I/O and significance of functions

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of programming

CO2: Understand and Apply loop construct for a given problem

CO3: Demonstrate the use pointers

CO4: Understand the use of functions and develop modular reusable code

CO5: Understand File I/O operations

SYLLABUS

UNIT-I:

INTRODUCTION TO COMPUTERS: Functional Components of computer, computer software, categories of memory, types of programming languages, Development of algorithms, flow charts, software development process, Computer Numbering system

BASICS OF C PROGRAMMING: Introduction to programming paradigms, Structure of C program, Data Types, C Tokens, Operators: Precedence and Associativity, Expressions Input/output statements, Assignment statements

UNIT-II:

Decision making statements: if, if else, nester if. Multi way decision making statements: else if, Switch statement. **Loop statements**: while, do while, for, Compilation process.

UNIT-III:

Introduction to Arrays: Declaration, Initialization, One dimensional array, Example Programs on one dimensional array, Selection sort, linear and binary search, two dimensional arrays, Matrix Operations, Multi-dimensional Arrays

Strings: Declaration, String operations: length, compare, concatenate, copy, String handling functions.

UNIT-IV:

FUNCTIONS: Introduction to functions: Function prototype, function definition, function call, Built-in functions, Recursion, Storage classes, Passing Arrays & Strings to the functions, Preprocessor directives

POINTERS: Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers, Parameter passing: Pass by value, Pass by reference, Dynamic Memory Allocation

UNIT-V:

STRUCTURES AND UNIONS: Structure, Nested structures, Pointer and Structures, Array of structures, Example Program using structures and pointers, Self-referential structures, Unions.

FILE PROCESSING: Files, Types of file processing: Sequential access, Random access, Sequential access file, Random access file, Command line arguments

Text Books:

1. Krnighan. B.W and Ritche, D.M, “The C Programming Language”, Second Edition, Pearson Education, 2006
2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.

References:

1. Pradepdey, Manas Ghosh, “Fundamentals of Computing and programming in C”, First Edition, Oxford University Press, 2009.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh Edition, Pearson Publication.
3. E Balagursamy, “Programming in C, Sixth Edition, Tata McGraw Hill.
4. Ajay Mittal, “Programming in C A practical Approach”, Pearson education

		L	T	P	C
B.TECH II SEMESTER	**BSC**	**0**	**0**	**3**	**1.5**

20EE2L06 APPLIED CHEMISTRYLAB

Pre-requisite: Acquire some experimental skills.

Course Objective: Objective of the course is to impart

- The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations.
- A few instrumental methods of chemical analysis.

Course Outcomes:

At the end of the course, student will be able to

CO1: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

LIST OF EXPERIMENTS

1 Determination of HCl using standard Na2CO3 solution.

2 Determination of alkalinity of a sample containing Na2CO3 and NaOH.

3 Determination of Mn+2 using standard oxalic acid solution.

4 Determination of ferrous iron using standard K2Cr2O7 solution.

5 Determination of Cu+2 using standard hypo solution.

6 Determination of temporary and permanent hardness of water using standard EDTA solution.

7 Determination of Fe+3 by a colorimetric method.

8 Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).

9 Determination of iso-electric point of amino acids using pH-metry method/conductometric method

10 Determination of the concentration of strong acid vs strong base (by

conductometric method).

11 Determination of strong acid vs strong base (by potentiometric method).

12 Determination of Mg^{+2} present in an antacid.

13 Determination of $CaCO_3$ present in an egg shell.

14 Estimation of Vitamin C.

15 Determination of phosphoric content in soft drinks.

16 Adsorption of acetic acid by charcoal.

17 Preparation of nylon-6, 6 and Bakelite (demonstration only).

B.TECH II SEMESTER	ESC	L	T	P	C
		0	0	3	1.5

20EE2L07: ENGINEERING & IT WORKSHOP

Course Objective: To impart hands-on practice on basic engineering trades and skills.

Trade:

1. **Carpentry**
   a. T-Lap Joint
   b. Cross Lap Joint
   c. Dovetail Joint
   d. Mortise and Tenon Joint
2. **Fitting**
   a. Vee Fit
   b. Square Fit
   c. Half Round Fit
   d. Dovetail Fit
3. **House Wiring**
   a. Parallel / Series Connection of three bulbs
   b. Stair Case wiring
   c. Florescent Lamp Fitting
   d. Measurement of Earth Resistance
4. **Tin Smithy**
   a. Taper Tray
   b. Square Box without lid
   c. Open Scoop
   d. Funnel
5. **Product prototyping using 3D Printing**
6. **IT Workshop**
   Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.

   Task 2: Practicing disassembling and assembling components of a PC

   Note: At least two exercises to be done from each trade.

B.TECH II SEMESTER **ESC**

L	T	P	C
0	0	3	1.5

20EE2L08 PROBLEM SOLVING THROUGH C LAB

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers &functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

- Demonstrate Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( )function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name
3. Write a program in C to remove a file from the disk.

B.TECH II SEMESTER

	L	T	P	C
MC	2	0	0	-

20EE2M09 **ENVIRONMENTAL SCIENCE**

Course objective:

To understand the importance of Environment and the importance of biodiversity

Course outcomes:

- The importance of environment, Natural resources and current global environmental challenges for the sustenance of the life on planet earth.
- The concepts of the ecosystem and its function in the environment.
- 3.The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- The various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices.
- The environmental legislations of India and Social issues and the possible means
- Environmental assessment and the stages involved in EIA.

SYLLABUS

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Introduction- Scope of Environmental Studies- Importance of Environmental Studies- Need for public awareness, Environmental ethics- Contemporary Environmentalists- Environmental Global moves: Stockholm conference, Earth summit

Concept of an ecosystem - Structure of an ecosystem- function of an ecosystem- Food chains, food webs- ecological pyramids- Energy flow in the ecosystem- Ecological succession- Nutrient cycling- 1^{o}production& 2^{o}production- Major ecosystems: Forest ecosystem- Grassland ecosystem, Desert ecosystem- Aquatic ecosystem: pond, Lake Ecosystem- Streams, river ecosystem, Oceans

UNIT-II: NATURAL RESOURCES AND CONSERVATION

Introduction and classification of natural resources-Forest resources**:** Use and over-exploitation- Deforestation-Timber extraction-Mining-Conservation-Water resources**:** Use and over utilization of surface and ground water,- Floods, drought, Dams and associated problems- Water conservation, rain water harvesting, water shed management-Energy resources**:** renewable energy sources –solar-wind-hydro-tidal- Ocean

thermal-geo thermal-bio mass-bio gas-bio fuels- Hydrogen.- Non-renewable energy sources-coal-petroleum-natural gas-Nuclear energy

UNIT-III: **BIODIVERSITY AND ITS CONSERVATION**

Definition, classification- Value of biodiversity-Threats to biodiversity: habitat loss, man-wildlife conflicts- Endangered and endemic species of India-Conservation of biodiversity- Biodiversity at national and local levels, Hot-sports of biodiversity

UNIT-IV: ENVIRONMENTAL PROBLEMS

Global warming, Climate change- Acid rain, Ozone depletion- Air pollution-Water pollution- Soil pollution- Noise pollution, Nuclear hazards- Solid Waste Management: Causes, Consequences and Control methods- Solid Waste Management- Population growth and explosion, effects, control measures- Pollution case studies- Role of an individual in prevention of pollution

UNIT-V: ENVIRONMENTALLEGISLATION & MANAGEMENT

Sustainable development- Air (Prevention and Control of Pollution) Act-Drawbacks- Water (Prevention and control of Pollution) Act- Drawbacks-Wildlife Protection Act- Drawbacks- Forest Conservation Act- Drawbacks-Environmental Protection Act- Drawbacks- Environmental Impact Assessment and its significance- Preparation of Environmental Management Plan and Environmental Impact Statement- Ecotourism

TEXT BOOKS:

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age Publications, New Delhi

2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada

3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCES:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Delhi

B.TECH III SEMESTER **BSC**

L	T	P	C
3	0	0	3

20EE3T01 NUMERICAL METHODS AND VECTOR CALCULUS

Pre-requisite: Linear Algebra and Differential Equations & Transformation Techniques

Course Objective: Objective of the course is to impart

- understand the basic numerical methods to solve simultaneous linear equations
- knowledge of numerical methods to solve ordinary differential equations
- the types of integration over the lines, surfaces & volumes

Course Outcomes:

S. No.	At the end of the course, student will be able to
CO1:	Determine the solution of transcendental equations by different numerical methods
CO2:	Provide the interpolation techniques which analyze the data of an unknown function
CO3:	Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries
CO4:	Evaluate areas and volumes using double & triple integrals
CO5:	Apply the concepts of calculus to scalar and vector fields and establish the relation between line, surface and volume integrals.

SYLLABUS

UNIT-I: Numerical Solution of Equations:

Solution of Algebraic and transcendental equations: Bisection method, Method of false position and Newton-Raphson method. Iterative methods of solution of linear simultaneous equations: Jacobi’s and Gauss-Seidel iteration methods.

UNIT-II: Interpolation:

Forward and backward, relation between these operators, Differences of a polynomial, Interpolation with unequal intervals: Lagrange’s interpolation formula, Newton’s forward & backward interpolation formulae & problems.

UNIT-III: Numerical Integration & Numerical Solutions of ordinary differential equations with initial conditions:

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rules.

Numerical Solution of ODE: Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method of 4^{th} order.

UNIT-IV: Multiple Integrals:

Double integrals in Cartesian & polar coordinates, Change of order of integration, Triple integrals, Change of variables (Cartesian to Polar, Rectangular coordinates to Cylindrical & Rectangular coordinates to Spherical polar coordinate systems). **Applications:** Area enclosed by plane curves, Volume of solids.

UNIT-V: Vector Differentiation & Vector Integration:

Introduction, Scalar and Vector point functions, Del applied to scalar point functions-Gradient, directional derivatives, Del applied to vector point functions-Div& Curl, physical interpretation of div & curl, Del applied twice to point functions, Del applied to products of point functions (Identities without proofs).

Line integral, Green's theorem in the plane (without proof), Surface integrals, Stoke's theorem (without proof), Volume integral, Gauss Divergence theorem (without proof).

Text Books:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43^{rd} Edition, 2014.
2. **B. V. RAMANA,** Higher Engineering Mathematics, Tata MC Graw Hill, 1^{st} Edition, 2007.

Reference Books:

1. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, John Wiley & Sons, 10^{th} Edition, 2015.
2. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9^{th} Edition, 2014.

		L	T	P	C
B.TECH III SEMESTER	**PCC**	**3**	**0**	**0**	**3**

20EE3T02 **ELECTRICAL CIRCUIT ANALYSIS-II**

Course Objectives:

• To study the concepts of balanced three-phase circuits.

• To study the concepts of unbalanced three-phase circuits.

• To study the transient behavior of electrical networks with DC, pulse and AC excitations.

• To study the performance of a network based on input and output excitation/response.

• To understand the realization of electrical network function into electrical equivalent passive elements.

Course Outcomes:

At the end of the course, student will be able to

CO1: Solve three- phase circuits under balanced condition

CO2: Solve three- phase circuits under unbalanced condition

CO3: Find the transient response of electrical networks for different types of excitations.

CO4: Find parameters for different types of network.

CO5: Realize electrical equivalent network for a given network transfer function.

SYLLABUS

UNIT-I BALANCED THREE PHASE CIRCUITS

Phase sequence- star and delta connection - relation between line and phase voltages and currents - analysis of balanced three phase circuits - measurement of active and reactive power.

UNIT-II UNBALANCED THREE PHASE CIRCUITS

Analysis of three phase unbalanced circuits: Loop method – Star-Delta transformation technique, Two wattmeter methods for measurement of three phase power.

UNIT-III TRANSIENT ANALYSIS IN DC AND AC CIRCUITS

Transient response of R-L, R-C, R-L-C circuits for DC and AC excitations, Solution using differential equations and Laplace transforms.

UNIT-IV TWO PORT NETWORKS

Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, Cascaded networks - Poles and zeros of network functions.

UNIT-V NETWORK SYNTHESIS

Positive real function - basic synthesis procedure - LC immittance functions - RC impedance functions and RL admittance function - RL impedance function and RC admittance function - Foster and Cauer methods.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company,6 th edition

2. Network synthesis: Van Valkenburg; Prentice-Hall of India Private Ltd

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India)

2. Introduction to circuit analysis and design by TildonGlisson. Jr, Springer

3. Circuits by A.Bruce Carlson , Cengage Learning Publications

4. Network Theory Analysis and Synthesis by SmarajitGhosh, PHI publications

5. Networks and Systems by D. Roy Choudhury, New Age International publishers

6. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi, DhanpatRai & Co

B.TECH III SEMESTER	PCC	L	T	P	C
		3	0	0	3

20EE3T03 ANALOG ELECTRONICS-I

Course objectives

The objectives of the course are as follows

- To learn the basics of semiconductor physics and study the construction details, operation and characteristics of various semiconductor diodes
- To understand the operation and analysis of rectifiers with and without filters, clippers, clampers and Zener voltage regulators.
- To study the characteristics of different bipolar junction transistors and their biasing stabilization and compensation techniques.
- To understand the basics of FET, MOSFETs
- To understand the concepts of positive and negative feedbacks and their role in amplifiers and oscillators.

Course outcomes

Upon completion of course the student should be able to

CO1: Describe the characteristics of various diodes

CO2: Understand operation & design aspects of diode circuits

CO3: Understand characteristics of various BJT configuration & analyze transistor amplifier

CO4: Understand the operation & characteristics of FET & Power semiconductor devices

CO5: Understand the concepts of feedback and its role in amplifier and oscillator

SYLLABUS

UNIT – I Semiconductor diodes: Review of Semi-Conductor Materials, p-n Junction Diode, V-I Characteristics and its temperature dependence, Ideal and Practical Diode Equivalent Circuits, concept of Diode Resistance & Capacitances,

Zener and Avalanche breakdown, zener diode characterstics, zener diode as a voltage regulator.

UNIT-II Diode Circuits: Rectifiers: Half wave, full wave (Centre tapped, bridge) rectifiers, filters, Regulation and Ripple calculations.

Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers

UNIT – III Bipolar Junction Transistors:

Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self-Bias, Bias Stability, Bias Compensation using Diodes

UNIT-IV Field Effect Transistors: JFET, pinch-off voltage, Volt-ampere characteristics, MOSFET-Enhancement & Depletion mode, Volt-ampere characteristics, small signal model of FET, Biasing of FET,

UNIT -V Feedback amplifiers: Concept of Feedback, General characteristics of negative feedback amplifier, Effect of negative feedback on input and output impedances, voltage and current, series and shunt feedbacks.

Oscillators: Barkhausen criterion, RC oscillators, Wien bridge, phase shift, LC Hartley and Colpitts oscillator, Crystal oscillators (BJT only).

TEXT BOOKS:

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill

REFERENCE BOOKS:

1. Electronic Devices and Circuits by David A. Bell, Oxford University Press

2. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, TATA McGraw

Hill, Second Edition Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9thEdition, 2006

B.TECH III SEMESTER

PCC	L	T	P	C
	3	0	0	3

20EE3T04 ELECTRICAL MACHINES-I

Course objectives:

- Understand the unifying principles of electromagnetic energy conversion.
- Understand the construction, principle of operation and performance of DC machines.
- Learn the characteristics, performance, methods of speed control and testing methods of DC motors.
- To predetermine the performance of single phase transformers with equivalent circuit models.
- Understand the methods of testing of single-phase transformer.
- Analyze the three phase transformers and achieve three phase to two phase conversion.

Course outcomes:

CO1: Assimilate the concepts of electromechanical energy conversion.

CO2: Mitigate the ill-effects of armature reaction and improve commutation in dc machines.

CO3: Understand the torque production mechanism and control the speed of dc motors.

CO4: Analyze the performance of single phase transformers& Predetermine regulation, losses and efficiency of single phase transformers.

CO5: Analyze the three phase transformers and achieve three phase to two phase conversion.

SYLLABUS

Unit – I: Electromechanical energy conversion principles

Basic Laws, electromechanical energy conversion principles – singly excited magnetic system, doubly excited magnetic system. Physical concept of torque production – electromagnetic torque & reluctance torque. Static and dynamic induced voltage, basic concepts of Lap and wave windings

Unit – II: DC Generators

Construction details and operating principle, EMF equation, types of DC generators – separately excited, shunt, series and compound generators. Characteristics of DC generators, voltage build up in shunt generator, armature reaction & methods of reducing effect of armature reaction, commutation, losses and efficiency-applications.

Unit – III: DC Motors

Torque production, back EMF, types of DC motors – DC shunt, series and compound motor, characteristics of DC motors. Starters – need for starter, shunt, compound and series motor starters. Speed control methods armature and field control methods, brake test, swinburne's test, Hopkinson's test, losses and efficiency- applications.

Unit – IV: Single phase transformers

Transformer construction, principle of operation, EMF equation, ideal transformer, equivalent circuit, phasor diagram, transformer losses, regulation and efficiency, all day efficiency, polarity test, open circuit and short circuit tests, sumpner"s test, parallel operation of single phase transformer, auto transformer, applications of of transformers.

Unit – V: Three phase transformers

Types of three phase transformers Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Tertiary winding, Scott connection, transients in switching – off load and on load tap changers.

Text Books:

1. Electrical Machines – P.S. Bhimbra, Khanna Publishers

2. Electric Machinery by A.E.Fitzgerald, Charleskingsley, Stephen D.Umans, TMH

Reference Books:

1. Electrical Machines by D. P.Kothari, I .J .Nagarth, McGrawHill Publications, 4th edition

2. Electrical Machines by R.K. Rajput, Lakshmi publications,5th edition.

3. Electrical Machinery by Abijith Chakrabarthi and Sudhipta Debnath, McGraw Hill education 2015

4. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill

Education 2010

5. Electric Machines by Mulukutla S.Sarma & Mukeshk. Pathak, CENGAGE Learning.

6. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria& Sons

B.TECH III SEMESTER

PCC	L	T	P	C
	3	0	0	3

20EE3T05 ELECTROMAGNETIC FIELDS

Course objectives

- The production of electric field and potentials due to different configurations of static charges
- The properties of conductors and dielectrics calculate the capacitance of different configurations and understand the concepts of conduction and convection current densities.
- The magnetic fields produced by currents in different configurations, applications of Ampere's circuital law and Maxwell's second and third equations.
- The magnetic force and torque through Lorentz force in magnetic field environment like conductors and other current loop and The concept of self and mutual inductances and the energy stored
- The time varying and Maxwell's equations in different forms and Maxwell and Maxwell's fourth equation for induced EMF

Course outcomes

At the end of the course student will be able to

CO1: Understand the production of electric field and potentials due to different configurations of static charges

CO2: Understand the concepts of conduction and convection current densities

CO3: Understand the concept of magnetic field and Maxwell equations

CO4: Calculate the magnetic force.

CO5: Understand the time varying fields

SYLLABUS

UNIT-I ELECTROSTATICS

Coulomb's law and field intensity, Electric fields due to continuous charge distributions, Electric flux density. Gauss's law – Maxwell's Equation, applications of Gauss's law, Electric potential, relationship between E and V – Maxwell's Equation, an electric dipole and flux lines, energy density in electrostatic fields.

UNIT- II CONDUCTORS AND DIELECTRICS

Behavior of Conductors in an Electric Field-Conductors and Insulators – Electric Field Inside a Dielectric Material – Polarization – Dielectric Conductors and

Dielectric Boundary Conditions – Capacitance-Capacitance of Parallel Plate, Spherical & Co-axial capacitors – Energy Stored and Energy Density in a Static Electric Field – Current Density – Conduction and Convection Current Densities – Ohm's Law in Point Form – Equation of Continuity

UNIT-III MAGNETO STATICS AND AMPERE'S LAW

Static Magnetic Fields – Biot-Savart Law – Oerstead's experiment – Magnetic Field Intensity(MFI) due to a Straight, Circular &Solenoid Current Carrying Wire – Maxwell's Second Equation. Ampere's Circuital Law and its Applications Viz., MFI Due to an Infinite Sheet of Current and a Long Current Carrying Filament – Point Form of Ampere's Circuital Law – Maxwell's Third Equation

UNIT – IV MAGNETIC FORCE AND ENERGY IN MAGNETIC FIELDS

Magnetic Force — Lorentz Force Equation – Force on Current Element in a Magnetic Field - Force on a Straight and Long Current Carrying Conductor in a Magnetic Field - Force Between two Straight and Parallel Current Carrying Conductors. Self and Mutual Inductances – Neumann's Formulae – Determination of Self Inductance of a Solenoid and Toroid and Mutual Inductance Between a Straight, Long Wire and a Square Loop Wire in the Same Plane – Energy Stored and Intensity in a Magnetic Field

UNIT-V TIME VARYING FIELDS

Faraday's Law of Electromagnetic Induction – It's Integral and Point Forms – Maxwell's Fourth Equation. Statically and Dynamically Induced E.M.F's -Modified Maxwell's Equations for Time Varying Fields – Displacement Current. Uniform Plane Wave equation Poynting Theorem, Poynting Vector and its Significance.

TEXT BOOKS:

1. Principles of Electromagnetics, 6th Edition, Sadiku, Kulkarni, OXFORD University Press, 2015
2. Engineering Electromagnetics, William.H.Hayt, Mc.Graw Hill, 2010.

REFERENCE BOOKS:

1. Electromagnetics 5th edition, J.D.Kraus,Mc.Graw – Hill Inc, 1999.
2. Field & Electromagnetic waves – 2nd edition, David K. Cheng
3. Electromagnetics, Joseph Edminister, Tata Mc Graw Hill, 2006.

B.TECH III SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20EE3L06 ELECTRICAL CIRCUITS LAB

Course objectives:

- To verify and demonstrate various thermos, locus diagrams, resonance and two port networks.
- To determine self and mutual inductance of a magnetic circuit, parameters of a given coil and measurement of 3-phase power.

Course outcomes:

CO1: Able to apply various thermos, determination of self and mutual inductances, two port parameters of a given electric circuits.

CO2: Able to draw locus diagrams. Waveforms and phasor diagram for lagging and leading networks.

LIST OF EXPERIMENTS

Any 10 of the following experiments are to be conducted:

1. Verification of Thevenin's and Norton's Theorems
2. Verification of Superposition theorem and Maximum Power Transfer Theorem
3. Verification of Compensation Theorem
4. Verification of Reciprocity, Millmann's Theorems
5. Representation of Locus Diagrams for RL and RC Series Circuits
6. Study of Series and Parallel Resonance
7. Determination of Self, Mutual Inductances and Coefficient of coupling
8. Determination of two port network parameters (Z and Y)
9. Determination of two port network parameters (Transmission and hybrid)
10. Determination of Parameters of a choke coil.
11. Determination of cold and hot resistance of an electric lamp.
12. Measurement of 3-phase Power by two Wattmeter Method for unbalanced loads

B.TECH III SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20EE3L07 ELECTRICAL MACHINES LAB-I

Course objectives:

- To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.
- To control the speed of the DC motors.
- Determine and predetermine the performance of DC machines.
- To predetermine the efficiency and regulation of transformers and assess their performance.

Course outcomes:

CO1: Determine and predetermine the performance of DC machines and Transformers.

CO2: Control the speed of DC motor.

CO3: Achieve three phase to two phase transformation.

LIST OF EXPERIMENTS

Any 10 of the following experiments are to be conducted

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Brake test on DC shunt motor. Determination of performance curves.
3. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
4. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
5. Speed control of DC shunt motor by Field and armature Control.
6. Retardation test on DC shunt motor. Determination of losses at rated speed.
7. Separation of losses in DC shunts motor.
8. OC& SC test on single phase transformer.
9. Sumpner's test on single phase transformer.
10. Scott connection of transformers
11. Parallel operation of Single phase Transformers
12. Separation of core losses of a single phase transformer

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20EE3L08 ANALOG ELECTRONICS LAB

Course Objectives

- To identify and test various electronic components
- To design and analyze rectifiers & nonlinear wave shaping circuits
- To plot the characteristics of diode and transistor

Course Outcomes

At the end of the laboratory course the students are able to:

CO1: Understand the diode and transistor characteristics.

CO2: Verify the rectifier circuits using diodes and implement them using hardware.

CO3: Design the biasing circuits like self-biasing.

CO4: Design various amplifiers like CE, CC, common source amplifiers and implement them using hardware and also observe their frequency responses

CO5: Analyze the concepts of SCR,UJT &FET and observe its characteristics.

Electronic Workshop Practice:

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

List of Experiments:

(Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics

Part A: Germanium Diode (Forward bias& Reverse bias)

Part B: Silicon Diode (Forward Bias only)

2. Zener Diode Characteristics

Part A: V-I Characteristics

Part B: Zener Diode as Voltage Regulator

3. Rectifiers (without and with c-filter)

Part A: Half-wave Rectifier

Part B: Full-wave Rectifier

4. BJT Characteristics (CE Configuration)

Part A: Input Characteristics

Part B: Output Characteristics

5. FET Characteristics (CS Configuration)

Part A: Drain Characteristics

Part B: Transfer Characteristics

6. SCR characteristics

7. UJT Characteristics

8. Transistor Biasing

9. CRO Operation and its Measurements

10. BJT-CE Amplifier

11. Emitter Follower-CC Amplifier

12. FET-CS Amplifier

13. Clippers with different reference voltages

14. Clampers with different reference voltages

		L	T	P	C
B.TECH III SEMESTER	**SC**	**0**	**0**	**4**	**2**

20EE3S09 **PYTHON PROGRAMMING (Skill Oriented Course)**

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to:

CO1: Structure simple Python programs for solving problems.

CO2: Decompose a Python program into functions.

CO3: Represent compound data using Python lists, tuples, and dictionaries.

CO4: Read and write data from/to files in Python Programs.

CO5: To build software for real needs.

Concepts to be covered:

- Introduction: Variables, Assignment, Keywords, Comments, Input-Output, Indentation
- Types, Operators and Expressions: Data types, Operators, Control flow statements
- Data Structures: Lists, Tuples, Sets, Dictionary, Sequences, Comprehensions
- Functions: Types of Arguments, Anonymous, Fruitful and Lambda Functions.
- Python Packages: Installation and Importing packages, Brief tour of packages like System, math, random, date and time, Numpy, Matplotlib, Multi-threading, scikit-learn and Internet Access.
- Object Oriented Programming Concepts in Python.
- Exception handling in python

Lab Exercises:

1. Write a program to perform various list of operations (eg: Arithmetic, logical, bitwise etc) in python.

2. Write a program to implement control flow statements. 3. Write a programs implementing various predefined function of Lists, Sets, Tuples and Dictionaries.

4. Write a program covering various arguments for a function.

5. Write a program to implement various types of functions.

6. Write a program to implement recursion.

7. Write a program to implement command line arguments.

8. Write a program to create a class and its constructors.

9. Write a program to implement inheritance.

10. Write a program for exception handling.

11. Write a program to perform various linear algebra operations like finding eigen vales and vectors, determinant for a matrix.

12. Write a program to read a file.

13. Write a program to use System,math etc packages.

14. Write a program for visualizing the data using matplotlib package.

15. Write a program to access data from the web and validate it.

16. Write a program to demonstrate multi- threading.

TEXT BOOKS

1. Learning Python, Mark Lutz, Orielly

2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

3. John V Guttag, ―Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press, 2013.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press

2. Core Python Programming, W.Chun, Pearson.

3. Introduction to Python, Kenneth A. Lambert, Cengage

4. “Python in easy steps In Easy Steps”, Mike MC Grath, illustrated edition, In easy steps 2013 publishers.

B.TECH IV SEMESTER **HSMC**

L	T	P	C
3	0	0	3

20EE4T01: COMPLEX VARIABLES AND STATISTICAL METHODS

Pre-requisite: Basic knowledge about Calculus and Probability

Course Objective: Objective of the course is to impart

- basic understanding of complex variable theory
- description of sampling distribution of means, proportions & variances
- testing the hypothesis concerning means, proportions & variances

Course Outcomes:

At the end of the course, student will be able to

CO 1: Determine analytic and non-analytic functions

CO 2: Analyze the analytic function into a power series which is useful in the study of communication systems.

CO 3: Understand random variables and probability distributions

CO 4: Apply different distributions to compute confidence intervals

CO 5: Test the hypothesis concerning means and proportions

SYLLABUS

UNIT-I: Analytic Functions:

Introduction, Complex function, Limit and continuity of a complex function, Derivative of f(z), Analytic functions, Harmonic functions & orthogonal system, finding analytic functions by Milne-Thomson method. Applications to flow problems.

UNIT-II: Complex Integration and Residues: (all theorems without proofs)

Complex integration, Cauchy's theorem and Cauchy's integral formula, Series of complex terms, Taylor's series and Laurent's series. Zeros and singularities of an analytic function, Residues and Cauchy-Residue theorem. Evaluation of real definite integrals using contour integration about unit circle.

UNIT-III: Random variables and distributions:

Introduction-Discrete & Continuous Random variable - Distribution functions.

Binomial, Poisson distributions. Continuous distribution: Normal distributions, Normal approximation to Binomial distribution.

UNIT-IV: Sampling Theory:

Introduction - Population and samples- Sampling distribution of means (s known)-Central limit theorem- t-distribution- Sampling distribution of means (s unknown)- Sampling distribution of variances - Point estimation- Maximum error of estimate - Interval estimation.

UNIT-V: Tests of Hypothesis:

Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors –Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences.

Text Books:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014.
2. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition, PHI.

Reference Books:

3. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.
4. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8thedition, Cengage Publshers.

B.TECH IV SEMESTER

PCC	L	T	P	C
	3	0	0	3

20EE4T02 ELECTRICAL MACHINES-II

Course objectives:

- Understand the principle of operation and performance of 3-phase induction motor.
- Quantify the performance of induction motor and induction generator in terms of torque and slip.
- To understand the torque producing mechanism of a single phase induction motor.
- To understand the principle of emf generation, the effect of armature reaction and predetermination of voltage regulation in synchronous generators.
- To study parallel operation and control of real and reactive powers for synchronous generators.
- To understand the operation, performance and starting methods of synchronous motors.

Course outcomes:

CO1: Explain the operation and performance of three phase induction machine.

CO2: Explain the operation and performance of single phase induction motor.

CO3: Perform winding design and predetermine the regulation of synchronous generators.

CO4: Understand the parallel operation of synchronous generators & load sharing

CO5: Avoid hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor.

SYLLABUS

Unit – I: Three phase induction motors

Construction, types, concept of rotating magnetic field, principle of operation, slip, torque, characteristics, equivalent circuit, phasor diagram, power, losses and efficiency, circle diagram of induction motor, starting methods - squirrel cage and slip ring induction motor. Double squirrel cage induction motor, speed control, concept of induction generator (self-excited)- applications.

Unit – II: Single phase induction motors

Double field revolving theory, starting methods of single phase motors, constructional features, principle of operation and equivalent circuits of single phase induction motors – capacitor start & run induction motor, shaded pole motors, AC series motor-applications.

Unit – III: Synchronous generators

Constructional features, types, EMF equation, winding factors, armature reaction, synchronous reactance, Alternator on load with vector diagrams, voltage regulation methods- EMF, MMF, ZPF. two reaction theory of salient pole synchronous machine, phasor diagram,.

Unit – IV: Parallel operation of Synchronous generators

synchronization methods, alternator connected to infinite bus bar , parallel operation of two alternators, effect of change in excitation and mechanical input-Applications.

Unit V: Synchronous motors

Principle of operation, starting torque, starting methods, effect of increased load with constant excitation, effect of changing excitation with constant load, v and inverted v curves, power developed, hunting and damper windings, synchronous condenser, applications.

Text Books:

1. Electrical Machines – P.S. Bhimbra, Khanna Publishers

2. Electric Machinery by A.E.Fitzgerald,Charleskingsley,StephenD.Umans, TMH

Reference Books:

1. Electrical Machines by D. P.Kothari, I .J .Nagarth,McGrawHill Publications, 4th edition

2. Electrical Machines by R. K. Rajput, Lakshmi publications, 5th edition

3. Electrical Machinery by Abijith Chakrabarthi and Sudhipta Debnath, McGraw Hill education 2015

4. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2010

5. Electric Machines by Mulukutla S.Sarma & Mukesh k. Pathak, CENGAGE Learning.

6. Theory & Performance of Electrical Machines by J.B. Guptha. S.K. Kataria & Sons

B.TECH IV SEMESTER

	L	T	P	C
PCC	3	0	0	3

20EE4T03 :ELECTRICAL MEASUREMENTS

Course Objectives:

- To study the principle of operation and working of different types of instruments. Measurement of voltage and current.
- To study the working principle of operation of different types of instruments for measurement of power and energy
- To understand the principle of operation and working of dc and ac potentiometers.
- To understand the principle of operation and working of various types of bridges for measurement of parameters –resistance, inductance, capacitance and frequency.
- To study the principle of operation and working of various types of magnetic measuring instruments.
- To study the applications of CRO for measurement of frequency, phase difference and hysteresis loop using Lissajous patterns

Course Outcomes:
At the end of the course student will be able to

CO1: Choose right type of instrument for measurement of voltage and current for ac and dc.

CO2: Choose right type of instrument for measurement of power and energy

CO3: Use potentiometer and instrumentation transformer.

CO4: Select suitable bridge for measurement of electrical parameters

CO5: Measure frequency and phase difference between signals using CRO. Able to use digital instruments in electrical measurements.

SYLLABUS

UNIT-I: Measuring Instruments

Classification of measuring instruments. Requirements of measuring instruments. Deflecting, control and damping torques. PMMC instrument, moving iron attraction and repulsion type instruments. Errors and compensations– Extension of range using shunts and series.

UNIT-II: Measurement of Power and Energy

Construction, working and torque equation of single and three phase Dynamometer wattmeter. Errors and their compensation. LPF wattmeter. Two wattmeter method, measurement of reactive power. Construction, working and torque equation of Single phase induction type Energy meter. Errors and their compensation. Testing by phantom loading using R.S.S. meter. Single phase Power factor meter-electro dynamometer type.

UNIT-III: Instrumentation transformers and Potentiometers

Construction of CT and PT, Ratio and phase angle errors. Potentiometers: Standardization. Principle and working of potentiometers. Standardization of potentiometer, Construction and working of Crompton's DC potentiometer

UNIT-IV: Measurement of parameters Measurement of Resistance: Voltmeter-ammeter method. Kelvin's Double Bridge, Megger. A.C. Bridges: Balance equation for an AC bridge. Measurement of Inductance: Maxwell's Bridge, Anderson's Bridge, Hay's Bridge. Measurement of Capacitance: Schering Bridge, Wien's Bridge.

UNIT-V: Digital meters

Advantages of digital meters -Digital Voltmeter: Successive approximation type, Ramp type and integrating type. Digital frequency meter–Digital multimeter–Digital Tachometer.

Text Books:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, fifth Edition, Wheeler Publishing.

2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

Reference Books:

1. Electrical & Electronic Measurement & Instruments by A. K. Sawhney Dhanpat Rai & Co. Publications.

2. Electrical and Electronic Measurements and instrumentation by R.K. Rajput, S. Chand.

3. Electrical Measurements – by Buckingham and Price, Prentice – Hall

4. Electrical Measurements by Forest K. Harris. John Wiley and Sons

B.TECH IV SEMESTER

PCC	L	T	P	C
	3	0	0	3

20EE4T04 : POWER SYSTEMS – II

Course Objectives:

- To compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR.
- To study the short and medium length transmission lines, their models and performance.
- To study the performance and modeling of long transmission lines.
- To study the effect of travelling waves on transmission lines.
- To study the factors affecting the performance of transmission lines and power factor improvement methods.
- To discuss sag and tension computation of transmission lines as well as to study the performance of overhead insulators.

Course Outcomes:
At the end of the course will be able to

CO1: Understand parameters of various types of transmission lines during different operating conditions.

CO2: Understand the performance of short and medium transmission lines.

CO3: Understand the performance of long transmission lines.

CO4: Understand various factors related to Mechanical design of lines & corona.

CO5: Analyse performance of line insulators and constructional aspects of power cables.

SYLLABUS

UNIT-I TRANSMISSION LINE PARAMETERS:

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines- Numerical problems.

UNIT-II PERFORMANCE OF SHORT & MEDIUM TRANSMISSION LINES: Classification of Transmission Lines - Short, medium and long line and their model - representations - Nominal-T, Nominal-Pie and A, B, C, D Constants. Mathematical Solutions to estimate regulation and efficiency of all types of lines – Numerical problems.

UNIT-III PERFORMANCE OF LONG TRANSMISSION LINES:

Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations – Representation of Long lines – Equivalent T and Equivalent – π.Incident, reflected and refracted waves. Surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation. Skin effect, Proximity effect and Ferranti effect. – Numerical problems

UNIT IV CORONA & MECHANICAL DESIGN OF LINES:

Corona: Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference – Numerical problems

Mechanical design of lines: Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor - Stringing chart and sag template and its applications. – Numerical problems

UNIT V INSULATORS & POWER CABLES Insulators: Types of Insulators- String efficiency and Methods for improvement– Voltage Distribution, Calculation of string efficiency- Capacitance grading and Static shielding. – **Silicon rubber insulators**- Numerical problems

POWER CABLES: Types of Cables, Types of Insulating materials, Calculations of Insulation resistance and stress- Capacitance of Single and 3-Core belted cables, Grading of Cables - Capacitance grading, Description of Inter-sheath grading.

TEXT BOOKS:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S. Bhatnagar and A. Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd., 2005.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND&COMPANY LTD., New Delhi 2004.

REFERENCE BOOKS:

1. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003

2. Power System Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill Education (India) Pvt. Ltd., 2nd Edition, 2008, 23rd Reprint 2015.

3. Electric Power Transmission System Engineering: Analysis and Design, TuranGonen, 2nd Edition, CRC Press, Taylor & Francis group, 2009, 1st Indian Reprint 2010.

B.TECH IV SEMESTER

HSMC	L	T	P	C
	3	0	0	3

20EE4T05 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product

CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs

CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units

CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis

CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

SYLLABUS

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement Demand forecasting and

Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition

edition
3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

B.TECH IV SEMESTER

	L	T	P	C
PCC	0	0	3	1.5

20EE4L06 ELECTRICAL MACHINES LAB-II

Course objectives:

- To control the speed of three phase induction motors.
- To determine /predetermine the performance three phase and single phase induction motors.
- To improve the power factor of single phase induction motor.
- To predetermine the regulation of three–phase alternator by various methods, find X_d/ $X_q$ratio of alternator and asses the performance of three–phase synchronous motor.

Course outcomes:

CO1: Able to assess the performance of single phase and three phase induction motors.

CO2: Able to control the speed of three phase induction motor.

CO3: Able to predetermine the regulation of three–phase alternator by various methods.

CO4: Able to find the X_d/ $X_q$ratio of alternator and asses the performance of three–phase synchronous motor.

LIST OF EXPERIMENTS

Any 10 of the Following experiments are to be conducted:

1. Brake test on three phase Induction Motor
2. No–load & Blocked rotor tests on three phase Induction motor
3. Regulation of a three –phase alternator by synchronous impedance & m.m.f. Methods
4. Regulation of three–phase alternator by Portier triangle method
5. V and Inverted V curves of a three—phase synchronous motor.
6. Determination of X_d and X_q of a salient pole synchronous machine
7. Equivalent circuit of single phase induction motor
8. Speed control of induction motor by V/f method.

9. Efficiency of three phase alternator by loading with three phase induction motor.
10. Power factor improvement of single phase induction motor by using capacitors
11. Load test on single phase induction motor.
12. Measurement of sequence impedance of a three–phase alternator

B.TECH IV SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20EE4L07 ELECTRICAL MEASUREMENTS LAB

Course Objectives:

- To understand the correct function of electrical parameters and calibration of voltage, current, single phase and three phase power and energy, and measurement of electrical characteristics of resistance, inductance and capacitance of a circuits through appropriate methods.
- To understand testing of transformer oil.

Course Outcomes:

CO1: To measure the electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance.

CO2: To test transformer oil for its effectiveness.

CO3: To measure the parameters of inductive coil.

LISTS OF EXPERIMENTS

Any 10 of the Following experiments are to be conducted:

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer wattmeter using phantom loading
3. Measurement of 3 phase reactive power with single phase wattmeter for balanced loading.
4. Calibration of LPF wattmeter by direct loading.
5. Calibration of Power factor meter
6. Measurement of Power by 3 Voltmeter and 3 Ammeter method.
7. Measurement of parameters of a Choke Coil using 3 Voltmeter and 3 Ammeter method.
8. Calibration of PMMC ammeter and voltmeter using Crompton D.C. Potentiometer
9. Measurement of resistance and Determination of Tolerance using Kelvin's double Bridge.
10. Capacitance Measurement using Schering Bridge.
11. Inductance Measurement using Anderson Bridge.
12. Dielectric oil testing using H.T test Kit.

B.TECH IV SEMESTER

	L	T	P	C
ESC	0	0	3	1.5

20EE4L08 DATA STRUCTURES THROUGH C LAB

Course Objectives:

- Understand different Data Structures
- Apply Data Structures to real world problems using C.

Course Outcomes:

CO1: Use basic data structures such as arrays and linked list.

CO2: Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.

CO3: Use various searching and sorting algorithms.

CO4: Understand and use Trees for complex operations

Topics Covered: Searching, Sorting, Linked Lists, Stacks, Queues, Trees-Operations, Binary Search Trees- Operations

LIST OF EXPERIMENTS:

Exercise -1 (Searching)

a) Write C program that use both recursive and non-recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non-recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order.

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order.

Exercise -3 (Sorting-II)

a) Write C program that implement radix sort, to sort a given list of integers in ascending order

b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4 (Singly Linked List)

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion operation on a singly linked list

c) Write a C program that uses functions to perform deletion operation on a singly linked list

d) Write a C program to reverse elements of a single linked List.

Exercise -5 (Queue)

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists

Exercise -6 (Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write C program for implementing infix to postfix conversion

d) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7 (Binary Tree)

Write a recursive C program for traversing a binary tree in preorder, in-order and post-order.

Exercise -8 (Binary Search Tree)

a) Write a C program to create a BST

b) Write a C program to insert a node into a BST.

c) Write a C program to delete a node from a BST.

Text Books:

1. Data Structures Using C. 2ndEdition. Reema Thareja, Oxford.

2. Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1. Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.

2. Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.

3. Data Structures with C, Seymour Lipschutz TMH

B.TECH IV SEMESTER

SC	L	T	P	C
	0	0	4	2

20EE4S09 INTRODUCTION TO MATLAB
(Skill Oriented Course)

LIST OF EXPERIMENTS

Any 10 of the following experiments are to be conducted

MATLAB FUNDAMENTALS:

1) Introduction, Installation of MATLAB, History, Key Features, User interface, Command window, Workspace, Setting directory – MATLAB editor, saving m files, Writing & Executing script files.

2) Write a program involving assigning of variables, Arrays and vectors, BODMOS rules, arithmetic, logical operations & solving arithmetic equations.

4) Write a program with basic Matrix operations like creating matrices, find inverse, determinant, Transpose of matrix.

PLOTS AND GUI:

5) Write a program for making 2D Plots with Basic plotting methods, specifying line styles, legend & colours, controlling the Axes, Multiple plots in one Figure and plot 3D plots with Creating Mesh & Surface plots, visualizing, Subplots.

6) Design a Graphical User Interface (GUI) with functions, component & Menu Designing Applications.

INTRODUCTION TO SIMULINK:

7) Simulate an RLC circuit in SIMULINK Environment using Simulink Library.
8) Model a simple circuit with Equation oriented Design.
9) Design a Subsystem Model to Connect & callback to main system.

LOOPS, CONDITIONAL STATEMENTS AND FUNCTIONS:

10) Write a program with Loop controls like for, while, continue, and break.

11) Write a program with Conditional Statements like if, else, Switch.

12) Write a program with user defined functions with Function calling and built in functions.

STUDY & WORKING WITH TOOLBOXES:

13) Design a Power electronics circuit using Sandscape Power Systems Toolbox.

14) Design an optimal system with Optimization Toolbox.

15) Develop a basic control system using Control System Toolbox.

B.TECH IV SEMESTER

	L	T	P	C
MC	2	0	0	-

20EE4M10 **CONSTITUTION OF INDIA**

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand historical background of the constitution making, importance for building a democratic India, features and principles of Indian Constitution.

CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO3: Understand the roles and powers of State Government and its Administration and value of the fundamental rights and duties for becoming good citizen of India.

CO4: Understand and analyze the decentralization of power between Union, State and Local self-Government and local administration.

CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission, UPSC, Welfare commissions for sustaining democracy.

SYLLABUS

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution -Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, CentreState relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, Rajya Sabha, The

Supreme Court and High Court: Powers and Functions;

UNIT III

State Government and its Administration Governor, Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV

A.Local Administration, District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy(Different departments),

Village level, Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V

Election Commission: Election Commission, Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.

2) Subash Kashyap, Indian Constitution, National Book Trust

3) J.A. Siwach, Dynamics of Indian Government & Politics

4) D.C. Gupta, Indian Government and Politics

5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

6) J.C. Johari, Indian Government and Politics Hans

7) J. Raj Indian Government and Politics

8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-sources:

1) nptel.ac.in/courses/109104074/8

2) nptel.ac.in/courses/109104045/

3) nptel.ac.in/courses/101104065/

4) www.hss.iitb.ac.in/en/lecture-details

5)www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

B.TECH V SEMESTER **PCC**

L	T	P	C
3	0	0	3

20EE5T01 CONTROL SYSTEMS

Course Objectives:

- To Enable the student to understand the importance of Modelling of Control systems
- To understand the First order & second order systems
- To understand the transfer function analysis
- To understand the Stability of the systems
- To understand the States Space Analysis

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand the different Classification of control systems and modelling
CO2: Understand the functioning of Signals & time response analysis
CO3: Understand the concept of Root Locus & Construction of Root Loci
CO4: Understand the concept of Bode plot & Nyquist Plot
CO5: Understand the concept of States Space Analysis of LTI System

SYLLABUS

UNIT – I

Mathematical Modeling of Control Systems: Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer Function of DC Servo motor - AC Servo motor- Synchro, transmitter and receiver – Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II

Time Response Analysis: Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III

Stability and Root locus Technique: The concept of stability – Routh's stability criterion –limitations of Routh's stability –Root locus concept - construction of root loci

UNIT–IV

Frequency Response Analysis:

Introduction to Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability criterion. Basic concepts of compensators.

UNIT–V

State Space Analysis of LTI Systems: Concepts of state, state variables and state model, state space representation of transfer function, Diagonalization-Solving the time invariant state equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

Text Books:

1. Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2nd Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems, ManikDhanesh N, Cengage publications.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International
   Publications, 5th Edition.
4. Control Systems Engineering, S.Palani,TataMcGraw Hill Publications.

B.TECH V SEMESTER **PCC**

L	T	P	C
3	0	0	3

20EE5T02 SWITCHGEAR AND PROTECTION

Course Objective:

- To provide the basic principles and operation of various types of circuit breakers.
- To study the classification, operation and application of different types of electromagnetic protective relays.
- To explain protective schemes, for generator and transformers, various protective schemes used for feeders and bus bars.
- To explain the principle and operation of different types of static relays.
- To study different types of over voltages in a power system and principles of different protective schemes for insulation co–ordination.

Course Outcome:

CO1: Able to understand the principles of arc interruption for application to High voltage circuit breakers of air, oil, vacuum, SF6 gas type.

CO2: Ability to understand the working principle and operation of different Types of electromagnetic protective relays.

CO3: Students acquire knowledge of faults and protective schemes for high power generator and transformers and understand various types of protective schemes used for feeders and bus bar protection.

CO4: Able to understand different types of static relays and their applications.

CO5: Able to understand different types of over voltages and protective schemes required for insulation co–ordination.

SYLLABUS

UNIT-I

Circuit Breakers: Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– Restriking Voltage and Recovery voltages– Restriking phenomenon - RRRV– Average and Max.RRRV– Current chopping and Resistance switching– Introduction to oil circuit breakers–Description and operation of Air Blast– Vacuum and SF6 circuit breakers– CB ratings and specifications.

UNIT-II

Electromagnetic Protection: Relay connection – Balanced beam type attracted armature relay - induction disc and induction cup relays–Torque equation - Relays classification–Instantaneous– DMT and IDMT types–Applications of relays**:** Over current and under voltage relays– Directional relays– Differential relays - Universal torque equation–Distance relays**:** Impedance– Reactance– Mho relays– Characteristics of Distance relays and comparison.

UNIT-III

Static relays: Introduction to static relays and Static relay components, Introduction to Microprocessor Relays.

Generator Protection: Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection

UNIT IV

Transformer Protection: Protection of transformers**:** Percentage differential protection– Design of CT's ratio– Buchholz relay protection

Feeder and Bus bar Protection: Protection of lines**:** Over current Protection schemes – PSM,TMS - Numerical examples - Carrier current and three zone distance relay using impedance relays–Protection of bus bars by using Differential protection

UNIT-V

Protection against over voltage and grounding: Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc oxide lighting arresters– Insulation coordination– BIL - Grounded and ungrounded neutral systems–Effects of ungrounded neutral on system performance– Methods of neutral grounding**:** Solid–resistance–Reactance–Arcing grounds and grounding Practices.

Text Books:

1. Power System Protection and Switchgear by Badari Ram and D.N Viswakarma, TMH Publications
2. M.L.Soni, P.V.Gupta, U. S. Bhatnagar and A. Chakraborti,‖Power System Engineering‖, Dhanpat Rai& co. Pvt. Ltd., 2016.

Reference Books:

1. Sunil S Rao, ―Switchgear and Protection‖, Khanna Publishers, Latest Edition

2. C.L.Wadhwa, ―Electrical Power Systems‖, New Age international (P) Ltd, 2012.

B.TECH V SEMESTER	PCC	L	T	P	C
		3	0	0	3

20EE5T03 ANALOG ELECTRONICS-II

Course Objectives:

- To Enable the student to understand the importance of Analog Electronic Devices
- To understand the Operational Amplifiers
- To understand the Applications of different Amplifiers
- To understand the concept of IC Timers
- To understand the Concept of Data Converters

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand the different Classifications of Multivibrators
CO2: Understand the functioning of Operational Amplifiers
CO3: Understand the Applications of different Amplifiers
CO4: Understand the concept of Active filters & IC 555 Timer
CO5: Understand the concept of Data Converters

UNIT –I Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators using transistors

Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Methods of Linearity improvement.

UNIT - II: Operational Amplifier: Basic information of op-amp, block diagram of op-amp, Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, buffer.

UNIT-III Applications of Op-Amp: Instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample & hold circuits, logarithm & antilogarithm amplifier, multiplier and divider, differentiator and integrator, comparator, Schmitt trigger, Multivibrators, waveform Generators - Triangular, Sawtooth, Square wave.

UNIT - IV: Active filters &IC 555 Timer: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters,

IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, Introduction to PLL.

UNIT - V: Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.

2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.

3. Operational Amplifiers–C.G. Clayton, Butterworth & Company Publ. Ltd./Elsevier, 1971

4. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill

5. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005

REFERENCES:

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma; SK Kataria &Sons;2nd Edition,2010

2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGraw Hill, 1988.

3. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.

4. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition.

5. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition

B.TECH V SEMESTER	PCC	L	T	P	C
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20EE5T06 AI TECHNIQUES IN ELECTRICAL ENGINEERING
(PROFESSIONAL ELECTIVE-I)

Course Objectives:

- To study various methods of AI
- To study the models and architecture of artificial neural networks.
- To study the ANN paradigms**.**
- To study the fuzzy sets and operations and fuzzy logic systems.
- To study the applications of AI.

Course Outcomes

CO1: Compare human brain and computer and learn different AI Techniques

CO2: Understand the basic concepts, models training algorithms and Applications of artificial neural networks CO 3

CO3: Explain the basic concepts of fuzzy and classical sets and fuzzy logic system components

CO4: Model an intelligent system from the concepts of Neural Networks

CO5: Fuzzy logic and understand their applications

SYLLABUS

UNIT–I

Fundamentals of Neural Networks: Introduction to artificial intelligence systems, Humans and Computers. Organization of the Brain – Biological Neuron – Biological and Artificial neuron Models, MC Culloch-pitts neuron model, Activation functions, Learning process, Learning rules, neural network architectures- Single-layer feed-forward networks: – Perceptron, Learning algorithm for perceptron- limitations of Perceptron model

Unit–II

Multilayer feed forward Neural Networks: Derivation of Back propagation (BP) Training, Radial Basis Function (RBF) Neural Network – Kohonen Self Organising feature Map (KSOM).

UNIT – III

Classical and Fuzzy Sets: Introduction to classical sets – properties – Operations and relations – Fuzzy sets – Membership – Uncertainty – Operations

– Properties – Fuzzy relations –Membership functions.

Fuzzy Logic System Components: Fuzzification – Membership value assignmen – Development of rule base and decision making system – Defuzzification to crisp sets – Defuzzification methods – Basic hybrid system.

UNIT IV

Genetic Algorithms and Genetic modeling: Introduction-Encoding – fitness function- Reproduction operators – Genetic Modeling – genetic operators – crossover – single site crossover – two point crossover – multipoint crossover – uniform crossover – matrix crossover – crossover rate – inversion & deletion – mutation operator – mutation – mutation rate.

UNIT–V:

Application of AI techniques: Load forecasting – Economic load dispatch – Reactive power control – Speed control of dc and ac motors- Load frequency control for single area system.

Text Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by S.Rajasekaran and G.A. Vijayalakshmi Pai – PHI Publication.
2. Fuzzy logic with fuzzy applications- by T.J. Ross, TMH.

Reference Books:

1. Introduction to Artificial Neural Systems – Jacek M. Zurada, Jaico Publishing House, 1997.
2. Fundamentals of Neural Networks Architectures, Algorithms and Applications - by laurene Fausett, Pearson.
3. Neural Networks, Algorithms, Applications and programming Techniques by James A. Freeman, David M. Skapura.
4. Introduction to Neural Networks using MATLAB 6.0 by S N Sivanandam, S Sumathi, S N Deepa TMGH

B.TECH V SEMESTER	PCC	L	T	P	C
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20EE5T07 DIGITAL ELECTRONICS
(PROFESSIONAL ELECTIVE-I)

Course Objectives:

- To Enable the student to understand the importance of Digital Electronics
- To understand the Operation of Binary Codes
- To understand the Concept of POS & SOP Simplifications
- To understand the concept of Adder Circuits & PLC
- To understand the Concept of Registers & Counters

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand the different Number Conversions
CO2: Understand the functioning of NAND, NOR, EX-OR
CO3: Understand the Applications of Adder circuits, Boolean functions
CO4: Understand the concept of Sequential Logic circuits
CO5: Understand the concept of Programmable Logic Controllers

SYLLABUS

UNIT- I

Introduction, Binary Numbers, Number base conversions, Complements of numbers, Signed binary numbers, Binary codes, Error detection and correction codes.

Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, logic operations & Logic gates.

UNIT-II

Introduction, K map method, four variable, Five variable Kmap, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation, Other two level Implementation, Ex-or Function.

UNIT-III

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, look-a-head adder circuit, Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, encoder, multiplexer, higher order multiplexing.

UNIT- IV

Sequential Logic: Basic latch circuit - Flip-flops: SR, JK, D and T, Truth table and excitation tables and conversion.

Registers & Counters: Registers, Shift registers, Applications of registers, Ripple & Synchronous counters- up/down counter, Ring counters.

UNIT-V

Design of Digital Systems: Programmable Logic devices: Introduction, PROM, PLA, PAL. Concept of state, State diagram and state reduction techniques

Introduction to digital logic families: Diode logic, RTL, DTL, TTL, ECL, CMOS.

Text Books:

1. Morris Mano M., Digital Design, Prentice Hall of India, 3rd Edition, 2002.

2. Donald Pleach, Albert Paul Malvino, Goutamsaba Digital Principles and Applications, McGraw- Hill, 6th Edition, 2006.

Reference Books:

1. Tocci, Widmer, Moss, Digital Systems, Principles and Applications, Pearson Education, 10th Edition, 2016.

2. B. Somnath Nair, Digital Electronics and Logic Design, Prentice Hall of India, Eastern Economy, Edition, 2006.

B.TECH V SEMESTER	PCC	L	T	P	C
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20EE5T08 PROGRAMMABLE LOGIC CONTROLLER AND APPLLICATIONS

(PROFESSIONAL ELECTIVE-I)

Course Objective:

- To provide the basic principles and operation of various PLC Blocks
- To study the operation and application of PLC
- To explain Instruction Set, Counters, Timers
- To explain the principle and operation of Ladder Diagrams
- To study different types of PLC Applications.

Course Outcomes: At the end of the course, student will be able to

CO1: Describe typical components of a Programmable Logic Controller

CO2: State basic PLC terminology and their meanings.

CO3: State Different instruction set in plc.

CO4: Explain and apply the concept of electrical ladder logic, its history, and its relationship to programmed PLC instruction

CO5: Use ladder language programming for real cases.

SYLLABUS

UNIT-1: Introduction to PLC, What is PLC, concept of PLC, Building blocks of PLC, Functions of various blocks, limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer.

UNIT-II: Working of PLC, Basic operation and principles of PLC - Scan Cycle - Memory structures, I/O structure - Programming terminal, power supply.

UNIT-III: Instruction Set Basic instructions like latch, master control self-holding relays. - Timer instruction like retentive timers, resetting of timers. - Counter instructions like up counter, down counter, resetting of counters. - Arithmetic Instructions (ADD, SUB, DIV, MUL etc.) - MOV instruction - RTC (Real Time Clock Function) - WatchDog Timer - Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equals.

UNIT-IV: Ladder Diagram Programming, Programming based on basic instructions, timer, counter, and comparison instructions using Ladder program

UNIT-V: Applications of PLCs

Object counter - On-off control - Car parking - Sequential starting of motors - Traffic light control - Motor in forward and reverse direction - Star-Delta, DOL

Starters - Filling of Bottles - Room Automation.

Text Books:

1. Programmable Logic Controller by Job Dan Otter; P.H. International, Inc,
2. Introduction to PLCs by Gary Dunning. McGraw Hill
3. Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh

Reference Books:

1. Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar

B. TECH V SEMESTER

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20EE5T09 VLSI DESIGN (PROFESSIONAL ELECTIVE-I)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To learn basic MOS and CMOS Fabrication principles and **Basic Electrical Properties of** MOS and CMOS circuits
2. To Implement CMOS logic circuits.
3. To learn Scaling and Circuit Concepts of CMOS logic circuits.
4. To Design Combinational and Sequential logic circuits
5. To learn the concepts implementation techniques

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Understand the insights of the MOS devices and its characteristics.
CO2: Implement the CMOS logic circuits
CO3: Analyze Scaling and Circuit Concepts of CMOS logic circuits.
CO4: Implement the CMOS combinational logic and sequential circuits.
CO5: Perform implementation techniques

SYLLABUS

UNIT-I: Introduction to MOS Devices

Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS,MOS transistor action, BICMOS technology. Comparison between CMOS and bipolar technologies.

Basic Electrical Properties of MOS Circuits: Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit.

UNIT-II: CMOS Logic Circuits

CMOS Logic Circuits: Implementation of logic circuits using nMOS and CMOS, Pass transistor and transmission gates,various pullups

UNIT-III: MOS CIRCUITS

Scaling of MOS Circuits: Scaling models, Scaling factors for device parameters, Limitations of scaling.

Basic Circuit Concepts: Sheet Resistance Rs and its concepts to MOS, Area Capacitance calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out.

UNIT-IV: COMBINATIONAL LOGIC CIRCUITS & SEQUENTIAL LOGIC CIRCUITS

Combinational Logic Circuits: Pass transistor Logic, Transmission gates, combinational circuits design using pass transistors, combinational circuits design using transmission gates.

Sequential Logic circuits: latches and Registers, Static latches and Registers, Bistability principle, Multiplexer based latches, Static latches –D,SR,JK,T latches, Master-slave edge triggered register, Dynamic latches- D,SR,JK,T latche

UNIT-V: IMPLEMENTATION STRATEGIES

Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems – Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGrawHill Education, 2003.

REFERENCE BOOKS

1. M. J. S. Smith, ‘Application Specific Integrated Circuits’, Addison Wesley, 1997.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.

B.TECH V SEMESTER | **PCC** | **L T P C** **0 0 3 1.5**

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B.TECH V SEMESTER	**PCC**	0	0	3	1.5

20EE5L10 CONTROL SYSTEMS LAB

Course Objectives:

1: Familiarize with concepts of PSPICE and MATLAB software's

2: Design and simulate various electrical circuits using PSPICE.

3: Design and simulate various electrical circuits using MATLAB.

4: Understand design of power system by performing load flow studies.

5: Understand the response of various transfer functions up to 5th order.

Course Outcomes:

CO1: Analyze and design of various power system and power electronics networks.

CO2: Examine the transient response of RLC circuits for different inputs

CO3: Analyze the voltage and current waveforms of power system components During normaland disturbance conditions.

CO4: Compute the power flow solution of power System

CO5: Understand the performance of transformer and lossy transmission line.

LIST OF EXPERIMENTS

Any 10 of the following experiments are to be conducted:

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – characteristics of stepper motor
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. DC position control system
8. Transfer function of separately excited DC motor
9. Temperature controller using PID controller
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Characteristics of DC servo motor
13. Potentiometer as an error detector

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20EE5L11 ELECTRICAL SIMULATION LAB

Course Objectives:

1: Familiarize with concepts of PSPICE and MATLAB software's

2: Design and simulate various electrical circuits using PSPICE.

3: Design and simulate various electrical circuits using MATLAB.

4: Understand design of power system by performing load flow studies.

5: Understand the response of various transfer functions up to 5^{th} order.

Course Outcomes:

CO1: Analyze and design of various power system and power electronics networks.

CO2: Examine the transient response of RLC circuits for different inputs

CO3: Analyze the voltage and current waveforms of power system components During normal and disturbance conditions.

CO4: Compute the power flow solution of power System

CO5: Understand the performance of transformer and lossy transmission line.

LISTS OF EXPERIMENTS

1	PSPICE simulation of transient and parametric analysis of RLC circuit to an input (i) Pulse (ii) Step and (iii) Sinusoidal Signals
2	Analysis of three phase circuit representing the generator transmission line and load. Plot three phase currents and neutral current using PSPICE
3	PSPICE simulation of single phase full converter using RLE loads and single phase AC voltage controller using RLE loads.
4	Plotting of Bode plots, Root locus and Nyquist plots for the transfer functions of system up to 5th order.
5	Power flow solution of power system.
6	Modelling of transformer and simulation of lossy transmission line.
7	Simulation of Op-Amp based integrator & differentiator circuits.
8	Transfer function analysis of a given circuit.

9	Simulation of resonant pulse commutation circuit and Buck chopper.
10	Simulation of single phase inverter with PWM control.
11	Dynamic stability analysis of power systems.

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20EE5S12 JAVA PROGRAMMING
(Skill Oriented Course)

Course Objectives:

- Understand fundamentals of Object-Oriented Programming in java including defining classes, invoking methods using class libraries etc.,
- Demonstrate an understanding of graphical user interfaces, multi-threaded programming and event driven programming.

Course Outcomes: By the end of the course student will be able to

1. Implement java applications using OOP principles and proper program structuring.
2. Develop java programs using packages, inheritance and interfaces.
3. Implement error and exception handling techniques.
4. Design event driven GUI and real-time web related applications.

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3 (Class, Objects)

Implement java programs using the concept of

a) Class mechanism. Create a class, methods and invoke them inside main method.

b) Constructor.

c) Constructor overloading.

b) Method overloading.

Exercise -4 (Inheritance)

Implement java programs using the concept of

a) Single Inheritance

b) Multilevel Inheritance

c) Abstract class

Exercise - 5 (Inheritance - Continued)

Implement java programs using the concept of

a)“super” keyword. b) Interfaces

Exercise – 6 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

Exercise – 7 (Exception)

Implement the programs by using the concepts of

a. Exception handling mechanism

b. Multiple catch clauses

c. Finally

d. Creating user defined exceptions

Exercise – 8 (Threads)

a) Write a JAVA program that creates threads by extending Thread class. First thread displays “Good Morning” every 1 sec, the second thread displays “Hello” every 2 seconds and the third display “Welcome” every 3 seconds,(Repeat the same by implementing Runnable)

b) Write a program illustrating isAlive and join ()

c) Write a Program illustrating Daemon Threads.

Exercise – 9 (Packages)

a) Create a user defined package and demonstrate different ways of importing packages

Exercise - 10 (Applet)

a) Write a JAVA program to paint like paint brush in applet.

b) Write a JAVA program to create different shapes and fill colors using Applet.

B. TECH V SEMESTER

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20EE5M13 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing.
- Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Understand the significance of Indian Traditional Knowledge
CO2: Classify the Indian Traditional Knowledge
CO3: Compare Modern Science with Indian Traditional Knowledge system.
CO4: Analyze the role of Government in protecting the Traditional Knowledge
CO5: Understand the impact of Philosophical tradition on Indian Knowledge System.

SYLLABUS

Unit I

Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in Global Economy.

Unit II

Basic structure of Indian Knowledge System: Astadash Vidya- 4 Ved - 4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi),6vedanga (Shisha, Kalppa, Nirukha,Vykaran, Jyothisha & Chand),4upanga (Dharmashastra, Meemamsa, purana & Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System: Indigenous Knowledge, Characteristics-Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge - Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain &Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, Nruthya Yevam Sahithya.

Text Books

1. Traditional Knowledge System in India, by AmitJha, 2009.

2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh,   Pratibha Prakashan 2012.

References

1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, BharatiyaVidya

2. Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan

3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.

4. Pramod Chandra, India Arts, Howard Univ. Press, 1983.

5. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html

2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf

3.https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_tex t.pdf

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20EE6T01 MICROPROCESSORS AND MICROCONTROLLERS

Course objectives:

- To understand the organization and architecture of 8086 Micro Processor
- To understand 8051 micro controller architecture
- To understand the programming principles for 8086 and 8051
- To understand the interfacing of MP with I/O as well as other devices
- To understand the applications of 8051 microcontroller

Course Outcomes:

CO1: To be able to understand the microprocessor capability in general and explore the evaluation of microprocessors.

CO2: To be able to understand the addressing modes of microprocessors

CO3: To be able to understand the micro controller capability

CO4: To be able to program microprocessor and microcontroller

CO5: To be able to interface microprocessor and microcontroller with other electronic devices

SYLLABUS

UNIT–I

Microprocessor Architecture: Introduction and evolution of Microprocessors–Architecture of 8086–Register Organization of 8086–Memory organization of 8086–pin diagram of 8086- General bus operation of 8086.

UNIT–II

Minimum and Maximum Mode Operations: Instruction set, Addressing modes– Minimum and Maximum mode operations of 8086–8086 Control signal interfacing–Read and write cycle timing diagrams.

UNIT–III

I/O Interface: 8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255–Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing – DMA controller (8257) – architecture–Interfacing 8257 DMA controller– Programmable Interrupt Controller (8259)–Command words and operating modes of 8259– Interfacing of 8259–

Keyboard/display controller (8279)–Architecture–Modes of operation–Command words of 8279– Interfacing of 8279,Introduction to ARM processor.

UNIT–IV

Introduction to 8051 Micro Controller: Overview of 8051 Micro Controller–Architecture– Register set–I/O ports and Memory Organization– Interrupts–Timers and Counters–Serial Communication.

UNIT– V:

Applications of Micro Controllers: Interfacing 8051 to LED's–Push button–Relay's and Latch Connections– Keyboard Interfacing– Interfacing Seven Segment Display–ADC and DAC Interfacing.

Text Books:

1. Microprocessors and Interfacing, Douglas V Hall, Mc–Graw Hill, 2nd Edition.
2. Ray and Burchandi, "Advanced Micro Processors and Interfacing", Tata McGraw Hill.
3. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications", Thomson Publishers, 2nd Edition.

Reference Books:

1. R.S. Kaler, " A Text book of Microprocessors and Micro Controllers", I.K. International Publishing
   House Pvt. Ltd.
2. Ajay V. Deshmukh, "Microcontrollers – Theory and Applications", Tata McGraw– Hill Companies –2005. Ajit Pal, "Microcontrollers – Principles and Applications", PHI Learning Pvt Ltd, 2011.

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20EE6T02 POWER SYSTEM OPERATION AND CONTROL

Course Objective:

- Calculation of power flow in a power system network using various techniques.
- Able to deal with short circuit analysis and analysis of power system for steady state and transient stability.
- To learn about load characteristics and economic operations of Power Systems.
- To know about single area and two area load frequency control.

Course Outcomes:

CO1: Develop Power flow solutions using iterative techniques.

CO2: Compute symmetrical and unsymmetrical fault analysis of given power system.

CO3: Perform stability analysis of a power system.

CO4: Analyse the performance of generators in thermal power station for economical operation.

CO5: Analyse Load frequency control of power system.

SYLLABUS

UNIT-I

Power Flow Studies: Per unit representation, Y bus formation by Direct inspection method, Power flow solution using Gauss Seidel Method, Newton Raphson Method in Polar Co-ordinates form, Decoupled and Fast Decoupled Methods, Algorithms. (problems upto 3 bus system only).

UNIT-II

Short Circuit Analysis:

Symmetrical fault analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors. Symmetrical Component Theory, Positive, Negative and Zero sequence components: Positive, Negative and Zero sequence Networks.

Unsymmetrical fault analysis: LG, LL, LLG faults with and without fault impedance.

UNIT-III

Power System Stability Analysis: Classification of power system stability, Power system stability problem-Power angle curve-stability limits, Derivation of Swing Equation, Analysis of steady state stability, Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Methods to improve Stability, Introduction to Voltage stability.

UNIT-IV

Economic operation of Power Systems: Optimal operation of Generators in Thermal power stations, Heat rate curve, Cost Curve, Incremental fuel and Production costs, Input–output characteristics. Optimum generation allocation with & without transmission losses, Loss Coefficients.

UNIT-V

Load Frequency control:

Single area control: Definitions of Control area, Block diagram representation of an isolated power system, Steady state analysis, Dynamic response, uncontrolled case. Proportional plus Integral control of single area and its block diagram representation,

Two area control: uncontrolled case and controlled case, tie-line bias control.

Text Books:

1. Modern Power system Analysis–by I.J.Nagrath & D.P.Kothari: Tata McGraw-Hill Publishing Company, 2nd edition.
2. C.L. Wadhwa, “Electrical Power Systems”, New Age International Publishers, 7th Edition, 2017.
3. Power System Analysis by Hadi Saadat –TMH Edition.
4. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill
5. Power Generation Operation and Control -Wood and Wollenberg, Wiley Publishers.
6. Power Systems Operation and Control –Chakravarthi, Halder.

Reference Books:

1. Computer Methods in Power Systems, Stagg El –Abiad & Stags.
2. Power System Analysis–by A.R.Bergen, Prentice Hall, Inc.
3. Computer Analysis of Power Systems –J Arrillaga.
4. Power System Stability –Vol-1, Kimbark, IEEE Press.
5. Analysis of Faulted Power Systems –P M Anderson, IEEE Press.

6. Power System Stability and Control –Prabha Kundur, McGraw Hill Publishers.

B.TECH VI SEMESTER **PCC**

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20EE6T03 POWER ELECTRONICS

Course Objectives:

- To study the characteristics of various power semiconductor devices and their switching operation.
- To understand the operation of $1-\emptyset$ & $3-\emptyset$ full–wave converters and their harmonic analysis.
- To understand the operation of different types of DC-DC converters.
- To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- To analyze the operation of AC-AC controllers.

Course Outcomes:

Student should able to

CO1: Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR's.

CO2: Explain the operation of single phase & three Phase full–wave converters and analyze harmonics in the input current.

CO3: Analyze the operation of different types of DC-DC converters.

CO4: Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.

CO5: Analyze the operation of AC-AC regulators.

SYLLABUS

UNIT-I

Power Semiconductor Devices: Thyristors – Silicon Controlled Rectifiers (SCRs) – BJT – Power MOSFET – Power IGBT and their characteristics. Basic theory of operation of SCR – Static and Dynamic characteristics of SCR – Triggering and commutation methods – Turn on and turn off methods. Gate driver circuits for SCR & IGBT - Snubber circuit details

UNIT-II

AC to DC converters: Principles of phase controlled rectification -Study of Single phase and three-phase half controlled and full controlled bridge rectifiers with R and RL loads. Effect of source inductance, Dual converters.

UNIT-III

DC to DC converters: Analysis of Buck, boost, buck-boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations. Principle operation of forward and fly back converters in CCM.

UNIT-IV

DC to AC converters: Principle of operation of Single phase Inverters -Three phase bridge Inverters (180^0 and 120^0 modes)-voltage control of inverters-Single pulse width modulation- multiple pulse width modulation, sinusoidal pulse width modulation. Harmonic reduction techniques- basics of Voltage Source Inverters and Current source Inverters - Comparison of VSI and CSI

UNIT-V

AC to AC Converters: Static V-I characteristics of TRIAC and modes of operation – 1-phase AC-AC regulator phase angle control and integrated cycle control with R and RL load – For continuous and discontinuous conduction- 3-Phase AC-AC regulators with R load - Cycloconverters

Text Books:

1. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
2. Power Electronics by M. D. Singh and K. B. Khanchandani
3. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India

Reference Books:

1. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India
2. Power Electronics by VedamSubramanyam, New Age International (p) Limited, Publishers.
3. Power Electronics by P.C. Sen, Tata Mc Graw-Hill Publishing.

B.TECH VI SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE6T04 DIGITAL CONTROL SYSTEMS

(PROFESSIONAL ELECTIVE-II)

Course Objective:

- To understand the concepts of digital control systems and assemble various components associated with it.
- To represent the discrete–time systems in state–space model and evaluation of state transition matrix
- To examine the stability of the system using different tests.
- To study the conventional method of analyzing digital control systems in the w–plane.
- To study the design of state feedback control by "the pole placement method."

Course Outcomes:

CO1: Learn the advantages of discrete time control systems and the "know how" of various associated accessories

CO2: Understand z–transformations and their role in the mathematical analysis of different Systems (like Laplace transforms in analog systems)

CO3: The stability criterion for digital systems and methods adopted for testing the same are Explained

CO4: Understand, the conventional and state space methods of design are also introduced

CO5: Understand, the State Feedback Controllers

SYLLABUS

UNIT-I

SIGNAL PROCESSING: Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Signals and processing – Frequency domain characteristics of zero order hold – z–Transforms – Solving of difference equations.

UNIT-II

STATE SPACE ANAYSIS: State space representation of discrete time systems – State transition matrix and methods of evaluation – Discretization of continuous Time state equations – Concepts of controllability and observability – Tests (without proof)

UNIT-III

STABILITY ANALYSIS: Mapping between the s–Plane and the z–Plane – Primary strips and Complementary strips – Stability criterion – Modified Routh's stability criterion and Jury's stability test.

UNIT-IV

DESIGN OF DISCRETE TIME CONTOL SYSTEMS: Transient and steady state specifications – Design using frequency response in the w–plane for lag and lead compensators – Root locus technique in the z–plane.

UNIT-V

STATE FEEDBACK CONTROLLERS: Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

Text Books:

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.
2. Digital Control and State Variable Methods by M.Gopal, TMH, 4th Edition.

Reference Books:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.

B.TECH VI SEMESTER **PCC**

L	T	P	C
3	0	0	3

20EE6T05 POWER QUALITY

(PROFESSIONAL ELECTIVE-II)

Course Objective:

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

Course Outcome:

At the end of this course the student should be able to

CO1: Differentiate between different types of power quality problems.
CO2: Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
CO3: Analyze power quality terms and power quality standards.
CO4: Explain the principle of voltage regulation and power factor improvement methods.
CO5: Explain the power quality monitoring concepts and the usage of measuring instruments.

SYLLABUS

Unit-I

Introduction to Power Quality: Terms and definitions of transients, Long Duration Voltage Variations: Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching DC offset; waveform distortion; voltage fluctuation; power frequency variations.

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction-capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics, measurement of harmonics, THD; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices" Kluwer Academic Publishers
3. Sankaran, " Power Quality" CRC Press.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis) Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

B.TECH VI SEMESTER

PCC	L	T	P	C
	3	0	0	3

20EE6T06 RENEWABLE AND DISTRIBUTED ENERGY TECHNOLOGIES

(PROFESSIONAL ELECTIVE-II)

Course Educational Objectives:

- To learn the technical challenges in renewable energy.
- To learn the basics of wind energy conversion & PV power generation.
- To learn the analysis of fuel cell system

Course Outcomes: At the end of the course, student will be able to

CO1: Understand various general aspects of renewable energy systems.

CO2: Analyze and design induction generator for power generation from wind.

CO3: Design MPPT controller for solar power utilization.

CO4: Utilize fuel cell systems for power generation

CO5: Understand about different applications of Renewable energy systems.

SYLLABUS

UNIT-I

Global and National Energy Scenario: Over view of conventional & renewable energy sources - Need & development of renewable energy sources - Types of renewable energy systems - Global and Indian Energy scenario -Renewable and Non-renewable Energy sources, Global climate change - CO2 reduction potential of renewable energy.

UNIT-II

Solar Energy: Solar energy system - Solar Radiation – Availability - Measurement and Estimation - Solar Thermal Conversion Devices and Storage - Applications Solar Photovoltaic Conversion - solar thermal - Applications of solar energy systems..

UNIT-III

Wind Power Plants: Site Selection; Evaluation of Wind Intensity; Topography; Purpose of the Energy Generation- General Classification of Wind Turbines; Rotor Turbines; Multiple-Blade Turbines; Drag Turbines; Lifting Turbines - Generators and Speed Control Used in Wind Power Energy; Analysis of Small wind energy conversion system.

UNIT-IV

Photovoltaic Power Plants: Solar Energy; Generation of Electricity by Photovoltaic Effect; Dependence of a PV Cell on Temperature and irradiance input-output Characteristics – Equivalent Models and Parameters for Photovoltaic Panels; concept of MPPT -Applications of Photovoltaic Solar Energy- Economical Analysis of Solar Energy

UNIT-V

Fuel Cells: The Fuel Cell; Low- and High-Temperature Fuel Cells; Commercial and Manufacturing Issues - Constructional Features of Proton Exchange-Membrane Fuel Cells; Reformers; Electrolyser Systems; Advantages and Disadvantages of Fuel Cells.

Text Books:

1. Felix A. Farret, M. Godoy Simo` es, Integration of Alternative Sources of Energy, John Wiley & Sons, 2006.

2. Remus Teodorescu, Marco Liserre, Pedro Rodríguez, Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons, 2011.

Reference Books:

1. Gilbert M. Masters, Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2004.

B.TECH VI SEMESTER **PCC**

L	T	P	C
3	0	0	3

20EE6T07 UTILIZATION OF ELECTRICAL ENERGY

(PROFESSIONAL ELECTIVE-II)

Course Objectives:

- To understand the operating principles and characteristics of traction motors with respect to speed, temperature, loading conditions.
- To acquaint with the different types of heating and welding techniques.
- To study the basic principles of illumination and its measurement.
- To understand different types of lightning system including design
- To understand the basic principle of electric traction including speed–time curves of different traction services and calculation of different parameters.

Course Outcomes:

CO1: Able to identify a suitable motor for electric drives and industrial applications

CO2: Able to identify most appropriate heating or welding techniques for suitable applications.

CO3: Able to understand various level of illuminosity produced by different illuminating sources.

CO4: Able to estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.

CO5: Able to determine the speed/time characteristics of different types of traction motors and estimate energy consumption levels

SYLLABUS

UNIT-I

Industrial Drives: Selection of motor, steady state and transient characteristics, Applications of electric drives, Types of industrial loads- continuous–Intermittent and variable loads.

UNIT-II:

Electric Heating, Welding and Refrigeration: Advantages and methods of electric heating–Resistance heating, induction heating and dielectric heating. Resistance welding and arc welding, electric welding equipment, Refrigeration components and its working

UNIT-III

Illumination: Introduction, terms used in illumination, Laws of illumination, Sources of light, Incandescent Lamp, Discharge lamps: Fluorescent lamp, Sodium Vapor lamps and Mercury Vapor lamps, LED lamps, Types of lighting, flood lighting, LED lighting, street lighting.

UNIT- IV

Electric Traction - I: Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed– time curves for different services – Trapezoidal and quadrilateral speed time curves- High speed transportation trains.

UNIT-V

Electric Traction – II: Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking, retardation adhesive weight and coefficient of adhesion–Principles of energy efficient motors-Modern traction motors.

Text Books:

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, DhanpatRai&Sons.

Reference Books:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

B.TECH VI SEMESTER **PCC**

L	T	P	C
0	0	3	1.5

20EE6L10 MICROPROCESSORS AND MICROCONTROLLERS LAB

Course Objectives:

- To study programming based on 8086 microprocessor and 8051 microcontroller.
- To study 8086 microprocessor based ALP using arithmetic, logical and shift operations.
- To study modular programming using 8086 microprocessor.
- To study to interface 8086 with I/O and other devices.
- To study parallel and serial communication using 8051 microcontroller.

Course Outcomes:

At the end of course student will be able

CO1: To write assembly language program using 8086 microprocessor based on arithmetic, logical, and shift operations.

CO2: To do modular programming using 8086 micro processor.

CO3: To interface 8086 with I/O and other devices.

CO4: To do serial communication using 8051 micro controllers.

CO5: To interface 8051 with I/O and other devices.

Lists of Experiments

Any 10 of the Following experiments are to be conducted

I. Microprocessor 8086:

Introduction to MASM/TASM.

1. Arithmetic operation – Multi byte addition and subtraction, multiplication and division – Signed and unsigned arithmetic operation, ASCII – Arithmetic operation.
2. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
3. By using string operation and Instruction prefix**:** Move block, Reverse string Sorting, Inserting, Deleting, Length of the string, String comparison.
4. Modular Program: Procedure, Near and Far implementation, Recursion.

5. Interfacing 8255–PPI
6. Programs using special instructions like swap, bit/byte, set/reset etc.
7. Interfacing 8259 – Interrupt Controller.
8. Interfacing 8279 – Keyboard Display.
9. Stepper motor control using 8253/8255
10. Arithmetic operations using 8051..
11. Reading and Writing on a parallel port.
12. Timer in different modes.
13. Serial communication implementation.
14. Understanding three memory areas of 00 – FF (Programs using above areas).Using external interrupts.

B.TECH VI SEMESTER **PCC**

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0	0	3	1.5

20EE6L11 POWER SYSTEMS LAB

Course Objective:

To impart the practical knowledge of functioning of various power system components and determination of various parameters and simulation of load flows, transient stability, LFC and Economic dispatch.

Course Outcomes:

CO1: Students are able to determine parameters of transmission line.

CO2: Students are able to understand the concept of fault analysis of alternator.

CO3: Students are able to check the dielectric strength of transformer oil.

CO4: Students are able to write the program for analysing energy management.

CO5: Students are able to check the systems functions at load dispatch centre.

LISTS OF EXPERIMENTS

Any 10 of the Following experiments are to be conducted

PART -A

1. Sequence impedances of 3 phase Transformer.
2. Sequence impedances of 3 phase Alternator by Fault Analysis.
3. Sequence impedances of 3 phase Alternator by Direct method.
4. ABCD parameters of the single phase Transmission line.
5. Power Angle Characteristics of 3phase Alternator with infinite bus bars.
6. Dielectric strength of Transformer oil.
7. Calibration of Tong Tester.

PART -B

8 Load flow studies using Gauss-seidel method

9. Load flow studies using N-R method.

10. Transient Stability Analysis using Swing curve.

11. Load frequency control without control.

12. Load frequency control with PI control.

13. Economic load dispatch without losses.

14. Economic load dispatch with losses.

B.TECH VI SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20EE6L12 POWER ELECTRONICS LAB

Course Objectives:

- To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
- To analyze the performance of single–phase and three–phase full–wave
- Bridge converters with both resistive and inductive loads.
- To understand the operation of PWM inverter and AC voltage regulator with resistive and inductive loads.
- To understand the working of AC voltage controller and ac-ac converters.

Course Outcomes:

At the end of the course the student will be able to:

CO1: Obtain static characteristics of semiconductor devices to discuss their Performance.

CO2: Trigger the SCR by different methods

CO3: Verify the performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads.

CO4: Verify the performance of single phase full bridge inverter connected to resistive load.

CO5: Ability to experiment about switching characteristics various switches.

LIST OF EXPERIMENTS

1. Static Characteristics of SCR.
2. Static Characteristics of MOSFET and IGBT.
3. Characteristic of TRIAC.

4 SCR turn on circuit using synchronized UJT relaxation oscillator.

5. Gate Pulse Generation using R, RC and UJT.
6. Characteristics of SCR and TRIAC
7. Single phase controlled full wave rectifier with R load, R –L load, R-L-E load
8. AC voltage controller connected to R and RL loads.
9. Single phase controlled Half wave rectifier with R load, R –L load
10. IGBT based single phase PWM inverteR
11. IGBT based three phase PWM inverter
12. Study of performance of a Cyclo converter

B. TECH VI SEMESTER

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SC	0	0	4	2

20EE6S13 SOFT SKILLS
(Skill Oriented Course)

Course Outcomes

The student will acquaint himself with various nuances of Soft Skills and Personality Development besides aspects related to Campus Recruitment Process.

SYLLABUS

1 Life Skills

2 JAM

3 Presentation Skills

4 Resume Writing

5 Group Discussion

6 Interview Skills

References:

1. ***Interact*****,** Orient Blackswan

2. **Communication Skills,** Sanjay Kumar and Pushp Latha.OUP,2011

B.TECH VI SEMESTER

	L	T	P	C
MC	2	0	0	-

20EE6M14 DISASTER MANAGEMENT

Course Learning Objectives: The objective of this course is to

1. Understand Types of disasters like Earthquake, Landslide, Flood, Drought, Fire
2. Know Panchayati Raj Institutions/ Urban Local Bodies (PRIs/ ULBs), States,Centre, and other stakeholders
3. Understand Climate Change Adaptation - IPCC Scenario and Scenarios in the context of India
4. Understand Role of GIS and Information Technology Components in Preparedness, Risk Assessment
5. Know various case studies

Course Learning Outcomes: On successful completion of this course, the students will be able to

CO1: Differentiate the types of disasters, causes and their impact on environment and society

CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation.

CO3: Draw the hazard and vulnerability profile of India, Scenarios in the Indian context

CO4: Analyze the Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

CO5: Understand about Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment

UNIT-I:

INTRODUCTION TO DISASTERS Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT-II:

APPROACHES TO DISASTER RISK REDUCTION (DRR) Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT-III:

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT-IV:

DISASTER RISK MANAGEMENT IN INDIA Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT-V:

DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Text Books:

1. Singhal J.P."Disaster Management", Laxmi Publications, 2010. ISBN-10: ISBN-13: 978-9380386423

2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

Reference Books:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005

2. Government of India, National Disaster Management Policy, 2009

B.TECH VI SEMESTER	PCC	L	T	P	C
		3	0	0	3

20EE7T01 POWER ELECTRONIC CONTROL OF ELECTRIC DRIVES

(PROFESSIONAL ELECTIVE-III)

Course Objectives:

- To understand the concept of drive and multi-quadrant operation of drive.
- It covers in detail the basic and advanced speed control techniques using power electronic converters that are used in industry.
- To understand the operation of Rectifier and Chopper fed DC drives.
- Describes the slip power recovery schemes in induction motors and operation of AC drives.

Course Outcomes:

Upon the completion of this course, the student will be able to

CO1: Identify different electric drive system.

CO2: Understand the operation of rectifier fed DC drives, chopper fed DC drives and closed loop control of DC motor.

CO3: Analyse the slip power recovery schemes of Induction motor and speed control of converter fed induction motor & synchronous motor.

CO4: Evalute the performance of speed control of synchronuous motor by CSI and VSI.

CO5: Evalute the performance of different drive characteristics.

SYLLABUS

Unit I

Basics of Electric Drives: Definition, Advantages and applications of drives, Components of electric drive system, Difference between DC and AC drives, Multi quadrant operation of drive, fundamental torque equation and components of torque, load equalization, Speed control methods of DC motors and Induction motor, Electric Braking.

Unit II

Rectifier Control of DC Motor Drives: Single Phase Fully controlled converters connected to DC separately excited motor and DC series motor – Continuous & Discontinuous current operation – voltage and current waveforms – Speed Torque expressions – Speed Torque Characteristics.

Unit III

Chopper Control of DC Motor Drives: Chopper controlled DC separately excited motor and DC series motor – Continuous current operation – voltage and current waveforms – Speed Torque expressions – Speed Torque characteristics, Closed loop control of DC drive (Only Block Diagram).

Unit IV

Control of Induction Motors: Variable voltage control of Induction motor by AC voltage controller, Variable frequency control of Induction motor – waveforms – Speed Torque characteristics, Slip power recovery schemes – Static Kramer Drive – Static Scherbius Drive.

Unit V

Control of Synchronous Motors: Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI and Load commutated CSI fed Synchronous Motor – Operation – Waveforms – Speed Torque characteristics-PMSM Drive.

Text Books:

1. Fundamentals of Electrical Drives by G.K.Dubey, Second Edition, 2002.
2. Power Electronics: Circuits, Devices and Applications by M.H.Rashid, Third Edition, 2009.
3. P.S. Bimbhra, ― Power Electronics‖, 4th Edition, Khanna publishers. 2010

Reference Books:

1. Power Electronics by M.D.Singh and K.B.Khanchandani, Second Edition, 2017.
2. Modern Power Electronics and AC Drives by Bimal K Bose, 2005.
3. Thyristor Control of Electric Drives by Vedam Subramanyam, Tata McGraw-Hill Publications,2008.

B.TECH VI SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE7T02 HIGH VOLTAGE ENGINEERING
(PROFESSIONAL ELECTIVE-III)

Course Objectives:

- To understand electric field distribution and computation in different configuration of electrode systems.
- To understand HV breakdown phenomena in gases, liquids and solids dielectric materials.
- To acquaint with the generating principle of operation and design of HVDC, AC and Impulse voltages and impulse currents.
- To understand various techniques of AC, DC and Impulse measurement of high voltages and currents.
- To understand the insulating characteristics of dielectric materials. To understand the various testing techniques of HV equipments.

Course Outcomes:

At the end of the course, student will be able to

CO1: Various types of over voltages in power system and protection methods

CO2: Study the nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.

CO3: Generation of over voltages techniques

CO4: Analyze measurement of over voltages.

CO5: Testing of power apparatus and insulation coordination

SYLLABUS

UNIT– 1 OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection against over voltages.

UNIT– 2 DIELECTRIC BREAKDOWN

Properties of Dielectric materials – Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids. Breakdown mechanisms in solid and composite dielectrics- Applications of insulating materials in electrical equipment.

UNIT– 3 GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS

Generation of high DC voltages – Generation of high alternating voltages – Generation of impulse voltages – Generation of impulse currents – Tripping and control of impulse generators.

UNIT– 4 MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS

Measurement of high AC, DC and Impulse voltages – Voltages and measurement of high currents – Direct, alternating and Impulse.

UNIT– 5 HIGH VOLTAGE TESTING & INSULATION COORDINATION

Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination.

Text Books

- High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition.
- High Voltage Engineering : Fundamentals by E.Kuffel, W.S. Zaengl J. Kuffel by Elsevier, 2nd Edition.
- High Voltage Engineering and Technology by Ryan, IET Publishers.

Reference Books

- High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
- High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New. Age International (P) Limited, 1995.

B.TECH VI SEMESTER **PEC**

L	T	P	C
3	0	0	3

20EE7T03 SMART GRID TECHNOLOGIES

(PROFESSIONAL ELECTIVE-III)

Course Objective:

- To understand various aspects of smart grid
- To study various smart transmission and distribution technologies
- To appreciate distribution generation and micro grids
- To know the Elements of communication and networking for smart grid
- To know the different energy sources with communication networks

Course Outcomes:

CO1: Understand technologies for smart grid

CO2: Appreciate the smart transmission as well distribution systems

CO3: Realize the distribution generation and

CO4: Know the Elements of communication methods

CO5: Know the Elements of Networking methods

SYLLABUS

UNIT – I

Introduction to Smart Grids: Definition need for smart grids, smart grid conceptual model, Difference between conventional & smart grid, Role of Smart grids. Smart grid economic and environmental benefits

UNIT – II:

Monitoring and control for transmission system: Smart Substations and their automation, Supervisory control and data acquisition (SCADA), energy management system (EMS), phasor measurement units (PMU), Wide area measurement systems (WAMS)

UNIT – III

Smart Distribution Technologies: Distribution automation, automated meter reading (AMR), fault location isolation and service restoration (FLISR), Outage Management Systems (OMS), Energy Storage, Renewable Integration

UNIT – IV

Micro grids: Concept of micro grid, need & applications of micro grid, formation of micro grid, issues of interconnection, protection & control of micro grid.

Distributed energy resources (DERs): Small scale distributed generation, Distributed Generation Technology, Micro turbines, Fuel Cells, Solar Photovoltaic, Solar thermal, Wind power, Advantages and disadvantages of DG.

UNIT – V

Elements of communication and networking:

Local Area Network (LAN) - House Area Network (HAN) - Wide Area Network (WAN) - Broadband over Power line (BPL) - IP based Protocols - Basics of web service and CLOUD Computing, Cyber Security for Smart Grid.

Text Books:

1. Clark W Gellings, "The Smart Grid, Enabling Energy Efficiency and Demand Side Response"- CRC Press, 2009.
2. Jean Claude Sabonnadière, Nouredine Hadjsaïd, "Smart Grids", Wiley-ISTE, IEEE Press, May 2012
3. Tony Flick and Justin Morehouse, "Securing the Smart Grid", Elsevier Inc.

Reference Books:

1. James Momoh, "Smart Grid: Fundamentals of Design and Analysis" – Wiley, IEEE Press, 2012.
2. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong. Wu, Akihiko Yokoyama, Nick Jenkins, "Smart Grid: Technology and Applications"- Wiley, 2012.
3. Stuart Borlase , Smart Grid: Infrastructure, Technology and Solutions, CRC Press 2012.
4. Mini S. Thomas, John D McDonald, Power System SCADA and Smart Grids, CRC Press, 2015
5. Kenneth C.Budka, Jayant G. Deshpande, Marina Thottan, Communication Networks for Smart Grids, Springer, 2014.
6. Ali K., M.N. Marwali, Min Dai, "Integration of Green and Renewable Energy in Electric Power Systems", Wiley.

B.TECH VII SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE7T04 ADVANCED CONTROL SYSTEMS

(PROFESSIONAL ELECTIVE-III)

Course Objective:

- Review of the state space representation of a control system: Formulation of different models from the signal flow graph, diagonalization.
- To introduce the concept of controllability and observability. Design by pole placement technique.
- Analysis of a nonlinear system using Describing function approach and Phase plane analysis.
- The Lypanov's method of stability analysis of a system &Formulation of Euler Laugrange equation
- Formulation of linear quadratic optimal regulator (LQR) problem by parameter adjustment and solving riccatti equation.

Course Outcomes:

CO1: State space representation of control system and formulation of different state models are reviewed.

CO2: Able to design of control system using the pole placement technique is given after introducing the concept of controllability and observability.

CO3: Able to analyse of nonlinear system using the describing function technique and phase plane analysis.

CO4: Able to analyse the stability analysis using lypnov method& Minimization of functionals using calculus of variation studied.

CO5: Able to formulate and solve the LQR problem and riccatti equation.

UNIT-I

State space analysis: State Space Representation – Solution of state equation – State transition matrix, –Canonical forms – Controllable canonical form – Observable canonical form, Jordan Canonical Form

UNIT-II

Controllability, observability and design of pole placement: Tests for controllability and observability for continuous time systems – Time varying case

– Minimum energy control – Time invariant case – Principle of duality Controllability and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability – Design of state feedback control through pole placement.

UNIT-III

Describing function analysis: Introduction to nonlinear systems, Types of nonlinearities, describing functions, Introduction to phase–plane analysis.

Stability analysis: Stability in the sense of Lyapunov – Lyapunov's stability and Lypanov's instability theorems – Direct method of Lypanov for the linear and nonlinear continuous time autonomous systems.

UNIT-IV

Calculus of variations: Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints – Euler lagrangine equation.

UNIT-V

Optimal control: Linear quadratic optimal regulator (LQR) problem formulation – Optimal regulator design by parameter adjustment (Lyapunov method) – Optimal regulator design by continuous time algebraic riccatti equation (CARE) – Optimal controller design using LQG framework.

Text Books:

1. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998
2. Automatic Control Systems by B.C. Kuo, Prentice Hall Publication

Reference Books:

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996
2. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
3. Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw–Hill Companies, 1997.
4. Systems and Control by Stainslaw H. Zak , Oxford Press, 2003.
5. Optimal control theory: an Introduction by Donald E.Kirk by Dover publications.

B.TECH VII SEMESTER	PEC	L	T	P	C
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20EE7T05 DIGITAL SIGNAL PROCESSING

(PROFESSIONAL ELECTIVE-IV)

Course Objectives: This course is an essential course that provides design techniques for processing all type of signals in various fields. The main objectives are:

- To provide background and fundamental material for the analysis and processing of digital signals.
- To familiarize the relationships between continuous-time and discrete time signals and systems.
- To study fundamentals of time, frequency and Z-plane analysis and to discuss the inter-relationships of these analytic method.
- To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.

Course Outcomes: On completion of this subject, the student should be able to:

CO1: Perform time, frequency, and Z -transform analysis on signals and systems.

CO2: Understand the inter-relationship between DFT and various transforms.

CO3: Understand the significance of various filter structures and effects of round off errors.

CO4: Design a digital filter for a given specification.

CO5: Understand the fast computation of DFT and appreciate the FFT processing.

SYLLABUS

UNIT - I

Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

UNIT - II

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency

Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

UNIT - III

Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform. Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT, and FFT with General Radix-N.

UNIT - IV

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT - V

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response, Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
3. Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009

REFERENCES:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

B.TECH VII SEMESTER

PEC	L	T	P	C
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20EE7T06 SPECIAL ELECTRICAL MACHINES

(PROFESSIONAL ELECTIVE-IV)

Course Objective:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor**.**
- To explain the theory of travelling magnetic field and applications of linear motors.

Course Outcomes:

The student should be able to

CO1: Distinguish between brush dc motor and brush less dc motor**.**

CO2: Explain the performance and control of stepper motors, and their applications.

CO3: Explain theory of operation and control of switched reluctance motor.

CO4: Explain the theory of travelling magnetic field and applications of linear motors.

CO5: Understand the significance of electrical motors for traction drives.

SYLLABUS

Unit I

Stepper Motors: Classification and construction details of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of stepper motors – Applications of stepping motors.

Unit II

Switched Reluctance Motors: Construction – Comparison of conventional and switched reluctance motors –Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

Unit III

Brushless DC Motor: Construction – Principle of operation of BLDM – sensing and logic scheme, basic drive circuit, power converter circuit, transient analysis Theory of brushless DC motor as variable speed synchronous motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency.

UNIT-IV

Linear motors: Linear induction motor: Construction– principle of operation–applications. Linear synchronous motor: Construction – principle of operation–applications.

Unit V

Electric Motors for traction drives: AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:

1. Special electrical Machines, K.VenkataRatnam, University press, 2009, New
2. "Linear Electric Motors: Theory, Design and Practical application" , Naser A and Boldea I, Prentice Hall Inc, New Jersey, 1987.

Reference Books:

1. Generalized Theory of Electrical Machines – PS Bhimbra, Khanna Publishers.
2. "Brushless Permanent Magnet and Reluctance Motor Drives" , Miller T.J.E. Clarendon Press, Oxford, 1989.
3. Electric Machines – Theory, operation, Applications and Control - Charles I. Hubert – Pearson Publications.

B.TECH VII SEMESTER **PEC**

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3	0	0	3

20EE7T07 HVDC & FACTS

(PROFESSIONAL ELECTIVE-IV)

Course Objective:

- To Understand basic concepts of HVDC Transmission
- To analyze the converter configuration.
- To Know the control of converter and HVDC Transmission.
- To Understand the basic concepts of FACTS.
- To Know the operation of different FACTS devices

Course Outcomes:

CO1: Learn different types of HVDC levels and basic concepts.

CO2: Know the operation of converters.

CO3: Learn the control of converter and HVDC Transmission.

CO4: Analyze the basic concepts of FACTS.

CO5: To learn the operation of different FACTS devices

SYLLABUS

UNIT – I

Basic Concepts and Analysis of HVDC Converters: Basic Concepts: Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links –Apparatus required for HVDC Systems – Comparison of AC &DC Transmission,

Analysis of HVDC Converters: Choice of converter configuration, and analysis of Graetz – characteristics of 6 pulse & 12 pulse converters.

UNIT – II

Reactive Power Control in HVDC and System Control: Principal of DC Link Control – Converters Control Characteristics – Firing angle control Current and extinction angle control, sources of reactive power AC Filters – shunt capacitors-synchronous condensers.

NIT – III

Converter Faults,Harmonics & Introduction to FACTS:

Converter Faults and Harmonics: Converter faults, DC breakers, Characteristics harmonics, Non- Characteristics harmonics, Effect of Pulse number on harmonics.

Introduction to FACTS: Power flow in an AC System, Dynamic stability considerations, Importance of controllable parameters, Basic types of FACTS controllers, Benefits from FACTS controllers.

UNIT – IV

Voltage source and Current source converters and Shunt Compensators:

VSC AND CSC: Concept of voltage source converter (VSC) – Single phase bridge converter – Three–phase full wave bridge converter, Concept of current source converter (CSC), Comparison of current source converter with voltage source converter.

Shunt Compensators: Objectives of shunt compensation, Mid–point voltage regulation for line segmentation, Thyristor Switched Capacitor (TSC), Thyristor Switched Capacitor – Thyristor Switched Reactor (TSC–TCR).

UNIT – V

Series Compensators and Combined Controllers

Series Compensators: Objectives of series compensation, Concept of series capacitive compensation, GTO thyristors controlled Series Capacitor (GCSC), Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC), Basic concept of Unified Power Flow Controller (UPFC).

Text Books:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.
2. HVDC Transmission by S.Kamakshaiah andV.Kamaraju-Tata McGraw–Hill
3. “Understanding FACTS” N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition is Available:—Standard Publications, 2001.

Reference Books:

1. HVDC Transmission – J.Arrillaga.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.
3.Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications
4. “Flexible ac transmission system (FACTS)” Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
5. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.MohanMathur and Rajiv k.Varma, Wiley

B.TECH VII SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE7T08 EVOLUTIONARY ALGORITHMS AND APPLICATIONS

(PROFESSIONAL ELECTIVE-IV)

SYLLABUS

UNIT-I: INTRODUCTION TO EVOLUTIONARY ALGORITHMS

Classification of evolutionary algorithms, "Soft" computing versus "Hard" computing, Characteristics of Soft computing, Advantages and applications of Soft computing techniques.

UNIT-II GENETIC ALGORITHMS

Concept of "Genetics" and "Evolution" and its application to problem solving, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc., Solving single-objective optimization problems using GAs.

UNIT-III SINGLE OBJECTIVE OPTIMIZATION PROBLEM SOLVING

Objective functions, constraints handling, standard test functions, Population initialization, fitness calculation, updating initial population, Particle swarm optimization algorithm, Applications.

UNIT-IV: MULTI-OBJECTIVE OPTIMIZATION PROBLEM SOLVING

Concept of multi-objective optimization problems (MOOPs) and issues of solving them, Multi-Objective Evolutionary Algorithm (MOEA), Non-Pareto approaches to solve MOOPs Pareto-based approaches to solve MOOPs, Some applications with MOEAs.

UNIT-V: APPLICATIONS OF EVOLUTIONARY ALGORITHMS

Applications in Power flow analysis, Economic load dispatch, DC and AC motor drives, Load forecasting.

Text Books:

1. Soft Computing, D. K. Pratihar, Narosa, 2008.
2. Dan Simon," Evolutionary Optimization Algorithms" Biologically inspired and population based approaches for computer intelligence, Wiley Publications.
3. Kalyanmoy Deb, "Multi objective optimization using Evolutionary Algorithms," Wiley publications

Reference Books:

1. Kalyanmoy Deb, "Optimization for Engineering Design: Algorithms and Examples", PHI Publications.

2. Practical Genetic Algorithms, Randy L. Haupt and sue Ellen Haupt, John Willey & Sons, 2002.

B.TECH VII SEMESTER **PEC**

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20EE7T09 IOT APPLICATIONS IN ELECTRICAL ENGIEERING

(PROFESSIONAL ELECTIVE-V)

Course Objective: To understand the definition and significance of the Internet of Things· Discuss the architecture, operation, emerging technological options and case studies of IoT implementation.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basics of IoT.

CO2: Implement the state of the Architecture of an IoT.

CO3: Understand design methodology and hardware platforms involved in IoT.

CO4: Understand how to analyze and organize the data.

CO5: Compare IOT Applications in Industrial & real world.

SYLLABUS

UNIT I: FUNDAMENTALS OF IoT

Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT-II: IoT PROTOCOLS

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT..

UNIT-III: DESIGN AND DEVELOPMENT

Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks. IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details.

UNIT-IV: DATA ANALYTICS AND SUPPORTING SERVICES

Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M.

Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

UNIT-V: CASE STUDIES / INDUSTRIAL APPLICATIONS

IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments, Industry 4.0 concepts.

Text Book(s)

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017.
2. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015.
1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education

References

1. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit2).
2. "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence",Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
3. Architecting the Internet of Things,Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer,2011.
4. Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition,Michael Margolis,Arduino Cookbook and O‟Reilly Media,2011.

B.TECH VII SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE7T10 SWITCH MODE POWER CONVERSION

(PROFESSIONAL ELECTIVE-V)

Course Objectives:

- To understand the control operation of non-sinusoidal DC-DC converters.
- To understand the basic operation of resonant converters.
- To understand the control operation of isolated DC-DC converters.
- To understand the control schemes of DC-DC converters and designing of magnetic components.
- To understand the modeling and control design of switch mode conversion based on linearization.
- To understand how to analyze the switch mode converters using small-signal analysis

Course Outcomes:

At the end of the course, student will be able to

CO1: Analyze operation and control of non-isolated

CO2: Analyze operation and control of isolated switch mode converters.

CO3: Design of non-isolated and isolated switch mode converters.

CO4: Analyze operation and control of resonant converters.

CO5: Feedback design of switch mode converters based on linearized models.

SYLLABUS

UNIT– 1 Non-isolated switch mode converters:

Control of DC-DC converters: Buck converters, Boost converters, Buck-Boost converter, CUK Converter, continuous and discontinuous operation, Converter realization with non-ideal components.

UNIT– 2 Isolated switched mode converters:

Forwarded converter, flyback converter, push-pull converter, half-bridge converter, full bridge converter.

UNIT– 3 Resonant converters:

Basic resonant circuit concepts, series resonant circuits, parallel resonant circuits, zero current switching quasi-resonant buck converter, zero current switching quasi-resonant boost converter, zero voltage switching quasi-resonant buck converter, zero voltage switching quasi-resonant boost converter- dual active bridge resonant converters.

UNIT– 4 Control schemes of switching converters:

Voltage control, Current mode control, control scheme for resonant converters. Magnetic design consideration: Transformer design, inductor and capacitor design.

UNIT– 5 Modeling and Controller design based on linearization:

Formulation of averaged models for buck and boost converters: state space analysis, average circuit models, linearization and small – signal analysis, small-signal models. Control design based on linearization: Transfer function of converters and control design.

Text Books:

1. Fundamentals of Power Electronics-Erickson, Robert W., Maksimovic, Dragan, Springer, 2011.

2. Power switching converters-Simon Ang, Alejandro Oliva, CRC Press, 2010.

3. Elements of Power Electronics – Philip T. Krein, Oxford University press, 2014.

4. Design of Magnetic Components for Switched Mode Power Converters- Umanand, S.P. Bhat, John Wiley & Sons Australia, 1992.

Reference Books:

1. Switching Power Supply Design-Abraham I. Pressman, McGraw-Hill Ryerson, Limited, 1991.

2. Power Electronics – IssaBatareseh, Jhon Wiley publications, 2004.

3. Power Electronics: converters Applications & Design – Mohan, Undeland, Robbins-Wiley publications

B.TECH VII SEMESTER	**PEC**	**L**	**T**	**P**	**C**
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20EE7T11 ELECTRIC VEHICLES

(PROFESSIONAL ELECTIVE-V)

Course Objective:

To study the different drive train configurations of electric vehicles

To propose the various propulsion and energy storage systems for EHVs

To know the sizing of propulsion motors and other systems involved in EH vehicles

To carry out different design case studies of EHv and BEVs

Course Outcomes: At the end of the course, the student will be able to:

CO1: Assess the performance, societal and environmental impact of EHVs having known their past history

CO2: Implement various drive train topologies and control strategies in Electric and Hybrid vehicles

CO3: Recommend, Design/Size and Control different electric propulsion units and other components of EHVs and BEVs

CO4: Appropriately select the energy storage system and strategize its management in EHVs

CO5: Define Ancillary Service Management and explain different ancillary services.

SYLLABUS

UNIT-I INTRODUCTION TO ELECTRIC VEHICLES:

History of electric vehicles (EV) and hybrid electric vehicle (EHV), need and importance of EV and HEV, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Power/energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics.

UNIT-II HYBRID ELECTRIC DRIVE-TRAINS: Basic architecture and concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

UNIT-III ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, and Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV BATTERY ENERGY STORAGE SYSTEMS:

Battery Basics - Lead-Acid Battery -Cell Discharge Operation - Cell Charge Operation-Construction-Battery Parameters - Battery Capacity-Discharge Rate - State of Charge- State of Discharge- Depth of Discharge-Technical Characteristics - Practical Capacity -Battery Energy -Constant Current Discharge -Specific Energy - Battery Power -Specific Power -Batteries for EV applications.

UNIT-V MODELLING OF EV/HEV:

Modelling and analysis of EV/HEV drive train sizing of motor, and design of traction power electronics, various vehicle subsystems.

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2010.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,2009.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

REFERENCES:

1. Jefferson, C.M., Barnard and R.H., Hybrid Vehicle Propulsion, WIT Press, Boston, 2002

2. Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012

3. SerefSoylu “Electric Vehicles - The Benefits and Barriers”, InTech Publishers, Croatia, 2011

4. Jack Erjavec and Jeff Arias, “Alternative Fuel Technology – Electric, Hybrid and Fuel Cell Vehicles”, Cengage Learning Pvt. Ltd., New Delhi, 2007

5. Seth Leitman, “Build Your Own Electric Vehicle” McGraw hill, New York, USA, 2013

B.TECH VII SEMESTER	PEC	L	T	P	C
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20EE7T12 ELECTRICAL DISTRIBUTION SYSTEMS

(PROFESSIONAL ELECTIVE-V)

Course Objective:

- To study the Load characteristics and corresponding factors.
- To understand about substations and design the distribution systems.
- To study about distribution feeders and determination of voltage drop and power loss calculations.
- To study the distribution system protection and its coordination.
- To model the capacitor bank for power factor improvement and study about voltage control equipment.

Course Outcomes:

- Able to understand the daily load curve and finding different factors for economical operation.
- Able to understand the different substation equipment and design of distribution systems.
- Able to understand the distribution feeders, voltage drop and power loss calculations.
- Able to understand the different protective devices and how to coordinate them for complete protection.
- Able to modelling the capacitor banks for improving power factor and understanding about voltage control.

SYLLABUS

UNIT-1

General Concepts: Introduction to distribution systems - Distribution system losses – Coincidence factor –Contribution factor loss factor – Numerical Problems – Load Modelling and Characteristics –Relationship between the load factor and loss factor – Classification and characteristics of loads(Residential, commercial, Agricultural and Industrial).

UNIT – II

Substations : Location of substations: Rating of distribution substation – Service area with'n'primary feeders –Benefits and methods of optimal location of substations. Distribution Feeders Design Considerations of distribution feeders: Radial and loop types of primary feeders –Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

UNIT – III

System Analysis : Voltage drop and power loss calculations: Derivation for voltage drop and power loss in lines – Uniformly distributed loads and non-uniformly distributed loads – Numerical problems – Three phase balanced primary lines. Load flow analysis: forward/backward – direct approach.

UNIT – IV

Protective devices and Coordination: Objectives of distribution system protection –Time current characteristics – Protective devices**:** Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers, Modulated case circuit breakers, Earth leakage circuit breakers.

UNIT – V

Power Factor and Voltage control: Capacitive compensation for power factor control – Different types of power capacitors –Application and modelling of capacitor banks– Power factor correction – Capacitor allocation –Effect of series capacitors – Effect of AVB/AVR –Line drop compensation.

Text books:

1. Electric Power Distribution System Engineering, Turan Gonen, CRC press, Taylor & Fracis Group, 2nd edition.
2. J. J. Burke "Power Distribution Engineering: Fundamentals and Applications", CRC Press, 1994.

Reference books:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing Company, 4th edition, 1997.
3. Electrical Power Distribution Systems by V. Kamaraju, Right Publishers.

B.TECH VII SEMESTER

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20EE7T17 UNIVERSAL HUMAN VALUES 2
Understanding Harmony

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcome

On completion of this course, the students will be able to

CO1: Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society

CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.

CO3: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society

CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.

CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

SYLLABUS

UNIT- I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I

2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential

Validation- as the process for self-exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority

5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT- II

Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

10. Understanding the characteristics and activities of 'I' and harmony in 'I'

11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT- III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

22. Definitiveness of Ethical Human Conduct

23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

24. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

25. Case studies of typical holistic technologies, management models and production systems

26. Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations

27. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Readings

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj – Pandit Sunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)

13. Gandhi - Romain Rolland (English)

B.TECH VII SEMESTER

	L	T	P	C
SC	0	0	4	2

20EE7S18 ELECTRICAL CAD

(SKILL ORIENTED COURSE)

Course Objectives:

- Understand the concepts of Electrical CAD lab

Course Outcomes:

CO1: Understand CAD Application package for Electrical Drawing.

CO2: Develop winding diagrams of Electrical Machines.

CO3: Draw and Realize the Sectional views of AC Machines.

CO4: Understand and Draw Electrical Building Wiring,

CO5: Understand the Panel board wiring, Single line diagrams

LISTS OF EXPERIMENTS: Perform Any 10 experiments

1 Study the AutoCAD screen with various toolbars and menus

2 Exercise on standard commands

3 Exercise on 2D drawing commands

4 Exercise on modify 2D commands

5 Exercise on dimensioning commands

6 Exercise on formatting commands

7 Exercise on Insert commands

8 Exercise on view commands

9 Exercise on isometric drawings in 2D

i) Draw electrical symbols.

ii) Draw electric poles.

10 iii) Draw electric towers.

i) Draw pipe earthing.

ii) Draw plate earthing.

iii) Draw guarding systems.

iv) Draw different types of stays.

11 Exercise on shading of 3D models

12 Practicing of Project Management Software & Tools

13 Control & protection schemes of motors

		L	T	P	C
B.TECH V SEMESTER	**OEC**	**3**	**0**	**0**	**3**

20CE5T04 ARCHITECTURE AND TOWN PLANNING

(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

- Initiating the students to different architectures of the world.
- Salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization.
- Architectural Design concepts, Principles of Planning and Composition.
- To understand town planning from ancient times to modern times.
- To impart the concepts of town planning standards.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Student should be able to distinguish architectural styles of eastern and Western world.

CO2: Student should understand the importance of Orders of Architecture.

CO3: Should be able to compose spaces of buildings using design concepts, planning principles.

CO4: Student should understand the town planning standards, landscaping features.

SYLLABUS

UNIT-I:

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace – Fort - Tomb.

UNIT-II:

Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT-III:

Principles of Planning: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements,

Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wright, Walter Groping.

UNIT-IV:

Histroical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT-V:

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- neighbor hood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation planning regulations and limitations.

Text books:

1. 'The great ages of World Architecture' by G.K. Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y. S.Sane.
3. 'Professional Practice' by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, NewDelhi.
4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning'by G.K. Haraskar.

Reference Books:

1. 'Drafting and Design for Architecture' by Hepler, Cengage
2. Learning 'Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.
3. 'Mordern Ideal Homes for India' by R. S. Deshpande.
4. 'Town and County Planning' by A.J. Brown and H.M. Sherrard.
5. 'Town Design' by Federik Glbbard, Architectural press, London.

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE5T05 ELEMENTS OF CIVIL ENGINEERING

(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources, Water Supply, Sanitary, Electrical Works in Building and Highway engineering.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: The student should be able to know the basics of civil engineering and concepts of surveying.

CO2: The student should be able to know various properties of building materials and various types of building.

CO3: The student should be able to know the fundamentals of Water Resources, Water Supply, Sanitary and Electrical Works in Building.

CO4: The student should be able to know the fundamental concepts highway engineering.

SYLLABUS

UNIT-I:

Introduction. Introduction of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on economy of country.

UNIT-II:

Surveying Introduction: Definition of Surveying, Fundamental principles of surveying, Classification of surveying.

Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining and Ranging.

Angular Measurement: Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing local attraction.

Levelling: Objectives and applications-terminology-Instruments, component parts of dumpy level, Types of levelling, levelling staff

UNIT-III:

Building Materials and Construction Materials: Introduction to construction materials - Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen. Construction: Classification of buildings, Building components and their functions.

UNIT-IV:

Water Resources Hydrologic cycle, water use and its conservation, Introduction to dams, barrages and check dams. Water Supply, Sanitary and Electrical Works in Building Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

UNIT–V:

Transportation Engineering, classification of roads, Introduction of flexible and rigid pavements, Introduction to road traffic and traffic control mechanism.

Text Books:

1. Elements of Civil Engineering, Mimi Das Saikia, Bhargab Mohan Dasand Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, Publisher: McGraw Hill Education, India Pvt. Ltd.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, Arun kumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books:

1. Surveying Theory and Practice, James M Anderson and Edward, 7th Edition, M Mikhail Publisher: McGraw Hill Education, India Pvt. Ltd.
2. Surveying and Leveling, R. Subramanian Publisher, Oxford University.
3. Building drawing, M.G. Shah, C.M.Kale and S.Y. Patki Publisher: TataMcGraw Hill.

		L	T	P	C
B.TECH V SEMESTER	**OEC**	**3**	**0**	**0**	**3**

20EE5T04 BASICS OF CONTROL SYSTEMS
(OPEN ELECTIVE-I)

Course Objectives:

- To Enable the student to understand the importance of Modelling of Control systems
- To understand the First order & second order systems
- To understand the transfer function analysis
- To understand the Stability of the systems
- To understand the States Space Analysis

Course Outcomes:

At the end of the course, the student will be able to

CO1: Understand the different Classification of control systems and modelling

CO2: Understand the functioning of Signals & time response analysis

CO3: Understand the concept of Root Locus & Construction of Root Loci

CO4: Understand the concept of Bode plot & Nyquist Plot

CO5: Understand the concept of States Space Analysis of LTI System

SYLLABUS

UNIT – I

Mathematical Modeling of Control Systems: Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems

UNIT-II

Time Response Analysis: Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III

Stability and Root locus Technique: The concept of stability – Routh's stability criterion –limitations of Routh's stability –Root locus concept - construction of root loci

UNIT–IV

Frequency Response Analysis: Introduction to Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots.

UNIT–V

State Space Analysis of LTI Systems: Concepts of state variables and state model, state space representation of transfer function, Diagonalization- Solving the time invariant state equations.

Text Books:

1. Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4^{th} Edition.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2^{nd} Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems, Manik Dhanesh N, Cengage publications.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International
   Publications, 5th Edition.
4. Control Systems Engineering, S.Palani,TataMcGraw Hill Publications.

B.TECH V SEMESTER **OE**

L	T	P	C
3	0	0	3

20EE5T05 SPECIAL ELECTRICAL MACHINES

(OPEN ELECTIVE-I)

Course Objective:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor**.**
- To explain the theory of travelling magnetic field and applications of linear motors.

Course Outcomes:

The student should be able to

CO1: Distinguish between brush dc motor and brush less dc motor**.**

CO2: Explain the performance and control of stepper motors, and their applications.

CO3: Explain theory of operation and control of switched reluctance motor.

CO4: Explain the theory of travelling magnetic field and applications of linear motors.

CO5: Understand the significance of electrical motors for traction drives.

SYLLABUS

Unit I: Stepper Motors: Classification and construction details of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of stepper motors – Applications of stepping motors.

Unit II: Switched Reluctance Motors: Construction – Comparison of conventional and switched reluctance motors –Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

Unit III : Brushless DC Motor: Construction – Principle of operation of BLDM – sensing and logic scheme, basic drive circuit, power converter circuit, transient analysis Theory of brushless DC motor as variable speed synchronous motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency.

UNIT-IV: **Linear motors:** Linear induction motor: Construction– principle of operation– applications. Linear synchronous motor: Construction – principle of operation– applications.

Unit V: Electric Motors for traction drives: AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:

1. Special electrical Machines, K. Venkata Ratnam, University press, 2009, New
2. "Linear Electric Motors: Theory, Design and Practical application" , Naser A and Boldea I, Prentice Hall Inc, New Jersey, 1987.

Reference Books:

1. Generalized Theory of Electrical Machines – PS Bhimbra, Khanna Publishers.
2. "Brushless Permanent Magnet and Reluctance Motor Drives" , Miller T.J.E. Clarendon Press, Oxford, 1989.
3. Electric Machines – Theory, operation, Applications and Control - Charles I. Hubert – Pearson Publications.

B.TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME5T04 **DESIGN THINKING & PRODUCT INNOVATION (OPEN ELECTIVE-I)**

Pre-requisite: Managerial Economics and Financial Analysis,

Management Science.

Course Objective: At the end of the course, The student will able to

1. Design and develop the new product
2. Explain the basics of design thinking.
3. Describe the role of reverse engineering in product development.
4. Identify the needs of society and convert into demand.
5. Explain the product planning and product development process

Course Outcomes: At the end of the course, student will be able to

CO1: To bring awareness on innovative design and new product development.

CO2: To explain the basics of design thinking.

CO3: To familiarize the role of reverse engineering in product development.

CO4: To train how to identify the needs of society and convert into demand.

CO5: To introduce product planning and product development process.

SYLLABUS

UNIT-I: SCIENCE TO ENGINEERING:

Job of engineers, engineering units and measurement, elements of engineering analysis, forces and motion, energy, kinematics and motion, conversion of linear motion to rotary and vice versa, motion transmission. Physics to Engineering: Application of Newton laws, Pascal's law, Bouncy, Bernoulli's theorem, Ohm's law, electrical induction in
engineering products.

UNIT-II: HISTORICAL DEVELOPMENT:

Invention wheel, early mechanics in design, mechanical advantages,
industrial revolution, steam and petrol for mobility. Innovations in Electrical and Electronics: Electrical energy generation, electrical bulb, electrical equipment, electronics and automation, computing for early days to present, innovations in communications.

UNIT-III: SYSTEMATIC APPROACH TO PRODUCT DEVELOPMENT:

Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation. Solution finding methods: Conventional, intuitive, discursive, methods for combining solution, decision making for new design.

UNIT-IV: REVERSE ENGINEERING IN PRODUCT DEVELOPMENT:

Reversing engineering methods, identifying the bad features in a product, reduction in size and weight, usage of new materials, 3D printing, study of introducing electrical and electronic controls to the old products, importance of ergonomics in product development, environmental considerations in design, safety considerations in design.

UNIT-V:

Study of Product Development- Agriculture, development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy. Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of electrical vehicles, unmanned vehicles, design principles in drones.

Text Books:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, “Exploring Engineering: An Introduction to Engineering and Design”, 4th edition, Elsevier, 2016.
2. David Ralzman, “History of Modern Design”, 2nd edition, Laurence King Publishing Ltd., 2010
3. An AVA Book, “Design Thinking”, AVA Publishing, 2010.

Reference Books:

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, “Engineering Design: A Systematic Approach”, 3rd edition, Springer, 2007.
2. Tom Kelley, Jonathan Littman, “Ten Faces in Innovation”, Currency Books, 2006.

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME5T05 **NANOTECHNOLOGY (OPEN ELECTIVE-I)**

Pre-requisite: Materials Science

Course Objective:

- To familiarize with principles of quantum mechanics on which nano materials behave
- To elucidate applications of nanotechnology

Course Outcomes:

At the end of the course, student will be able to

CO1: Analyze the concepts and preparation methods of Nano materials

CO2: Understand the nano material properties and their behavior

CO3: Use various techniques for investigating nano material

CO4: Know the importance of Nano Technology for advanced materials processing

CO5: Know the importance of Nano structured Materials for Various Energies.

SYLLABUS

UNIT-I: Introduction to Nano technology:

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects

UNIT-II: Unique Properties of Nanomaterials:

Microstructure and Defects in nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple, and disclinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility, Magnetic Properties: Soft magnetic Nanocrystalline alloy, Permanent magnetic Nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT-III: Synthesis Routes :

Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method ,Self assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

UNIT-IV: Nanomaterials for Energy Conversion Systems:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy, Conversion Systems, Fuel Cells, Principles and nanomaterials design for Proton exchange membrane fuel cells (PEMFC); Direct methanol fuel cells (DMFC).

UNIT-V:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy Storage Systems, Primary and Secondary Batteries (Lithium ion Batteries), Cathode and anode materials, Nanostructured Carbon based materials, Nano-Oxides, Novel hybrid electrode materials, Current status and future trends.

Text books:

1. Electrochemical methods: Fundamentals and Applications, Allen J.Bard and Larry R. Faulkner, 2ndEdition John Wiley & Sons. Inc (2004)
2. D. Linden Ed., Handbook of Batteries, 2nd edition, McGraw-Hill, New York (1995)
3. G.A. Nazri and G. Pistoia, Lithium Batteries: Science and Technology, KulwerAcdemic Publishers, Dordrecht, Netherlands (2004).
4. J. Larmine and A. Dicks, Fuel Cell System Explained, John Wiley, New York (2000).

Reference Books:

1. Science and Technology of Lithium Batteries-Materials Aspects: An Overview, A. Manthiram, Kulwer Academic Publisher (2000).
2. M. S. Whittingham, A. J. Jacobson, Intercalation Chemistry, Academic Press, New York (1982).
3. M. Wakihara, O. Yamamoto, (Eds.) Lithium Ion Batteries: Fundamentals and Performance, Wiley –VCH ,Weinheim (1998).

B. Tech V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20EC5T04 LINEAR SYSTEM ANALYSIS (OPEN ELECTIVE –I)

Pre-requisite: Basic knowledge about vectors, differentiation and integration

COURSE OBJECTIVES:
The main objectives of this course are given below:

	At the end of the course, student will be able to
1	To understand basics of Signals and Systems required for all Engineering related courses.
2	To understand the behaviour of signal in time and frequency domain.
3	To understand the characteristics of LTI systems.
4	To understand concepts of Signals and Systems and its analysis using different transform techniques.
5	To understand sampling, convolution and correlation.

COURSE OUTCOMES:
At the end of this course the student will able to:

	At the end of the course, student will be able to
CO1:	Differentiate various signal functions.
CO2:	Represent any arbitrary signal in time and frequency domain.
CO3:	Understand the characteristics of linear time invariant systems.
CO4:	Analyse the signals with different transform technique.
CO5:	Understand the concept of sampling.

SYLLABUS

UNIT-I: Signal Analysis

Analogy between Vectors and Signals, Orthogonal Signal Space, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function

UNIT-II: Fourier series & Fourier transforms

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series.Deriving Fourier Transform from Fourier series,

Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform.

UNIT-III: Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Pauley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time.

UNIT-IV: Laplace Transforms & Z–Transforms

Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal.

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms

UNIT-V: Sampling theorem & Correlation

Graphical and analytical proof for Band Limited Signals, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parseval's Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation.

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2nd Ed.

Reference Books:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH

B. TECH V SEMESTER

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

20EC5T05 DIGITAL LOGIC DESIGN (OPEN ELECTIVE –I)

Course Objectives:
At the end of the course, student will be able to

1. To represent numbers and conversion between different representations.
2. To analyze logic processes and implement logical operations.
3. To develop the combinational logic circuits.
4. To understand concept of programmable logic devices like PROM, PLA, PAL.
5. To design and analyze the concepts of sequential circuits.

Course Outcomes:
At the end of this course the student will able to:

CO1: Understand different number systems and their conversions.

CO2: Analyze the logical operations and Boolean algebra

CO3: Develop combinational circuits and perform logical operations.

CO4: Understand different programmable logic devices.

CO5: Design the sequential logic functions.\

SYLLABUS

UNIT-I:

Number Systems: Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r‘s Complement- (r-1)‘s Complement- Subtraction of Unsigned Numbers- Signed Binary Numbers- Problems.

UNIT-II:

Logic Gates and Boolean Algebra: Basic Gates- Universal Gates- Ex-Or and Ex-Nor Gates- SOP- POS- Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- K Map Method- Minimization of Boolean Functions.

UNIT-III: Signal Transmission through Linear Systems

Combinational Logic Circuits: Design of Half Adder- Full Adder- Half Subtractor- Full Subtractor- Ripple Adder and Subtractor- Design of Decoders- Encoders- Multiplexers- Demultiplexers- Magnitude Comparator.

UNIT-IV: Laplace Transforms & Z–Transforms

Introduction to Programmable Logic Devices (PLDs): PLA- PAL- PROM- Realization of Switching Functions Using PROM- Comparison of PLA, PAL and PROM.

UNIT-V: Sampling theorem & Correlation

Introduction to Sequential Logic Circuits: Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear)- Design of Registers- Universal Shift Register- Ring Counter- Johnson Counter.

TEXT BOOKS

1. Digital Design, M.Morris Mano, Michael D Ciletti, 4thEdition, PEA, 2003.

2. Fundamentals of Logic Design, Roth, 5thEdition, Cengage, 2004

REFERENCE BOOKS

1. Switching and Finite Automata Theory, Kohavi, 3rd Edition, Jha, Cambridge, 2005

2. Digital Logic Design, Leach, Malvino, Saha, TMH, 2000.

B. TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

SOLID STATE DEVICES
20EC5T06 (OPEN ELECTIVE –I)

Course Objectives: Students undergoing this course, are expected to

1. Familiarize with the fundamentals of Semiconductor physics
2. Familiarize with various diodes and characteristics.
3. Familiarize with the transistors and their configurations.
4. Disseminate Amplifications with transistors
5. Understand the operation and working of Oscillators

Course Outcomes:

After undergoing the course, students will be able to

CO1: Understand importance of semiconductors.

CO2: Analyze Diode characteristics.

CO3: Differentiate various Transistor BJT configurations.

CO4: Design amplifiers at different applications using transistor.

CO5: Analyze different Feedback amplifiers & oscillators design

SYLLABUS.

Unit I: Basics Concepts of Semiconductor Physics, Charged Particles, Field Intensity, Potential, Energy, the eV unit of energy, Energy Band theory of Crystals, Insulators, Semiconductors and metals, Mobility and Conductivity, Electrons and Holes, Donor and Acceptor impurities, Charge Densities in a Semiconductor, Electrical properties of Ge and Si, Hall Effect, Diffusion and Drift Currents, Mass action Law, Fermi-Dirac distribution.

Unit II: Diodes: PN junction diode- Energy band diagram of PN junction Diode- V-I Characteristics –Current components in PN junction Diode- Diode equation- Diode resistance and capacitance, Characteristics of Zener Diode, Varactor Diode- SCR and UJT.

Unit III: Transistors Bipolar Junction Transistor: Transistor current components- Transistor equation- Transistor configurations- Characteristics of a transistor in CB, CC&CE configurations- Transistor as a Switch,Transistor as an amplifier. Field Effect Transistors (FET): Junction Field Effect Transistor construction & operation, characteristics of CS, CD & CG

Unit IV: Small Signal Transistor Amplifier models: Low Frequency Transistor Amplifier Models: Two port network, Transistor hybrid model, determination of h- parameters, generalized analysis of transistor amplifier model using h-parameters

Unit V: Feedback Amplifiers and Oscillators: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and their analysis. Generalized analysis of LC Oscillators, Hartley and Colpitt‘s oscillators with BJT and their analysis.

Text Books:

1) Millman, Halkias, ―Integrated Electronics- Analog and Digital Circuits and Systems, TMH.

2).Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGrawHill,Second Edition.

Reference Books:

1) Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.

2) . Basic Electronic Circuits -V.K.Mehta, S-chand Publications,2008

B. TECH V SEMESTER **OEC**

L	T	P	C
3	0	0	3

INTRODUCTION TO ARTIFICIAL INTELLIGENCE
20CS5T07 (OPEN ELECTIVE –I)

Course Objectives:

- To gain a historical perspective of Artificial Intelligence and its foundations.
- To familiarize the basic principles of Artificial Intelligence towards problem solving Inference, Perception, Knowledge representation and Learning.
- To understand advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems.

Course Outcomes: At the end of the course, the students will be able to:

CO1: To Understand the history of Artificial Intelligence and its foundations.

CO2: Apply various Artificial Intelligence Techniques for problem solving.

CO3: Formalization of knowledge using the framework of predicate logic.

CO4: Ability to apply knowledge representation and reasoning to real world problems.

CO5: Derive conclusions from uncertain knowledge and quantify the uncertainty in the Conclusions obtained.

SYLLABUS

UNIT-1:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT-2: Problem Solving:

State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem Reduction and Game Playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT-3: Logic Concepts:

Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-4: Knowledge representation:

Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT-5: Expert system and applications:

Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning (Units 1,2,3,4,5)

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
4. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

OPERATING SYSTEMS
20CS5T08 (OPEN ELECTIVE –I)

Course Objectives:

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes:

CO1: Understand the importance, functions and structures of operating systems.

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

SYLLABUS

UNIT - I: Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication

UNIT - II: Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multithreading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT – III: Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures

UNIT - IV: Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock- Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Dead lock.

UNIT - V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling

TEXT BOOKS:

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley, 9thedition.(Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition–2005.(Unit-5)

REFERENCES:

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley ,Operating Systems: A Design-Oriented Approach, Tata Mc Graw Hill Education,1996.

B. TECH V SEMESTER

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

SOFTWARE ENGINEERING
20CS5T09 (OPEN ELECTIVE –I)

Course Objective:

- Gain knowledge about software process models.
- Familiarize the basic software engineering methods, practices and its applications.
- Facilitate students in software design.

Course Outcomes:

CO1: Understand the software life cycle models

CO2: Understand the scrum approach to agile project management**.**

CO3: Analyze the software requirements and generate SRS document

CO4: Understand some of the different models that may be used to design

CO5: Understand various software testing approaches and quality control to ensure good quality software

SYLLABUS

Unit-I:

Introduction to Software Engineering: Nature of software, Software engineering, The Software Processes, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialised Process models, The Unified Process, Personal and Team Process Models.

Unit-II:

Requirements Engineering: Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

Requirements Modelling: Requirement Analysis, Scenario-Based Modelling, Data Modelling Concepts, Class-Based Modelling

Unit-III:

Design Concepts: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Unit-IV:

Understanding of UML diagrams: Structural diagrams - class diagram, object diagram, component diagram, deployment diagram, Behavioural diagrams - Use-case diagram, activity diagram, sequence diagram, collaboration diagram, state chart diagram.

Unit-V:

Implementation: Structured coding Techniques, Coding Styles-Standards and Guidelines, Implementation Issues.

Software Testing Strategies: A Strategic approach to Software Testing, Strategic Issues and Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing, Software Quality concepts.

TEXT BOOKS:

1. Roger S. Pressman (2010), Software Engineering, A Practitioner's Approach, 7th Edition, McGraw-Hill International Edition, India.
2. Ian Sommerville (2011), Software Engineering, 9th Edition, Pearson education, India.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.Jim ConallenKelli A. Houston," Object-Oriented Analysis and Design with Applications", 3rd edition.

REFERENCES:

1. Pankaj Jalote (2010), Software Engineering, A Precise Approach, Wiley India.
2. Waman S. Jawadekar (2008), Software Engineering: A Primer, McGraw-Hill, India.
3. Hans Van Vilet (2008), Software Engineering Principles and Practice, 3rd Edition, John Wiley & Sons Ltd.
4. Rajib Mall (2005), Fundamental of Software Engineering, PHI.
5. Deepak Jain, Software Engineering, Principles and Practices, Oxford, University Press, India.

B. TECH V SEMESTER

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

COMPUTER NETWORKS
20IT5T07 (OPEN ELECTIVE –I)

Course Objectives:

- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the students to basic principles of networking using the goals like protocol layering and top down approach.
- Build an understanding of the basics of the internetworking and routing used in the computer networks.
- To provide guidelines in developing network applications

Course Outcomes:

At the end of the course, student will be able to

CO1- Independently enumerate the layers of the OSI model and TCP/IP.

CO2- Identify the different types of network topologies and protocols.

CO3- Compare and contrast methods to identify Errors and correct them

CO4- Differentiate between various network routing algorithms.

CO5- Understand WWW and HTTP Architectures.

SYLLABUS

UNIT - I: Introduction:

OSI overview, TCP/IP and other networks models, Examples of Networks: Arpanet, Internet, Network Topologies Wide Area Networks(WAN), Local Area Networks(LAN), Metropolitan Area Networks(MAN).

UNIT - II: Physical Layer and overview of PL Switching:

Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, introduction to switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT – III: Data link layer:

Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction, CRC, Checksum: idea, one's complement internet checksum, services provided to Network.

Elementary Data Link Layer protocols: Simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.

Sliding window protocol: One bit, Go-back N, Selective Repetitive protocol, Stop and wait protocol.

UNIT - IV: Random Access:

ALOHA, MAC addresses, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access(CDMA).

Network layer: Shortest Path, Distance Vector Routing Algorithm, Hierarchal routing algorithm.

UNIT - V: Application layer (WWW and HTTP):

WWWARCHITECTURE: Client (Browser), Server, Uniform Resource Locator, Resource Record, HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Request Message Format, HTTP Response Message Format

TEXT BOOKS:

1. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH. (Units 1,2,4,5)
2. Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education(Units 1, 3, 4)

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

B. TECH V SEMESTER

OEC	L	T	P	C
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COMPUTER GRAPHICS
20IT5T08 (OPEN ELECTIVE –I)

Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

Course Outcomes:

After learning the course, the student will be able:

CO1: Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations.

CO2: Apply projections and visible surface detection techniques for display of 3D scene on 2D screen.

CO3: Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics.

CO4: Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).

CO5: Know and be able to discuss hardware system architecture for computer graphics. This Includes, but is not limited to: graphics pipeline, frame buffers, and graphic accelerators/co-processors.

SYLLABUS

UNIT - I: Introduction to Graphics:

Application area of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT - II: 3D Concepts:

Parallel and Perspective projections, Three dimensional object representation-Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT – III: Graphics Programming:

Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Key frame. Graphics programming using OPENGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes

UNIT – IV: Rendering:

Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadow of objects, Building a camera in a program, Creating shaded objects

UNIT - V: Overview of Ray Tracing:

Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics– C Version, second edition, Pearson Education, 2004

REFERENCES:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007

B. TECH V SEMESTER **OEC**

L	T	P	C
3	0	0	3

20HS5T01 QUANTITATIVE APTITUDE AND REASONING (OPEN ELECTIVE –I)

SYLLABUS

Unit-I: Divisibility and remainder rules of numbers, Unit digit , square root, cube root and simplification of numbers, HCF and LCM of numbers, Averages and Percentages, Alphabetical and miscellaneous series, Coding and decoding and Blood Relations

Unit-II: Profit & loss, Simple interest and Compound interest, Direction, Order and Ranking, Sitting arrangement and Puzzle

Unit-III: Ratio & proportions, Partnership, Alligation and mixtures and Ages.
Data sufficiency, Inequalities and Decision making.

Unit-IV: Time and work, Pipes & cisterns and Time and distance.
Syllogism, Statement and course of action and Statement and Assumption.

Unit-V: Boats and streams, Areas, Volume and surface areas.
Statement and argument, Cause and effect and Drawing inference.

Text Books:

1. "Objective Arithmetic" by R.S. Agarwal, S. Chand Publications.
2. Verbal and non-verbal Reasoning, R.S. Agarwal, S. Chand Publications

Reference Books:

1. Quantitative Aptitude by Dinesh Khattar, Pearson Education.
2. Quantitative Aptitude by Abhjit Guha.
3. Fast Track objective Arithmetic, Rajesh Verma, Arihant publications.

B. TECH V SEMESTER	OEC	L	T	P	C
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PRINCIPLES OF MANAGEMENT
20MB5T01 (OPEN ELECTIVE –I)

COURSE OBJECTIVE

This course ensures that the students understand

1. Management Concepts
2. Applications of Concepts in Practical aspects of business and Development of Managerial Skills.
3. Managers manage business organizations in the dynamic global environment and maintain competitive advantage.
4. Business decisions are made using various tools and techniques to remain competitive
5. Managers use problem-solving strategies, critical thinking skills in real-life situations and implement successful planning.

COURSE OUTCOME

After learning the contents of this course, the student would be able to know

CO1: What are the circumstances that lead to management evolution and how it will affect future managers.

CO2: Analyze and evaluate the influence of historical forces on the current practice of management

CO3: Develop the process of management's functions: Planning and Organizing.

CO4: Evaluate leadership styles to anticipate the consequences of each leadership style and directing.

CO5: Identify the areas to control and selecting the appropriate controlling methods/techniques.

SYLLABUS

UNIT I

Introduction to Management: Definition, Functions, Process, Scope and Significance of Management.

Nature of Management, Functions of Management, Managerial Roles, Levels Managerial Skills and Activities, Difference between Management and Administration, Significance of Values and Ethics in Management.

Challenges of Management

UNIT II

Evolution of Management Thought: Approaches to Management - Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT III

Planning and Organizing: Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing.

UNIT IV

Directing: Effective Directing, Supervision, Motivation, Different Theories of Motivation-Maslow, Herzberg, McClelland, Vroom, Porter and Lawler, Job Satisfaction. Concept of Leadership- Theories and Styles. Communication Process, Channels and Barriers, Effective Communication.

UNIT V

Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

TEXT BOOKS

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Management-Tasks, Responsibilities & Practices, Drucker, F. Peter
4. Principles of Management, Terry and Franklin

REFERENCES

1. Essentials of Management, Koontz Weihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

NPTEL WEB COURSE:

nptel.ac.in/courses/122108038/

NPTEL VIDEO COURSE:

nptel.ac.in/courses/122108038/#

B. TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

TECHNOLOGY MANAGEMENT
20MB5T02 (OPEN ELECTIVE –I)

Course Objective

- The course aims at providing an overview of various issues connected with Management of Technology in organizations.

Course Outcomes

CO1: To understand the importance of technology and innovation management

CO2: To understand the technology absorption, incremental innovation, research and development, technovation and technology fusion that dominate the contemporary world industry.

CO3: To understand the nature, significance, dimensions requirements, concepts, issues, themes, policies and structure of the management of technology and technovation.

SYLLABUS

UNIT-I

Evolution of Technology-Effects of New Technology- Technology Innovation.-Invention-Innovation- Diffusion- Revolutionary and Evolutionary Innovation- Product and Process Innovation- Strategic Implications of Technology- Technology – Strategy Alliance -Convergent and Divergent Cycle- The Balanced Approach.

UNIT-II

Technology Assessment- Technology Choice- Technological Leadership and Followership- Technology Acquisition- Technological Forecasting- Exploratory, Intuitive, Extrapolation, Growth Curves, Technology Monitoring- Normative: Relevance Tree, Morphological Analysis, Mission Flow Diagram.

UNIT-III

Diffusion of Technology- Rate of Diffusion; Innovation Time and Innovation CostSpeed of Diffusion- Technology Indicators- Various Indicators- Organizational Implications of Technology- Relationship between Technical Structure and Organizational Infrastructure- Flexible Manufacturing Management System (FMMS).

UNIT-IV

Financial Aspects in Technology Management- Improving Traditional Cost - Management System- Barriers to the Evaluation of New Technology- Social Issues in Technology Management- Technological Change and Industrial Relations- Technology Assessment and Environmental Impact Analysis.

UNIT-V

Human Aspects in Technology Management- Integration of People and Technology Organizational and Psychological Factors- Organizational Outcome- Technology Transfer-Technology Management Scenario in India.

Text Books

1. Sharif Nawaz: Management of Technology Transfer & Development, APCFT, Bangalore, 1983.

2. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,New Delhi.

References

1. Betz Fredrick: Managing Technology, Prentice Hall, New Jersey.
2. Gaynor: Handbook of Technology Management, McGraw Hill.
3. Tarek Khalil: Management of Technology, McGraw Hill International, 2000.
4. “Managing Technology and Innovation”, Robert & Roland, 1st Edition, Routledge.

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

FOUNDATIONS OF DATA SCIENCE
20AD5T07 (OPEN ELECTIVE –I)

Course Objective: *This* ***course*** explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

UNIT-1: Data science in a big data world: Benefits and uses of data science and big data, Facets of data, The data science process, The big data eco system and data science, An introductory working example of Hadoop.

UNIT-2:

The data science process: Overview of the data science process, Step 1: Defining research goals and creating a project charter, Step 2: Retrieving data, Step 3: Cleansing, integrating, and transforming data, Step 4: Exploratory data analysis, Step 5: Build the models, Step 6: Presenting findings and building applications on top of them. Machine learning: What is machine learning and why should you care about it?, The modeling process, Types of machine learning, Semi-supervised learning.

UNIT-3:

Handling large data on a single computer: The problems you face when handling large data, General techniques for handling large volumes of data, General programming tips for dealing with large data sets, Case study 1: Predicting malicious URLs, Case study 2: Building a recommender system inside a database.

UNIT-4: First steps in big data: Distributing data storage and processing with frameworks, Case study: Assessing risk when loaning money, Join the NoSQL movement: Introduction to NoSQL, ACID: the core principle of relational databases,

CAP Theorem: the problem with DBs on many nodes, The BASE principles of NoSQL databases, NoSQL database types, Case study: What disease is that?

UNIT-5: The rise of graph databases: Introducing connected data and graph databases , Introducing Neo4j: a graph database, Connected data example: a recipe recommendation engine, Text mining and text analytics: Text mining in the real world, Text mining techniques, Case study: Classifying Reddit posts.

Text Book:

Introducing Data Science by Davy Cielen, Arno D. B. Meysman, and Mohamed Ali

B. TECH V SEMESTER

OEC	L	T	P	C
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20AM5T07 INTRODUCTION TO MACHINE LEARNING (OPEN ELECTIVE –I)

Pre-requisite: Probability and Statistics, Linear Algebra

Course Objective: *This* ***course*** explains basic concepts of Machine Learning and teaches you to use recent machine learning software for solving problems and understanding supervised and unsupervised learning methods

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the characteristics of machine learning.

CO2: Summarize the Model building and evaluation approaches.

CO3: Apply Bayesian learning and regression algorithms for real-world Problems.

CO4: Apply supervised learning algorithms to solve the real-world Problems.

CO5: Apply unsupervised learning algorithms for the real world data.

SYLLABUS

Unit-1: Introduction to Machine Learning and Preparing to Model:

Introduction to Machine Learning- Introduction, What is Human Learning? Types of Human Learning, What is Machine Learning? Types of Machine Learning, Problems Not To Be Solved Using Machine Learning, Applications of Machine Learning.

Preparing to Model- Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

Modeling & Evaluation, Basics of Feature Engineering:

Modeling & Evaluation - Introduction, Selecting a Model, Training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model.

Basics of Feature Engineering - Introduction, Feature Transformation, Feature Subset Selection.

Unit-2: Bayesian Concept Learning and Regression:

Bayesian Concept Learning - Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network.

Regression: Introduction, Regression Algorithms - Simple linear regression, Multiple linear regression, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

Unit-3: Supervised Learning: Classification, Ensemble Learning: Classification-Introduction, Example of Supervised Learning, Classification Model, Classification

Learning Steps, Common Classification Algorithms - k-Nearest Neighbour (KNN), Decision tree, Random forest model, Support vector machines.

Ensemble Learning- Boosting, Bagging

Unit-4: Basics of Neural Network

Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network, Learning Process in ANN, Backpropagation, Deep Learning

Unit-5: Unsupervised Learning:

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning.

Principle Component Analysis: Introduction, Probabilistic PCA- Maximum Likelihood PCA, EM Algorithm for PCA, Bayesian PCA, Factor Analysis; Kernel PCA

Clustering: Clustering as a Machine Learning task, Different types of clustering techniques, Partitioning methods, Hierarchical clustering, Density-based methods: DBSCAN.

Finding Pattern using Association Rule - Definition of common terms, Association rule, Apriori algorithm.

Text Books:

1. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, "Machine Learning", Pearson Education India ,1st edition.
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning". New York :Springer, 2006.

Reference Books:

1. Tom M. Mitchell, "Machine Learning', MGH, 1997.
2. Shai Shalev-Shwartz, ShaiBen David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge.
3. Peter Harington, "Machine Learning in Action" , Cengage, 1st edition, 2012.

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20CE6T08 REMOTE SENSING AND GIS
(OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Learn various types of sensors and platforms
- learn concepts of visual and digital image analyses
- Understand the principles of spatial analysis
- Appreciate application of RS and GIS to Civil engineering

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Be familiar with ground, air and satellite based sensor platforms.

CO2: Interpret the aerial photographs and satellite imageries

CO3: Create and input spatial data for GIS application

CO4: Apply RS and GIS concepts in water resources engineering

SYLLABUS

UNIT–I:

Introduction to remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems. Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

UNIT–II:

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT–III:

Geographic Information System: Introduction, key components, application areas of GIS, map projections. Data entry and preparation: spatial data input, raster data models, vector data Models.

UNIT – IV:

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT–V:

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications. Application to Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management.

Text Books:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

Reference Books:

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A KW Yeung, Prentice Hall (India), 2006
3. 'Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. 'Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE6T09 ENVIRONMENTAL IMPACT ASSESSMENT (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- impart knowledge on different concepts of Environmental Impact Assessment
- know procedures of risk assessment
- learn the EIA methodologies and the criterion for selection of EIA methods
- pre-requisites for ISO 14001 certification
- know the procedures for environmental clearances and audit
- appreciate the importance of stakeholder participation in EIA

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Prepare EMP, EIS, and EIA report

CO2: Identify the risks and impacts of a project

CO3: Selection of an appropriate EIA methodology

CO4: Evaluation the EIA report

CO5: Estimate the cost benefit ratio of a project

CO6: Know the role of stakeholder and public hearing in the preparation of EIA

SYLLABUS

UNIT–I:

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA.

UNIT–II:

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP.

UNIT-III:

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV:

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with

reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT–V:

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

Reference Books:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE6T08 RENEWABLE ENERGY SOURCES (OPEN ELECTIVE-II)

Course Objective:

- To give sufficient knowledge about the promising new and renewable sources of energy
- Explain the concept of various forms of renewable energy
- Learn the present energy scenario
- Analyse the environmental aspects of renewable energy resources.

Course Outcomes:

CO1: Know the need of various renewable energy systems

CO2: understand the concepts of bio-energy,

CO3: Acquire the knowledge of OTEC, tidal,

CO4: Acquire the knowledge of geothermal and Alternative energy sources

SYLLABUS

UNIT-I

Introduction: Introduction to energy sources, reserves and estimates, global energy scenario, renewable energy -environment implications, global warming and climate change, limitations of conventional energy sources, classification of non-conventional energy sources - solar energy, wind energy, bio-energy, Ocean Thermal Energy Conversion (OTEC), tidal, geothermal and hydro.

UNIT-II

Bio-energy: Biomass and its sources, energy plantation, production of fuel wood, bio-conversion processes, bio-gas, bio-diesel and ethanol production and utilization, thermo-chemical processes, biomass gasification, process, types of reactors, utilization of producer gas for thermal and electricity generation.

UNIT-III

Ocean thermal energy conversion, tidal, geothermal: Tidal energy, wave energy, data, technology options; open and closed *Ocean thermal energy conversion* cycles, geothermal energy sources, power plant and environmental issues.

UNIT-IV

Fuel Cells: Hydrogen generation-storage, transport and utilization, applications, power generation. Fuel cells-Technologies, types, economics and power generation.

UNIT-V

Solar Energy Storage and Applications:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2006
2. Renewable Energy Resources – Twidell&Wier, CRC Press(Taylor & Francis), 2012
3. *Y. W. B. Charles*, *B.H. Essel*, *―Biomass Conversion and Technology‖*, John Wiley, Latest Edition

Reference Books:

1. Renewable energy resources by G. N. Tiwari, M. K. Ghosal, Alpha Science International, 2005.
2. Renewable Energy Technologies by R. Ramesh, K. Uday Kumar, M. Anandakrishnan, Narosa Publishing House, 1997
3. Non-Conventional Energy Systems by K Mittal, A. H. Wheeler Publishing Company Limited, 01-Jan-1999.
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, P.H.I.
5. Godfrey Boyle, ―Renewable Energy- Power for a Sustainable Future‖, Oxford University Press, U.K.,
6. Twidell, J.W. & Weir, A., ―Renewable Energy Sources‖, E.F.N Spon Ltd., UK.

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE6T09 ENERGY AUDIT, CONSERVATION AND MANAGEMENT (OPEN ELECTIVE-II)

Course Objective:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Course Outcomes:
At the end of the course student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

SYLLABUS

UNIT-I

Basic Principles of Energy Audit and management: Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Piecharts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions –Language – Questionnaire – Check list for top management.

UNIT-II

Lighting: Modification of existing systems – Replacement of existing systems – Priorities**:** Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level –Illumination of inclined surface to beam – Luminance or brightness – Types of lamps –Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT-III

Power Factor and energy instruments: Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters– Tong testers – Power analyzer.

UNIT-IV

Space Heating and Ventilation: Ventilation – Air–Conditioning (HVAC) and Water Heating**:** Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning –Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

UNIT-V

Economic Aspects and Financial Analysis: Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems.

Computation of Economic Aspects

Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment –Numerical examples.

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill

2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd– 2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevierpublications. 2012

2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.

3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.

4. Energy management hand book by W.C.Turner, John wiley and sons.

5. Energy management and conservation –k v

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20ME6T07 INDUSTRIAL ROBOTICS (OPEN ELECTIVE-II)

Pre-requisite: Kinematics and Mathematics

Course Objective:

1. The student will be exposed to the concepts of automation and fundamentals of robotics
2. The students will be exposed to the concepts of transformations and robot kinematics,
3. The students will understand the functioning of sensors and actuators
4. The students will be exposed to robot programming languages and Programming.
5. The student will be exposed to the applications of robotics in manufacturing.

Course Outcomes: At the end of the course, student will be able to

CO1	Understand various applications of robotics and classification of coordinate system and control systems.
CO2	Build the concepts of components of industrial robotics.
CO3	Apply kinematic analysis with D-H notation, forward and inverse kinematics and Solve dynamic analysis with Lagrange – Euler and Newton – Euler formulations.
CO4	Model trajectory planning for a manipulator by avoiding obstacles.
CO5	Understand different types of actuators and applications of robots in manufacturing.

SYLLABUS

UNIT-I:

Introduction: Automation and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT-II: MOTION ANALYSIS AND CONTROL:

Motion Analysis: Basic Rotation Matrices, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT-III:

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion straight line motion.

UNIT-IV:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools.

UNIT-V:

Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.

Text Book(s)

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson, 3rd edition.

References

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
4. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley

5. Introduction to Robotics by SK Saha, The McGrah Hill Company, 6th, 2012
6. Robotics and Control / Mittal R K &Nagrath I J / TMH

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME6T08 **3D PRINTING (OPEN ELECTIVE-II)**

Pre-requisite: Manufacturing Process

Course Objective:

The course aims at the importance of Additive Manufacturing, Classifications, models, specifications of various Additive Manufacturing Techniques. To learn the different tools, soft-wares required and the applications of Additive Manufacturing

Course Outcomes: At the end of the course, student will be able to

CO1:	Understand the working principle and process parameters of AM processes
CO2:	Explore the applications of AM processes in various fields
CO3:	Apply the suitable process and material for fabricating a given product
CO4:	Use the suitable post process based on product application
CO5:	Design and develop a product for AM Process

SYLLABUS

UNIT-I:

Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT-II:

Machines for Rapid Prototyping: Overview of Polymerization: Stereolithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT-III:

Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive Manufactured Tools, Indirect Rapid

UNIT-IV:

Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture of Metal Components

UNIT-V:

Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2015, 2nd Edition.
2. 3D Printing and Additive Manufacturing: Principles & Applications, Chua Chee Kai, Leong Kah Fai, World Scientific, 2015, 4th Edition.

References:

1. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venuvinod and Weiyin Ma, Springer, 2004.
2. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.
3. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006.

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC6T07 **ELECTRONIC CIRCUITS AND NETWORKS (OPEN ELECTIVE-II)**

Course Objectives:

At the end of the course, student will be able to

1. To understand the Differentiator and Integrator circuits
2. To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
3. To Introduce to Time-base Generators and Principles of Synchronization and Frequency division.
4. To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.
5. To understand and Design gates using various logic families.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand the basic concepts of Optoelectronic Devices

CO2: Design linear wave shaping circuits.

CO3: Design Non- linear wave shaping circuits.

CO4: Design Different Time Base Generators

CO5: understand the concepts of one port networks

SYLLABUS

UNIT-I: Optoelectronic Devices

Introduction, Photo sensors, Photoconductors, Photodiodes, Phototransistors, Light-Emitting Diodes, Liquid Crystal Displays, Cathode Ray Tube Displays, Emerging Display Technologies, Opto couplers.

UNIT-II: LINEAR WAVE SHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT-III: NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of

voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT-IV: VOLTAGE TIME BASE GENERATORS

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator.

UNIT-V: Synthesis of one port networks

Synthesis of one port networks
Synthesis of reactive one-ports by Foster's and Cauer methods (forms I and II) - Synthesis of LC, RC and RL driving-point functions.

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.
2. K. S. Suresh Kumar, ―Electric Circuit Analysis‖, Pearson Publications, 2013.

Reference Books:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC6T08 **PRINCIPLES OF COMMUNICATIONS (OPEN ELECTIVE – II)**

Course Objectives:

At the end of the course, student will be able to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Familiarize with the fundamentals of digital communication systems
4. Familiarize with various techniques for digital modulation and demodulation of signals
5. Distinguish the figure of merits of various analog modulation methods

Course Outcomes:

At the end of this course the student will able to:

CO1: Differentiate various Analog modulation schemes

CO2: Analyze demodulation schemes and their spectral characteristics

CO3: Analyze demodulation schemes and their spectral characteristics

CO4: Analyze demodulation schemes and their spectral characteristics

CO5: Analyze noise characteristics of various analog modulation methods

SYLLABUS

UNIT-I: Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver

UNIT-II: Angle Modulation, Frequency and Phase modulation, frequency deviation, Bandwidth, FM Modulators and Demodulators, Narrow band and wide band FM, FM Broadcasting.

UNIT-III: Pulse digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Generation and Demodulation, Frequency Division Multiplexing, Time Division Multiplexing

UNIT-IV: Digital Representation of Analog Signals, Pulse Code Modulation (PCM), Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Mathematical Representation of Noise.

UNIT-V: Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops.

Text Book:

1. Herbert Taub and Donald L. Schilling, ―Principles of Communication Systems., Tata McGrawHill.

2. Rishabh Anand, Communication Systems, Khanna Publishers

Reference Books:

1. B.P.Lathi,―Modern Digital and Analog communication Systems, 3rd Edition, Oxford University Press.

2. Simon Haykin, ―Communication Systems, 4th Edition, Wiley India

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20EC6T09 **MICROCONTROLLERS & ITS APPLICATIONS (OPEN ELECTIVE-II)**

Course Objectives:

At the end of the course, student will be able to

1. To understand the basics of 8051 Microcontroller and its functionalities
2. To understand the 8051 family instruction set
3. To develop machine language programming in microprocessors.
4. Todesign and develop microcontroller based interfacing for real time applications using low level language like ALP.
5. To understand the basics of ARM architectures and its functionalities.

Course Outcomes:

At the end of this course the student will able to:

CO1: To be able to understand the overview of 8051 Micro controller in general.

CO2: To be able to understand the instruction set of 8051 microcontroller

CO3: To be able to understand the Assembly Language Programming in microcontrollers.

CO4: To be able to understand the microcontroller is interfacing with I/O devices, memory, and serial communication using ALP.

CO5: To be able to understand the overview of ARM Architecture in general.

SYLLABUS

UNIT-I: Introduction to 8051 Microcontrollers

Overview of 8051 microcontrollers, Architecture, I/O ports, Memory organization, Addressing modes, SFRs, Counters and timers, Synchronous serial-cum, Asynchronous serial communication, Interrupts and priorities.

UNIT-II: 8051 FAMILY MICROCONTROLLERS INSTRUCTION SET

Basic assembly language programming, Data transfer instructions, Data and bit- manipulation instructions, Arithmetic instructions, Instructions for logical operations on the test among the registers, Program flow control instructions, Interrupt control flow.

UNIT-III: 8051 REAL TIME CONTROL

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the serial communication Interrupts, programming Timers and Counters, serial port and its programming,

UNIT-IV: I/O and Memory Interface and Serial Communication and Bus Interface

I/O and Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer, USART, External Communication Interfaces-RS232,USB

UNIT-V: ARM Architecture:

ARM processor fundamentals, ARM Architecture –Register, exceptions and interrupts, interrupt vector table, ARM instruction set- Data processing, Branch, load and store instructions; Software instructions, Program status register instructions loading constants

TEXTBOOKS:

1. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System
   Design, 2/e, Pearson Education, 2005.
2. Kenneth. J. Ayala, The 8051 Microcontroller, 3/e, Cengage Learning, 2004.

REFERENCE:

1. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems, 2/e, Pearson Education, 2007
2. ARM system Developers guide, Andrew N Sloss, Dominic Symes, Chris Wright, Elsevier,2012

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

INTRODUCTION TO MACHINE LEARNING
20CS6T07 (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

INFORMATION SECURITY

20CS6T08 (OPEN ELECTIVE –II)

Course Objectives:

- Understand the concepts of classical encryption techniques and concepts of finite fields and number theory
- Understand Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Understand the Design issues and working principles of various authentication protocols, PKI standards
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications.

Course Outcomes:

CO1: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

CO2: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO3: Apply different digital signature algorithms to achieve authentication and create secure applications

CO4: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

CO5: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

SYLLABUS

UNIT - I: Classical Encryption Techniques:

The OSI Security Architecture, Security Attacks, Services & Mechanisms, Symmetric Cipher Model, Substitution Techniques: Caesar Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques: Rail fence, Row Transposition cipher, Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT - II:

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Block Cipher Modes of Operations.

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem

UNIT – III:

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security.

Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution

UNIT - IV:

User Authentication: Remote User Authentication Principles, Kerberos.

Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.

UNIT - V:

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS)

Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration

TEXT BOOKS:

1. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition. [Units 1,2,3,4,5]
2. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition. [Units 1,2,3,4,5]

REFERENCES:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

AGILE TECHNOLOGIES
20CS6T09 (OPEN ELECTIVE –II)

COURSE OBJECTIVES:

1. To have an understanding of the Agile Manifesto and Principles
2. To Apply Agile based techniques in each of the development phases.

COURSE OUTCOMES:

CO1: Understand the Agile Manifesto and Principles.
CO2: Apply agile software development practices to create high-quality software.
CO3: Acquire Knowledge on software design, set of software technologies and APIs.
CO4: Examine and demonstrate knowledge of Agile development
CO5: Demonstrate the Agile Approach to estimate project variables, control and Risk Management

SYLLABUS

UNIT-I

Agile Software Development: Genesis of Agile, Introduction and Background, Traditional Model Vs Agile Model, Values of Agile, Agile Manifesto and Principles, Stakeholders, Challenges.

UNIT-II

Lean Approach: Waste Management, Kaizen and Kanban, Add process and products add Value, Roles related to life cycle, Differences between Agile and Traditional Plans, Differences at different life cycle phases, Key techniques, Principles, Understand as a means of assessing the initial status of the project, How agile helps to build quality.

UNIT-III

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, **Agile Requirements:** User story definition, Characteristics and contents of user stories, Acceptance tests and verifying stories, Product Velocity, Burn down chart, Sprint planning and retrospective, Daily Scrum, Scrum roles- Product Owner, Scrum Master, Scrum Team, Scrum Case Study, Tools for Agile Project Management.

UNIT-IV

Agile Software Design and Development: Agile Design practices, Role of design principles including Single Responsibility principle, Open Closed Principle, Liskov Substitution principle, Interface Segregation principles, Dependency Inversion principle in Agile Design, Refactoring- Need and significance, Refactoring techniques, Continuous Integration, Automated Build tools, Version Control.

UNIT-V

Agile Testing and Review: Agile Testing Techniques, Test Driven Development, User Acceptance Test, Agile Metrics and Measurements, The Agile Approach to estimate project variables, Agile control- The 7 control parameters, Agile Approach to Risk, Agile approach to Configuration Management, Atern Principles and Philosophy, Best practices to manage Scrum.

TEXT BOOKS:

1. Robort C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013(Units 1, 3, 5)

2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson(Units 3,4)

3. Mike Cohn, Succeeding with Agile: Software Development Using Scrum, Addison Wesley Series.(Units 3, 4)

REFERENCES:

1. David J. Anderson and Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer,.

3. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley.

4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and management, Butterworth-Heinemann.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20IT6T07 FUNDAMENTALS OF MACHINE LEARNING (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
4. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20IT6T08 DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE –II)

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases

Course Outcomes:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT-I: Database System Applications:

A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT-II: Introduction to the Relational Model:

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III: SQL:

QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL.

UNIT-IV: Schema Refinement (Normalization):

Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.

UNIT-V: Transaction Management and Concurrency Control:

Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL” by Shashan k Tiwari, 2011, WROX Press.

REFERENCE:

1. Peter Rob & Carlos Coronel, “Data base Systems design, Implementation, and Management”, 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, “Data base System Concepts”, 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
4. C.J.Date, “Introduction to Database Systems”, 7th Edition, Pearson Education, 2002

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

OPERATIONS RESEARCH
20HS6T01 (OPEN ELECTIVE –II)

Course Objectives:

1) Identify and develop operational research models from the verbal description of the real system.
2) Understand the mathematical tools that are needed to solve optimization problems.
3) Use mathematical software to solve the proposed models.
4) Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

Course Outcomes:

CO1: Understand the methodology of Operations Research& concepts of linear programming

CO2: Formulate the solutions to transportation problems

CO3: Explain the solutions for various sequencing problems

CO4: Illustrate the solutions to different replacement policies

CO5: Apply game theory to solve real world problems

SYLLABUS

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions**.**

UNIT-II

Transportation Problem. Formulation, Solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.

UNIT-III

Assignment model. Formulation. Hungarian Method for optimal solution. Solving Unbalanced problem. Sequencing Models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines Processing n Jobs through m Machines.

UNIT-IV

Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

UNIT-V

Game Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

Inventory models. Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

TEXT BOOKS:

1) P. SankaraIyer,"Operations Research", Tata McGraw-Hill, 2008.
2) A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

REFERENCES:

1) J K Sharma. "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2) P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20MB6T01 ORGANIZATIONAL BEHAVIOUR (OPEN ELECTIVE –II)

Course Objectives

1. To understand the fundamentals of Organizational Behaviour.
2. For the understanding and balancing of Values and Emotions at work place.
3. To improve the student's Personality and Attitude.
4. To understand and improve the skill of perception and Group Behaviour.
5. Understanding and managing organizational culture, leadership and conflict.

Course Outcomes

Learning Organizational Behavior enables engineers:

CO1: To understand the psychology of workers and other members in the organization.

CO2: To be equipped with the right knowledge and skills regarding organizational processes, group behavior, organizational structure and culture.

CO3: To build up strategies for development at their work place.

CO4: To motivate and control employees.

CO5: To resolve organizational conflict effectively.

SYLLABUS

UNIT I

Fundamentals of OB: Definition, Scope and Importance of OB, Relationship between OB and the individual, Evolution of OB, Models of OB (Autocratic, Custodial, Supportive, Collegial & SOBC), Limitations of OB.

Unit II

Values, Attitudes and Emotions: Introduction, Values, Attitudes, Definition and Concept of Emotions, Emotional Intelligence - Fundamentals of Emotional Intelligence, The Emotional Competence Framework, Benefits of Emotional Intelligence, difference between EQ and IQ. Stress at workplace: Work Stressors – Prevention and Management of stress – Balancing work and Life, Workplace spirituality.

Unit III

Personality & Attitude: Definition Personality, importance of personality in Performance, The Myers-Briggs Type Indicator and The Big Five personality model, Johari Window, Transaction Analysis. Attitude – Definition, Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude.

Unit IV

Perception: Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). Motivation:

Definition & Concept of Motive & Motivation. Group and Team Dynamics: Meaning Group Dynamics, Types of Groups, Group Development, Team Effectiveness & Team Building.

Unit V

Organizational Culture: Types of Culture, Creating and Maintaining Organization Culture, Managing Cultural Diversity. Organizational Change: Types of Organizational change, Forces that acts as stimulants to change, overcome the Resistance to Change, Developing a Learning Organization. Leadership: Introduction, Managers V/s Leaders. Overview of Leadership- Traits and Types. Conflict Management: Sources of Conflict, Types of Conflict, Conflict Management Approaches.

Text Books

1. Pareek Udai: "Understanding Organizational Behavior", Oxford University Press, New Delhi, 2007.

1. K.Aswathappa: "Organizational Behavior-Text, Cases and Games", Himalaya Publishing House, New Delhi,2008.

2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "Organizational Behavior", Tata McGraw Hill Education, New Delhi, 2008.

References

1. Jerald Greenberg and Robert A Baron: "Behavior in Organizations", PHI Learning Pvt Ltd, New Delhi, 2009.

2. Robbins, Stephen P. Organizational behavior, 14/E. Pearson Education India, 2001.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

20MB6T02 **PROJECT MANAGEMENT (OPEN ELECTIVE –II)**

Course Objectives

The objective of this course is to enable the students to gain basic knowledge about the concept of project, project management, project life-cycle, project appraisal; to acquaint the students about various issues of project management.

SYLLABUS

Unit -I

Basics of Project Management –Concept– Project environment – Types of Projects – Project life cycle – Project proposals – Monitoring project progress – Project appraisal and Project selection – Causes of delay in Project commissioning– Remedies to avoid overruns. Identification of Investment opportunities – Sources of new project ideas, preliminary screening of projects – Components for project feasibility studies.

Unit- II

Market feasibility -Market survey – Categories of Market survey – steps involved in conducting market survey– Demand forecasting techniques, sales projections.

Unit- III

Technical and Legal feasibility: Production technology, materials and inputs, plant capacity, site selection, plant layout, Managerial Feasibility Project organization and responsibilities. Legalities – Basic legal provisions. Development of Programme Evaluation & Review Technique (PERT) –Construction of PERT (Project duration and valuation, slack and critical activities, critical path interpretation) – Critical Path Method (CPM)

Unit- IV

Financial feasibility – Capital Expenditure – Criteria and Investment strategies – Capital Investment Appraisal Techniques (Non DCF and DCF) – Risk analysis – Cost and financial feasibility – Cost of project and means of financing — Estimation of cash flows – Estimation of Capital costs and operating costs; Revenue estimation – Income – Determinants – Forecasting income –Operational feasibility - Breakeven point – Economics of working.

Unit -V

Project Implementation and Review: Forms of project organization – project planning – project control – human aspects of project management – prerequisites for successful project implementation – project review – performance evaluation – abandonment analysis.

Text Books

1. Prasanna Chandra, ―Projects, Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill Company Pvt. Ltd., New Delhi 1998.

2. Gido: Effective Project Management, 2e, Thomson, 2007.

References

1. Singh M.K, ―Project Evaluation and Management‖.

2. Vasanth Desai, Project Management, 4th edition, Himalaya Publications 2018.

3. Clifford F. Gray, Erik W. Larson, ―Project Management, the Managerial Emphasis, McGraw Hill, 2000.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20AM6T07 BIG DATA ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: Data Base Management System

Course objectives:

In this course student will learn about

1. To understand the need of Big Data, challenges and different analytical architectures
2. Installation and understanding of Hadoop Architecture and its ecosystems
3. Processing of Big Data with Advanced architectures like Spark.
4. Describe graphs and streaming data in Spark.

Course Outcomes: At the end of the course, student will be able to

CO1: Discuss the challenges and their solutions in Big Data

CO2: Understand and work on Hadoop Framework and eco systems.

CO3: Explain and Analyze the Big Data using Map-reduce programming in Both Hadoop and Spark framework.

CO4: Demonstrate spark programming with different programming languages.

CO5: Demonstrate the graph algorithms and live streaming data in Spark.

SYLLABUS

Unit-I:

Introduction to big data: Data, Types of digital data, Evolution and Definition of big data, Challenges of big data, Characteristics and Need of big data.

Introduction to Hadoop: Introducing Hadoop, need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Hadoop Distributors.

HDFS (Hadoop Distributed File System): HDFS Daemons, Anatomy of file read, Anatomy of file write, working with HDFS commands.

Unit-II:

Introduction to MAPREDUCE Programming: Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Mapper, Reducer, Combiner, Partitioner, Searching, Sorting , Compression, Hadoop EcoSystem.

Unit-III:

Introduction to Pig: Key Features of pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, Relational Operators.

Introduction to HIVE: HIVE features, HIVE architecture, HIVE datatypes, HIVE File Formats, HIVE Query Language.

Unit-IV:

NoSQL: Introduction to NOSQL, Types of NoSQL Databases, and Advantages of NoSQL databases, CAP Theorem, BASE, SQL versus NoSql.

NoSQL databases: Introduction to MongoDB, Data types in MongoDB, MongoDB query language.

Unit-V:

Spark: Introduction to data analytics with Spark, Spark Stack, Programming with RDDS, Working with key/value pairs, Spark SQL, Schema RDDs,

Sparking Streaming: High level architecture of Spark Streaming, DStreams, Transformations on DStreams, Different Types of Transformations on DStreams.

Text Books:

[1].SeemaAcharya, SubhashiniChellappan, Big Data and Analytics, Wiley Publishers

[2].Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia, "Learning Spark: Lightning-Fast Big Data Analysis", O'Reilly Media, Inc.

Reference Books:

[1]. TomWhite, Hadoop,"TheDefinitiveGuide",3rdEdition,O'ReillyPublications, 2012.

[2].David Loshin, "BigDataAnalytics: From Strategic Planning to Enterprise IntegrationwithTools,Techniques,NoSQL,andGraph",MorganKaufmannPublishers, 2013

[3].Hadoopin PracticebyAlexHolmes, MANNING

[4].Hadoop in Action byChuckLam, MANNING

[5] Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , "Understanding Big Data Analytics for Enterprise ClassHadoopandStreamingData", 1st Edition, TMH,2012.

[6] HienLuu, Beginning Apache Spark 2

E-resources and Other digital materials:

[1].Big Data Use cases for Beginners | Real Life Case Studies | Success Stories https://www.youtube.com/watch?v=HHR0-iJp2sM

[2]. Alexey Grishchenko, Hadoopvs MPP, https://0x0fff.com/hadoop-vs-mpp/

[3]. Random notes on bigdata- SlideShare: Available www.slideshare.net/yiranpang/random-notes-on-big-data-26439474

B. TECH VI SEMESTER

		L	T	P	C
	OEC	3	0	0	3

20AD6T07 VISUAL ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: There is no prerequisite to learn this course.

Course Objective: *This* ***course*** explains apply the fundamentals of Tableau tool, Use all the basic functionality to visualize their data, Connect to various data sources, Build a variety of basic charts, Combine insights into a useable dashboard, Share and publish visualizations.

Course Outcomes: At the end of the course, student will be able to

CO1: Examine, navigate, and learn to use the various features of Tableau

CO2: Create and design visualizations and dashboards for your intended audience

CO3: apply predicative analytics to improve business decision making

CO4: Assess the quality of the data and perform exploratory analysis

CO5: Combine the data to and follow the best practices to present your story

SYLLABUS

UNIT-1:

Introduction: Tableau Application Suite, Installing and Activating Tableau Desktop, Data Preparation, Finding the Dataset, Understanding the Data, The Tableau Workspace, Saving, Opening, and Sharing Your Workbooks, Setting Up a Data Connector, Adding a Table to a Data Model, Data Extracts and Live Connections, Data Protection and Data Governance, Data Types, Data Collection with IFTTT and Google Sheets, Website Analysis with Google Analytics, Performance Optimization.

UNIT-2:

Data Visualizations and Aggregate Functions: Chart Types, Scatter Plots, Bar Charts, Legends, Filters, and Hierarchies, Line Charts, Straight Lines, Step Charts, Continuous Date Fields, Highlight Tables, Heat maps, Bullet Charts, Aggregate Functions, Calculated Fields, Aggregations in Calculated Fields, Text Operators, Splits, Date Fields, and Formats, Working with NULL Values, Parameters

UNIT-3:

Table Calculations and Maps: Different Types of Calculations, Quick Table Calculations, Customized Table Calculations, Bump Charts, Dual Axis Charts, Keywords and Syntax, Cohort Analysis, Regional Averages, Different Types of Maps, Map Layers, Maps with Pie Charts: Creating a Pie Chart Map, Dual Axis Map Embedding the Chart in Tooltips, Mapbox Maps, Mapbox in Tableau, Using the Background Map, Spatial Data.

UNIT-4:

Advanced Analytics and Interactive Dashboards: Overview of the Tableau Analytics Pane, Constant, Average, and Reference Lines, Trend Lines, Forecasts, Model Description, Cluster Analysis, Clustering in Tableau, Python, R, and MATLAB Integration, Connecting Tableau with TabPy, Security, The Dashboard Pane, Placing Charts on the Dashboard, Dashboard Actions, Filter Actions, Adding Web Content via URL Actions, Design Tips for Creating a Dashboard

UNIT-5:

Data Preparation with Tableau: Connecting to Data, Wildcard Unions, Inspecting the Data, Removing Unneeded Fields, Data Cleaning and Formatting, Cleaning Steps and Built-in Cleaning Features, Unions, Joins, Splits Grouping, Running the Flow and Outputting the Data, Saving Flows.

Text Book:

Alexander Loth, "**Visual Analytics with Tableau**", ISBN: 978-1-119-56020-3, Wiley 2019

Reference Books:

1. "**Visual Thinking for Design"** by Colin Ware
2. "**Storytelling With Data: A Data Visualization Guide for Business Professionals"** by Cole Nussbaumer Knaflic
3. "**Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics"** by Nathan Yau

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE7T13 CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE-III)

Course Objectives:

- To introduce to the student the concept of project management including network drawing and monitoring
- To introduce various equipments like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
- to introduce the importance of safety in construction projects

Course Outcomes:

CO1: appreciate the importance of construction planning

CO2: understand the functioning of various earth moving equipment

CO3: the methods of production of aggregate products and concreting and usage of machinery required for the works.

CO4: apply the gained knowledge to project management and construction techniques

SYLLABUS

UNIT-I:

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts– critical Path Method – Applications

UNIT-II:

Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT-III:

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types

UNIT–IV:

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers –graders – scrapers– draglines - clamshell buckets

UNIT –V:

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers– selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality

control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder, Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

Reference Books:

1. Construction Project Management - An Integrated Approach, Peter Fewings, Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE7T14 GREEN BUILDINGS (OPEN ELECTIVE-III)

Course Objectives:

- To introduce the different concepts of green building techniques and how they may be synthesized to best fit a construction.
- To Know the importance of Green buildings
- To know and implement energy conservation and renewable resources
- To understand the knowledge of ECBC, LEED, GRIHA etc.

Course Outcomes:

CO1: Able to describe the importance and necessity of green building.

CO2: Able to suggest materials and technologies to improve energy efficiency of building.

CO3: Able to assess a building on the norms available for green building.

SYLLABUS

UNIT-I:

Introduction of Green Buildings, Salient features of green buildings, Advantages of Green Buildings- Sustainable site selection and planning of buildings to improve comfort, day lighting, ventilation, planning for drainage.

UNIT-II:

ENERGY EFFICIENT BUILDINGS Passive cooling and day lighting – Active solar and photovoltaic, building energy analysis methods, Lighting system design, Lighting economics and aesthetics, Impacts of lighting efficiency, Technological options for energy management.

UNIT-III:

ENERGY CONSERVATION Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings, waste to energy management in residential complexes or gated communities.

UNIT-IV:

RENEWABLE ENERGY RESOURCES Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar, windand hydro power appliances, success case studies of fully solar, wind and hydro power energies.

UNIT-V:

ENERGY REQUIREMENT AND GREEN BUILDING RATING SYSTEMS Energy

Conservation Building Code (ECBC) requirement for green buildings, Requirement for green rating systems - Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment (GRIHA), Building automation and building management systems.

Text Books:

1. 'Handbook on Green Practices published by Indian Society of Heating Refrigerating and Airconditioning Engineers', 2009
2. 'Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddyand K.S. Nanjunda Rao.
3. 'Green Building Handbook' by Tomwoolley and Samkimings, 2009

Reference Books:

1. 'Complete Guide to Green Buildings' by Trish riley.
2. 'Non-Conventional Energy Resources' by G. D. Rai, Khanna Publishers.
3. 'Standard for the design for High Performance Green Buildings' by Kent Peterson, 2009
4. Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE7T13 CONCEPT OF POWER SYSTEM ENGINEERING (OPEN ELECTIVE-III)

Course Objective: To develop problem solving skills and understanding of Power System concepts through the application of techniques and principles of electrical Power Generation methods.

Course Outcomes: At the end of the course, student will be able to

CO1: Various electrical Power System Components, Supply systems

CO2: Thermal Power Station working procedure, each module path directions

CO3: Hydro Power Station working procedure, classifications

CO4: Nuclear Power Station working procedure, Chain Reaction

CO5: Solar power generation & Wind Power Generation, Applications

SYLLABUS

UNIT-I: **Power System Components**

Single line Diagram of Power system, Different kinds of supply system, conventional and Non-conventional energy sources, Applications.

UNIT-II: Thermal Power Stations

Choice of site Selection, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super, heaters, Economizers, electrostatic precipitators

UNIT-III: Hydro & Nuclear Power Stations

Choice of site, arrangement of hydroelectric installations, Hydrology. Mass curve, flow duration curve, classification of Hydro Power Plants, Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components

UNIT-IV: Solar power generation & Wind Power Generation

Solar radiation spectrum. Radiation measurement. Applications of solar thermal systems Solar Photovoltaic (SPV) systems, Introduction to wind energy, basic principles of wind energy conversion.

UNIT-V: Transmission & Distribution

Transmission structure, classifications, types of conductors, primary & secondary distribution, Substation Equipments , layout.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagarand, A Chakrabarti, DhanpatRai& Co. Pvt. Ltd.

2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers
3. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006

B.TECH VII SEMESTER **OEC**

L	T	P	C
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20EE7T14 INSTRUMENTATION (OPEN ELECTIVE-III)

Course Objectives:

1 To study the basics of measuring system.
2 To study various Electrical transducers and to measure the various types of Non–electrical quantities
3 To study various types of digital voltmeters
4 To study the working principles of various types of oscilloscopes and their applications.
5 To study various types of signal analyzers

Course Outcomes:

CO1: Able to study the basics of measuring system.
CO2: Acquire proper knowledge to use various types of Transducers and able to monitor and measure various parameters such as strain, Fow, temperature and pressure
CO3: Acquire proper knowledge and working principle of various types of digital voltmeters.
CO4: Able to measure various parameters like phase and frequency of a signal with the help of CRO.
CO5: Acquire proper knowledge and able to handle various types of signal analyzers.

SYLLABUS

UNIT-I

Basics of Measuring System: Measuring Systems, Performance Characteristics – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors and Random Errors, Statistical analysis of random errors.

UNIT-II

Transducer Basics and Applications: Definition of transducers – Classification of transducers – Advantages of Electrical transducers –Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers. Measurement of Temperature, Pressure, Strain and Flow.

UNIT-III

Digital Voltmeters: Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type DVM, digital frequency meter – Digital phase angle meter.

UNIT-IV

Oscilloscope: Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns – Sampling oscilloscope, data logger, Transient recorder.

UNIT-V

Signal Analyzers: Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co

Reference Books:

1. Measurement and Instrumentation theory and application, Alan S.Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doeblin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson/Prentice Hall ofIndia
4. Modern Electronic Instrumentation and Measurement techniques – by A.D HelfrickandW.D.Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

B.TECH VII SEMESTER	OEC	L	T	P	C
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20ME7T10 GREEN ENGINEERING SYSTEMS (OPEN ELECTIVE -III)

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: The course aims to highlight the significance of alternative sources of energy, green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

Course Outcomes: At the end of the course, student will be able to

CO1: Evaluate the impact of technology on environment

CO2: Compare biological ecology to industrial ecology

CO3: Design eco-friendly product

CO4: Create sustainable products, facilities, processes and infrastructure

CO5: Asses the life cycle of a product to evaluate its impact on energy and materials use. Determine the effects of air and water quality

SYLLABUS

UNIT-I:

INTRODUCTION: SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT-III:

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV: ENERGY EFFICIENT SYSTEMS:

(A) ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V: ENERGY EFFICIENT PROCESSES:

Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/ TMH
2. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3. Green Manufacturing Processes and Systems, Edited / J. Paulo Davim/Springer 2013

References:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international

2. Principles of Solar Engineering / D.YogiGoswami, Frank Krieth& John F Kreider / Taylor & Francis
3. Non-Conventional Energy / Ashok V Desai /New Age International (P) Ltd
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Non conventional Energy Source/ G.D Roy/Standard Publishers
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd
7. Fuel Cell Technology –Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

B.TECH VII SEMESTER	OEC	L	T	P	C
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20ME7T11 HYBRID ELECTRIC VEHICLES (OPEN ELECTIVE -III)

Pre-requisite: Internal-Combustion engines.

Course Objective:

The main objective of this course is to provide the knowledge on architecture of Hybrid Electric Vehicles, Fuel cells and their sub-systems. The focus is as well on explaining the requirements of hybrid electric vehicles and Fuel-cells for automobile applications. At the same time, various design considerations in fuel cell vehicles and electric vehicles will be explained.

Course Outcomes: At the end of the course, student will be able to

CO1:	Compare and contrast the working of Conventional and Electric Vehicles.
CO2:	Comprehend the use of Series and Hybrid Electric vehicle drive trains
CO3:	Apply the fundamentals of to develop the propulsion and storage systems for Hybrid Electric Vehicles.
CO4:	Perform a case study on Hybrid Electric vehicle drive trains for different parameters
CO5:	Describe the working principle of various types of fuel-cells.

SYLLABUS

UNIT-I:

ELECTRIC VEHICLES: Introduction, Electric Vehicle Principle- Components of Electric Vehicle Constituents of a conventional vehicle-Drive cycles and Drive Terrain, Operating principle of Fuel Cell, Differences between conventional battery and Electric battery, Transmission differences between conventional and Electric Vehicles, Differences between conventional lighting system and Electric vehicle lighting system.

UNIT-II:

HYBRID ELECTRIC VEHICLES: Introduction, A Brief history of Hybrid Electric vehicles (HEVs),Basics of Hybrid Electric Vehicles (HEVs), Architecture of HEVs-Series HEVs, Parallel HEVs, Series-Parallel HEVs.

HYBRID ELECTRIC VEHICLE DRIVE TRAINS: Parallel Hybrid Drive trains with Torque coupling, Parallel Hybrid Drive trains with both Speed coupling, Parallel Hybrid Drive trains with both speed Torque coupling.

UNIT-III:

ELECTRIC PROPULSION SYSTEMS: DC Motors- Operating principle and control of DC motors, Induction Motor Drives: Operating principle and Control Mechanisms, Brushless Motor Drives-Principle and Construction, Switched Reluctance Motor (SRM) Drives- Basic structure, Drive Convertor, Modes of Operation.

ENERGY STORAGE SYSTEMS: Electrochemical Batteries, Lead-Acid Batteries, Nickel Based Batteries, Lithium Based Batteries, Ultra Capacitors- Basic Principles and Performance, Ultrahigh-speed flywheels- Basic Principle and Power Capacity, Fly Wheel technologies.

UNIT-IV:

DESIGN OF SERIES HYBRID ELECTRIC VEHICLE DRIVES: Design of Series Hybrid Electric Vehicle Drive- Control Strategies, Sizing of Major Components and Case Study for designing for various parameters.

DESIGN OF PARALLEL HYBRID ELECTRIC VEHICLE DRIVES: Design of Parallel Hybrid Electric Vehicle Drive- Control Strategies of Drive Train and Design of Drive Train Parameters.

UNIT-V:

FUEL CELL ELECTRIC VEHICLES: Operating principles of fuel cells, Fuel and oxidant consumption, Fuel cell system characteristics, Fuel cell technologies- Proton Exchange membrane fuel cells, Alkaline Fuel cells, Phosphoric acid fuel cells, Molten carbonate fuel cells, Solid oxide fuel cells, Fuel supply- Hydrogen storage-Hydrogen production, Ammonia as hydrogen carrier, Non-Hydrogen fuel cells, Fuel Cell Hybrid Vehicle Drive Train.

Text Books:

1) MehrdadEhsani, YiminGao, Ali Emadi, 2nd edition, Modern Electric, Hybrid Electric and Fuel cell vehicles, CRC Press, Taylor and Francis Group, 2010.
2) Chris Mi, M.AbulMasrur and David WenzhongGao, 1st Edition, Hybrid Electric Vehicles, John Wiley & Sons, Ltd, 2011.

B. TECH VII SEMESTER **OEC**

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20EC7T10 DATA COMMUNICATIONS (OPEN ELECTIVE-III)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To focus on information sharing and networks.
2. To Introduce flow of data, categories of network, different topologies.
3. To focus on different coding schemes.
4. To brief the students regarding protocols and standards.
5. To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices, etc.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Know basic knowledge of data Communication
CO2: Know basic knowledge of Analog & Digital Signals
CO3: Understand the basic knowledge of Analog Transmission
CO4: know Different types of transmission media
CO5: Focus on DTE-DCE Interface

SYLLABUS

UNIT-I:

Introduction to data communication and networking: Reason to study data communication, Data Communication, Networks, Protocols and Standards, Standards Organizations. Line Configuration, Topology, Transmission Modes, Categories of Networks Internet works. Study of OSI and TCP/IP protocol suit: The Model, Functions of the layers, TCP/IP Protocol Suites

UNIT-II:

Study of Signals: Analog and Digital, Periodic and Aperiodic Signals, Analog Signals, Time and Frequency Domains, Composite Signals, Digital Signals. Study of Digital transmission: Digital to Digital Conversion, Analog to Digital Conversion.

UNIT-III:

Study of Analog transmission: Digital to Analog Conversion, Analog to Analog Conversion. Study of Multiplexing: Many to one/one to Many, Frequency division Multiplexing, Wage division Multiplexing, Time division Multiplexing, Multiplexing applications.

UNIT-IV:

Types of transmission media: Guided Media, Unguided Media, Transmission Impairments, Performance Wavelength, Shannon Capacity, Media Comparison, PSTN, Switching. Error Detection and Correction: Types of Errors, Detection, Parity Check, Vertical Redundancy Check, Longitudinal Redundancy Check, Cyclic Redundancy Check, Checksum, Error Correction.

UNIT-V:

Study of DTE-DCE in brief: Digital data transmission, DTE-DCE Interface, Modems, 56K Modems, Cable Modems. Introduction to networks and devices: Network classes, Repeaters, Hub, Bridges, Switches, Routers, Gateways Routers, Routing Algorithms, Distance Vector Routing, Link State Routing.

Text Books:

1. Data communication & Networking by Bahrouz Forouzan.

2. Computer Networks by Andrew S. Tanenbaum

Reference Books:

1. Data and Computer Communications by William Stallings

2. Kleinrock, Leonard. Queueing Systems, Vol 1: Theory. New York, NY: Wiley J., 1975. ISBN: 0471491101.

B. Tech VII Semester **OEC**

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20EC7T11 MECHATRONICS (OPEN ELECTIVE III)

Course Objective: The main objective of this course is

- To introduce the integrative nature of Mechatronics.
- To describe the basic programming, different components and devices of mechatronics systems.

Course Outcomes:
At the end of this course the student will able to:

CO1: Basic concepts of mechatronics

CO2: To design mechatronics system with the help of Microprocessor

CO3: To design PLC and other electrical and Electronics Circuits

CO4: To understand the concept of solid state Devices

CO5: To know Dynamic models & controllers

SYLLABUS

UNIT-I:

Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors.

UNIT-II:

Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontrollers – Block diagram

UNIT-III:

Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC, Basic programming in PLC.

UNIT-IV:

Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning, operational amplifiers, noise reduction, filtering.

UNIT-V:

Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trend

TEXT BOOKS:

1. Bolton, ―Mechatronics‖, Printice Hall, 2000
2. Ramesh S Gaonkar, ―Microprocessor Architecture, Programming, and Applications with the 8085‖, 5th Edition, Prentice Hall, 2008.

REFERENCE BOOKS:

1. Mechatronics System Design / Devdas shetty/Richard/Thomson.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

B. TECH VII SEMESTER

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BIOMEDICAL INSTRUMENTATION.

20EC7T12 **(OPEN ELECTIVE III)**

Course Objectives:

1. To introduce student to basic biomedical engineering technology
2. To understand the anatomy & physiology of major systems of the body in designing equipment for medical treatments.
3. To impart knowledge about the principle and working of different types of bio-medical electronic equipment/devices.

Course- Outcomes:

After going through this course the student will able

CO1.To understand Physiological System of the Body and Bioelectric Potentials.

CO2.To understand Electrodes, Transducer and Sensors used in Biomedical field.

CO3 To understand the problem and identify the necessity of equipment for diagnosis and therapy.

CO4 To understand the importance of electronics engineering in medical field.

CO5 To understand the importance of telemetry in patient care

SYLLABUS

UNIT-1: INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT-II: ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output**.**

UNIT-III: CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV: PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids, Laparoscope, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention,

UNIT-V: DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring**.**

Text Books:

1. Bio-Medical Instrumentation‖, Cromwell , Wiebell, Pfeiffer
2. Hand Book of Bio-Medical Instrumentation‖, Instrumentation‖, Kandahar. McGraw-Hill

References

1. Introduction to Bio-Medical Equipment Technology‖, 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. “Bio-Medical Electronics and Instrumentation”, Onkar N. Pandey, Rakesh Kumar, Katson Books.

B. TECH VII SEMESTER

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ARTIFICIAL NEURAL NETWORKS.
20CS7T10 (OPEN ELECTIVE III)

Course Objectives:

- To deal with the historical developments of artificial intelligence leading to artificial neural networks (ANN).
- To introduce the basic concepts and models of ANN for solving real world problems.

Course Outcomes:

At the end of this course the student will be able to:

CO1- Understand biological neuron & artificial neuron and basic building blocks of ANN.

CO2-Understand different single layer/multiple layer Perceptron learning algorithms.

CO3- Understand and analyze Adaline and Madeline Networks and their applications

CO4- Learning algorithms based on basic gradient descent, backpropagation and their modifications.

CO5- Understand self-organization learning, ART, Radial basis Functions.

SYLLABUS

UNIT - I: Introduction to Artificial Neural Networks:

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT - II: Fundamental Models of Artificial Neural Networks:

Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS)Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.

Perceptron Networks: Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks

UNIT – III: Adaline and Madaline Networks:

Introduction, Adaline, Madaline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

UNIT - IV: Feedback Networks:

Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets.

Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT - V: Self Organizing Feature Map:

Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

Adaptive Resonance Theory: Introduction, ART Fundamentals, ART 1, ART2.

TEXT BOOKS:

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL : 2005.

REFERENCES:

1. “Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

B. TECH VII SEMESTER

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CYBER SECURITY
20CS7T11 (OPEN ELECTIVE III)

Course Objective:

- Understand the importance of Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

Course Outcomes:

CO1: Understand and classify various forms of Cybercrimes

CO2: Interpret the reasons for Cyber offence

CO3: Detect and analyze vulnerabilities in Mobile and Wireless devices

CO4: Analyze tools used to perform cyber crimes

CO5: Understand cyber security Laws

SYLLABUS:

UNIT-I: Introduction, Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes

UNIT-II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT-III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT-IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-V: Cybercrimes and Cyber security:

The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

B. TECH VII SEMESTER

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SOFTWARE TESTING METHODOLOGIES
20CS7T12 (OPEN ELECTIVE III)

Course Objectives:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To Understand different levels of Testing
- Apply Black Box and White Box Testing Techniques
- To learn how to plan a test project, design test cases and data, conduct testing operations, and generate a test report.
- To understand software test automation problems and solutions.

Course Outcomes:

CO1: Have an ability to apply software testing knowledge and engineering methods.

CO2: Ability to identify the needs of software test automation, and define a test tool to support test automation.

CO3: Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

CO4: Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

CO5: Apply techniques and skills to use modern software testing tools to support software testing projects.

SYLLABUS

UNIT-I: Software Testing:

Introduction, Evolution, Dichotomies, Goals & Typical Objectives of Testing, Model for testing, Software Testing Principles, **Software Testing Terminology and Methodology:** Software Testing Terminology, Errors, Defects, Failures, Root Causes and Effects, Software Testing Life Cycle, Software Testing Methodology.

UNIT-II: Verification and Validation:

Verification & Validation Activities, Categories of Test Techniques: Dynamic Testing,

Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing,

White-Box Testing: Need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT-III: Static Testing:

Inspections, Structured Walkthroughs, Technical reviews, Benefits of Static Testing, Static Vs Dynamic Testing.

Levels of Testing: Unit testing, Integration Testing,. Function testing, System testing and Acceptance testing.

Regression testing: Progressive Vs Regressive testing, Objectives of regression testing, Regression testing techniques

UNIT-IV: Test Management:

Test Organization, Test Planning, Test Design and Test case specifications, Structure of a Testing Group, Reasons for the growth of a Test suite, Test suite Minimization, Test suite prioritization, Types of test case prioritization, prioritization techniques, Measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models

Debugging: Debugging process, Debugging Techniques, Correcting Bugs, Debuggers

UNIT-V: Automation and Testing Tools:

Need for automation, Testing Tool Considerations, Test Tool Classification, Benefits and Risks of Test automation, Special Considerations for Test execution and Test Management Tools, Principles for tool selection, Testing tools- success factors, Guidelines for automated testing, overview of some commercial testing tools.

Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web **engineering**, testing of web based systems, Testing mobile systems.

TEXT BOOKS:

1. Software testing techniques - Baris Beizer, International Thomson computer press, second edition. (Unit 1)
2. Software Testing, Principles and Practices, Naresh Chauhan, Oxford Publishers(Unit 2,3,4,5)

REFERENCES:

Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

1. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
2. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

B. TECH VII SEMESTER

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INTERNET OF THINGS
20IT7T10 (OPEN ELECTIVE III)

Course Objectives:

- Understand the architecture of Internet of Things and connected world.
- Explore on use of various hardware, communication and sensing technologies to build IoT applications
- Develop the real time IoT applications to make smart world.
- Understand challenges and future trends in IoT.

Course Outcomes:

CO1: Design and Deployment of IoT.

CO2: Design and comparing M2M with IoT.

CO3: Understand Platform design and modeling of IoT

CO4: Apply IoT in different devices using Python

CO5: Implement IoT and cloud platforms.

SYLLABUS

UNIT-I: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT Enabling Technologies, IoT levels and deployment, domains Specific IoTs.

UNIT-II: IoT and M2M :

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

UNIT-III: IoT Platforms Design Methodology:

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data Structures, control flow, functions, modules, packages, file handling. Raspberry PI with Python, other IoT devices.

UNIT-IV: IoT Protocols:

Messaging Protocols- MQ Telemetry Transport (MQTT), Constrained Application Protocol (CoAP) Transport Protocols-Light Fidelity (Li-Fi), Bluetooth Low Energy (BLE) IoT Protocols: Addressing and Identification: Internet Protocol Version 4 (IPV4), Internet Protocol Version 6(IPV6), Uniform Resource Identifier (URI)

UNIT-V: IoT Physical Servers And Cloud Offerings: Introduction to cloud storage models and communication APIs, WAMP –Auto Bahn for IoT, Xively cloud for IoT, case studies illustrating IoT design –home automation, smart cities, smart environment.

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things: A Hands-on-Approach”, VPT, 1st Edition, 2014. (Units1,2,3,5)
2. Matt Richardson, Shawn Wallace, “Getting Started with Raspberry Pi”, O’Reilly (SPD), 3rd Edition, 2014. (Unit 3)
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram “ Internet of Things” Wiley (Unit 4).

REFERENCE BOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons2014.

B. TECH VII SEMESTER

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COMPUTER VISION
20IT7T11 (OPEN ELECTIVE III)

Course Objectives:

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand motion analysis.
- To study some applications of computer vision algorithms

Course Outcomes:

CO1: Implement fundamental image processing techniques required for computer vision.

CO2: Perform shape analysis.

CO3: Apply Hough Transform for line, circle, and ellipse detections.

CO4: Apply 3D vision techniques.

CO5: Develop applications using computer vision techniques

SYLLABUS

UNIT - I:

IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology –texture.

UNIT - II: SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT – III: HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT - IV: 3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

.**UNIT - V: APPLICATIONS**

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

TEXT BOOKS:

1.D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.

2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.
2. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
3. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
4. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.

B. TECH VII SEMESTER

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FUZZY SETS
20HS7T01 (OPEN ELECTIVE III)

COURSE OBJECTIVES:

1) Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
2) Explain different types operations performed on fuzzy sets.
3) Provide the knowledge of Arithmetic operations on fuzzy numbers.
4) Emphasis on different kinds of crisp and fuzzy relations
5) Enable students to know the validity of arguments by fuzzy logic.

COURSE OUTCOMES:

CO1: Understand basic knowledge of fuzzy sets and fuzzy logic.
CO2: Apply various kinds of operations on fuzzy sets.
CO3: Understand the concepts of fuzzy arithmetic to solve fuzzy equations.
CO4: Illustrate the properties of fuzzy sets to design modeling software system.
CO5: Apply fuzzy logic to solve the problems in neural networks.

SYLLABUS

UNIT-I

Fuzzy Sets(all theorems without proofs): Introduction, Crisp sets, Fuzzy sets: Basic types and basic concepts, additional properties of α-cuts, representations of Fuzzy sets, extension principle for Fuzzy sets.

UNIT-II

Operations on Fuzzy Sets(all theorems without proofs): Types of operations, Fuzzy complements, Fuzzy intersections: t-norms, Fuzzy unions: t-conorms, Combinations of operations, Aggregation operations.

UNIT-III

Fuzzy Arithmetic(all theorems without proofs): Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations.

UNIT-IV

Fuzzy Relations(all theorems without proofs): Crisp versus Fuzzy relations, Projection and cylindrical extensions, Binary Fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations, Fuzzy compatibility relations, Fuzzy ordering relations, Fuzzy morphisms.

UNIT-V

Fuzzy Logic(all theorems without proofs): Classical logic: an over view, multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic hedges, Inference from conditional Fuzzy propositions, Inference from conditional and qualified propositions, Inference from quantified propositions.

TEXT BOOKS:

1. George J. Klir& Bo Yuan, Fuzzy Sets & Fuzzy Logic, Pearson Education, PHI, 1995.
2. H. J. Zimmermann, Fuzzy Set Theory and its Applications, 4th edition, Springer.

REFERENCES:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd edition, Wiley, 2010.
2. John Yen & Reza Langari, Fuzzy Logic, Pearson.

B. TECH VII SEMESTER

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DIGITAL MEDIA MANAGEMENT

20MB7T01 (OPEN ELECTIVE III)

Course Objective

Digital marketing channels that can helps the students to understand the increased business visibility and brand awareness. Moreover, having a professional presence on social media helps them to reach a broader target audience to secure more leads and convert them into loyal customers.

SYLLABUS

Unit – I

Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

Unit – II

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How different segments use Digital Media –

Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

Unit – III

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Writing the Marketing Plan and Implementing the Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget.

Unit – IV

Search Engine Marketing and Online Advertising: Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

Unit – V

Social Media Marketing: Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

TEXT BOOKS

1 Richard Gay, Alan Charles worth and Rita Essen, Online Marketing, Oxford University Press, 2016.

REFERENCES

1. Dave Chaffey, Fiona Ellis-Chadwick, Richard Mayer, Kevin Johnston. Internet Marketing Strategy, Implementation and Practice,3rd Ed .Prentice Hall.

2. Rob Stokes e-Marketing: The essential guide to marketing in a digital world. 5th Ed. Quirk e-Marketing (Pty) Ltd.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

20MB7T02 ENTREPRENEURSHIP DEVELOPMENT (OPEN ELECTIVE III)

SYLLABUS

UNIT –I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.

2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International

3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

B. TECH VII SEMESTER

		L	T	P	C
	OEC	3	0	0	3

20AD7T10 **DATA ANALYSIS AND VISUALIZATION WITH PYTHON (OPEN ELECTIVE III)**

Pre-requisite:

Course Objective: *This course* explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

Unit-1:

Preliminaries: What Kinds of Data?, Why Python for Data Analysis?, Python as Glue, Solving the "Two-Language" Problem, Why Not Python?, Essential Python Libraries, Installation and Setup.

Python Language Basics, IPython, and Jupyter Notebooks: The Python Interpreter, IPython Basics, Python Language Basics.

NumPy Basics: Arrays and Vectorized Computation:

The NumPy ndarray: A Multidimensional Array Object, Universal Functions: Fast Element-Wise Array Functions, Array-Oriented Programming with Arrays, File Input and Output with Arrays, Linear Algebra, Pseudorandom Number Generation.

Unit-2:

Introduction to pandas Data Structures: Series, DataFrame, Index Objects

Essential Functionality: Reindexing, Dropping Entries from an Axis, Indexing, Selection, and Filtering, Integer Indexes, Arithmetic and Data Alignment, Function Application and Mapping, Sorting and Ranking, Axis Indexes with Duplicate Labels, Summarizing and Computing Descriptive Statistics: Correlation and Covariance, Unique Values, Value Counts, and Membership.

Unit-3:

Data Loading, Storage, and File Formats Reading and Writing Data in Text Format: Reading Text Files in Pieces, Writing Data to Text Format, Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping

Binary Data Formats: Using HDF5 Format, Reading Microsoft Excel Files

Data Cleaning and Preparation:

Handling Missing Data: Filtering Out Missing Data, Filling In Missing Data

Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, Computing Indicator/Dummy Variables

Unit-4:

Data Wrangling: Join, Combine, and Reshape:

Hierarchical Indexing: Reordering and Sorting Levels, Summary Statistics by Level, Indexing with a DataFrame's columns.

Combining and Merging Datasets: Database-Style DataFrame Joins, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap.

Reshaping and Pivoting: Reshaping with Hierarchical Indexing, Pivoting "Long" to "Wide" Format, Pivoting "Wide" to "Long" Format.

Unit-5:

Plotting and Visualization

A Brief matplotlib API Primer: Figures and Subplots, Colors, Markers, and Line , Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, matplotlib Configuration.

Plotting with pandas and seaborn: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots, Facet Grids and Categorical Data, Other Python Visualization Tools.

Text Book:

"Python for Data Analysis" Data Wrangling With Pandas, Numpy, And Ipython Second Edition by Wes McKinney, Oreilly Publications.

B. TECH VII SEMESTER

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OEC	3	0	0	3

20AM7T10 NoSQL DATABASES (OPEN ELECTIVE III)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains define, compare and use the four types of NoSQL Databases, demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases, explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases, ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the type of NoSQL database to implement based on business requirements

CO2: Apply NoSQL data modeling from application specific queries

CO3: Understand NoSQL Storage Architecture

CO4: Use Atomic Aggregates and denormalization as data modeling techniques to optimize query processing

CO5: Apply indexing and ordering of data sets

SYLLABUS

Unit-1:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented

Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

Unit-2:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

Unit-3:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value

Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

Unit-4:

NoSQL Stores: Similarities between Sql and Mongodb Query Features, Accessing Data

From Column-Oriented Databases like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution in Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

Unit-5:

Indexing and Ordering Data Sets: Essential Concepts behind a Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Reference Books:

1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional,2012.

2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications,2013.

3) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN:978-0-470-94224-6

4) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE7T15 WASTE WATER TREATMENT
(OPEN ELECTIVE-IV)

Course Objectives: To study about waste water treatment

Course Outcomes: Able to provide waste management techniques

SYLLABUS

UNIT–I:

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

UNIT–II:

Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems, Industrial waste water discharges into streams. Lakes and oceans- consequent problems.

UNIT–III:

Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries, Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods. Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT-IV:

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT–V:

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

Text Books:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

Reference Books:

1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE7T16 REPAIR AND REHABILITATION OF CONCRETE STRUCTURES
(OPEN ELECTIVE-IV)

Course Objectives:

- Familiarize Students with deterioration of concrete in structures
- Equip student with concepts of NDT and evaluation
- To evaluate the performance of the materials for repair
- To strategize different repair and rehabilitation of structures.

Course Outcomes:

CO1: Explain deterioration of concrete in structures

CO2: Carryout analysis using NDT and evaluate structures

CO3: Students must gain knowledge on quality of concrete

CO4: Examine how the Concrete repair industry equipped with variety of repair Material sand techniques .

SYLLABUS

UNIT–I:

Maintenance and Repair Strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT-II:

Causes of Damage To Structures Causes of Distress in Structures - Extrinsic and Intrinsic causes for damage of structures; Effect of Chemical and Marine Environment on structures.

UNIT-III:

Semi Destructive Tests for Damage Assessment Core Test, LOK test, CAPO test, Penetration Tests Non-Destructive Tests for Damage Assessment Rebound Hammer Test, Ultrasonic Pulse Velocity test, Resistivity Test, Carbonation Test, Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

UNIT-IV:

Materials for Repair: Criteria for durable concrete repair, selection of repair materials, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete, FRP sheets.

UNIT-V:

Techniques for Repair: Crack repair techniques – Crack Stitching, Mortar and dry pack, vacuum concrete, Shotcreting, Epoxy injection, Mortar repair for cracks Methods of Strengthening: Repairs to overcome low member strength – Jacketing, blanketing

Text Books:

1. 'Maintenance & Repair of Civil Structures' by B.L. Gupta & Amit Gupta.
2. 'Rehabilitation of Concrete Structures' by B. Vidivelli, Standard Publishers.
3. 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation' by V. K. Raina

Reference Books:

1. 'Concrete Structures- protection Repair and Rehabilitation' by R. Doodge Woodson, BH Publishers
2. Shetty M.S., "Concrete Technology – Theory and Practice", S. Chand and Company, 2008.
3. Dov Kominetzky. M. S., "Design and Construction Failures", Galgotia Publications Pvt.Ltd., 2001
4. Ravishankar.K., Krishnamoorthy. T. S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
5. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008,
6. Gambhir. M. L., "Concrete Technology", McGraw Hill, 2013

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE7T15 POWER QUALITY
(OPEN ELECTIVE-IV)

Course Objective:

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

Course Outcome:

At the end of this course the student should be able to

CO1: Differentiate between different types of power quality problems.

CO2: Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.

CO3: Analyze power quality terms and power quality standards.

CO4: Explain the principle of voltage regulation and power factor improvement methods.

CO5: Explain the power quality monitoring concepts and the usage of measuring instruments.

SYLLABUS

Unit-I

Introduction to Power Quality: Terms and definitions of transients, Long Duration Voltage Variations: Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching DC offset; waveform distortion; voltage fluctuation; power frequency variations.

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction-capacitor switching

transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics, measurement of harmonics, THD; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices" Kluwer Academic Publishers
3. Sankaran, " Power Quality" CRC Press.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis) Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE7T16 ELECTRIC VEHICLES

(OPEN ELECTIVE-IV)

Course Objective:

- To study the different drive train configurations of electric vehicles
- To propose the various propulsion and energy storage systems for EHVs
- To know the sizing of propulsion motors and other systems involved in EH vehicles
- To carry out different design case studies of EHv and BEVs

Course Outcomes: At the end of the course, the student will be able to:

CO1: Assess the performance, societal and environmental impact of EHVs having known their past history

CO2: Implement various drive train topologies and control strategies in Electric and Hybrid vehicles

CO3: Recommend, Design/Size and Control different electric propulsion units and other components of EHVs and BEVs

CO4: Appropriately select the energy storage system and strategize its management in EHVs

CO5: Define Ancillary Service Management and explain different ancillary services.

SYLLABUS

UNIT-I INTRODUCTION TO ELECTRIC VEHICLES:

History of electric vehicles (EV) and hybrid electric vehicle (EHV), need and importance of EV and HEV, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Power/energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics.

UNIT-II HYBRID ELECTRIC DRIVE-TRAINS: Basic architecture and concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

UNIT-III ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, and Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV BATTERY ENERGY STORAGE SYSTEMS:

Battery Basics - Lead-Acid Battery -Cell Discharge Operation - Cell Charge Operation-Construction-Battery Parameters - Battery Capacity-Discharge Rate - State of Charge- State of Discharge- Depth of Discharge-Technical Characteristics - Practical Capacity -Battery Energy -Constant Current Discharge -Specific Energy - Battery Power -Specific Power -Batteries for EV applications.

UNIT-V MODELLING OF EV/HEV:

Modelling and analysis of EV/HEV drive train sizing of motor, and design of traction power electronics, various vehicle subsystems.

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2010.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,2009.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

REFERENCES:

1. Jefferson, C.M., Barnard and R.H., Hybrid Vehicle Propulsion, WIT Press, Boston, 2002
2. Jack Erjavec and Jeff Arias, "Hybrid, Electric and Fuel Cell Vehicles", Cengage Learning, 2012
3. SerefSoylu "Electric Vehicles - The Benefits and Barriers", InTech Publishers, Croatia, 2011
4. Jack Erjavec and Jeff Arias, "Alternative Fuel Technology – Electric, Hybrid and Fuel Cell Vehicles", Cengage Learning Pvt. Ltd., New Delhi, 2007
5. Seth Leitman, "Build Your Own Electric Vehicle" McGraw hill, New York, USA, 2013

B.TECH VII SEMESTER	OEC	L	T	P	C
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20ME7T12 MICRO-ELECTRO- MECHANICAL SYSTEMS (OPEN ELECTIVE -IV)

Pre-requisite: Calculus and Differential Eq., Fundamentals of Physics (Mechanics, Optics, Electricity and magnetism), Fundamentals of Inorganic Chemistry.

Course Objective: The main objective of this course is to introduce the integrative nature of Micro Electro Mechanical systems. To describe the different components and devices of Micro Electro Mechanical systems.

Course Outcomes: At the end of the course, student will be able to

CO1:	Explain MEMS and Principles of sensing and actuation
CO2:	Explain Thermal Sensors and Actuators & Magnetic Sensors and Actuators
CO3:	Explain Micro-Opto-Electro Mechanical Systems
CO4:	Explain Radio Frequency (RF) MEMS & Micro Fluidic Systems
CO5:	Explain Chemical And Bio Medical Micro Systems

SYLLABUS

UNIT-I:

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT-II:

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, magnetic MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT-III: MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS:

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT-IV:

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

UNIT-V: CHEMICAL AND BIO MEDICAL MICRO SYSTEMS:

Sensing mechanism & principle, membrane transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (Enose), mass sensitive chemosensors, fluroscence detection, calorimetric spectroscopy.

Text Books:

1. MEMS, NitaigourPremchandMahalik, TMH Publishing co.

References:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. Bio-MEMS (Micro systems), Gerald Urban, Springer.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.

B.TECH VII SEMESTER	OEC	L	T	P	C
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20ME7T13 **SOLAR ENERGY SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: To impart knowledge on non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

Course Outcomes: At the end of the course, student will be able to

CO1: Significance of renewable energy and describe the principles of solar radiation. Analyze various solar collectors.

CO2: Know the various storage methods and application of solar energy.

CO3: Understand the concept of converting wind energy into electrical energy using both horizontal and vertical axis wind machines.

CO4: Know biomass disasters, functional operation of geothermal systems. Generalize the operation of ocean, tidal and wave energy systems.

CO5: understand the operating principle of direct energy conversion systems .and to recognize the need and ability to engage in lifelong learning for further developments in this field.

SYLLABUS

UNIT-I: FUNDAMENTALS OF SOLAR RADIATION:

Energy conservation principle, Energy scenario (world and India), Solar angles, Solar time, Solar radiation: Outside earth's atmosphere, Earth surface, measurements of solar radiation: Pyrometer, Sunshine recorder, Pyro heliometer.

UNIT-II: ENERGY STORAGE SYSTEMS:

Energy –Environment-Economy Necessity of energy storage, Specifications of energy storage devices, energy storage Methods-Mechanical Energy Storage-Thermal Energy Storage-Sensible Heat Storage-Solid media storage.

UNIT-III: SOLAR COLLECTORS:

Classifications, comparison of concentrating and non-concentrating types – Liquid flat plate collectors, Evacuated tube collectors. Modified flat plate collectors: Compound parabolic concentrator(CPC), Cylindrical parabolic Concentrator, Fixed mirror solar concentrator, Paraboloid Dish Collector.

UNIT-IV: SOLAR THERMAL DEVICES:

Solar water heater, Solar space heating and cooling systems, Solar industrial heating systems, Solar refrigeration and air conditioning systems, Solar Desalination – Solar cooker: domestic, community – Solar pond – Solar drying.

UNIT-V: SOLAR PHOTOVOLTAIC SYSTEMS:

Solar cell fundamentals, Energy band model of semiconductors, Working Principle of photovoltaic cell, solar cell classification, solar cell technologies, solar PV systems-classification. Solar cell –module-array Construction.

Text Books:

1. Goswami D.Y., Kreider, J. F. and Francis., "Principles of Solar Engineering', Taylor and Francis, 2000.
2. Chetan Singh Solanki, "Solar Photovoltatics – Fundamentals, Technologies and Applications", PHI Learning Private limited, 2011.
3. Sukhatme S.P., Nayak.J.P, 'Solar Energy – Principle of Thermal Storage and collection", Tata McGraw Hill, 2008.
4. Solar Energy International, "Photovoltaic – Design and Installation Manual" – New Society Publishers, 2006.
5. Roger Messenger and Jerry Vnetre, "Photovoltaic Systems Engineering", CRC Press, 2010.

Reference Books:

1. B.H.Khan "Non – conventional Energy Resources" Tata McGraw Hill education Pvt. Ltd.
2. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons .

B. TECH VII SEMESTER

OEC	L	T	P	C
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INTRODUCTION TO EMBEDDED SYSTEMS

20EC7T13 (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1 The basic concepts of an embedded system are introduced.

2 The various elements of embedded hardware and their design principles are explained

3 Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed

4 Embedded system implementation and testing tools are introduced and discussed.

Technology capabilities and limitations of the hardware, software components

5 Design Methodologies

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the basic concepts of an embedded system and able to know an embedded system design Approach to perform a specific function.

CO2: The various embedded firmware design approaches on embedded environment.

CO3: Identify the unique characteristics of real-time systems

CO4: Design, implement and test an embedded system.

CO5: Define the unique design problems and challenges of real-time systems

SYLLABUS

UNIT-I: Introduction to Embedded systems

What is an embedded system Vs. General Computing system, history, classification, major application areas, and purpose of embedded systems, Core of embedded system, Characteristics and Quality Attributes of Embedded systems

UNIT-II: Embedded Hardware Design

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real-time clock, Application specific and Domain specific embedded systems-Examples

UNIT-III:

Embedded Firmware design approaches, Embedded Firmware Development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA,Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV:

Factors to be considered in selecting a controller, 8051 Architecture, RTOS and Scheduling Operating basics, types, RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Types of multitasking, Non preemptive Scheduling, Preemptive Scheduling.

UNIT-V: Design and Development

Embedded system development Environment – IDE, Simulators, Emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry

Text books:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.
2. Embedded Systems, Rajkamal, TMH, 2009.

References:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE
2. Embedded Systems: A Contemporary Design Tool Paperback by James K. Peckol

B. Tech VII Semester **OEC**

L	T	P	C
3	0	0	3

20EC7T14 INTERNET OF THINGS (OPEN ELECTIVE –IV)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To introduce the terminology, technology and its applications
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language which is used in many IoT devices
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To introduce the implementation of web-based services on IoT devices

COURSE OUTCOMES:

At the end of this course the student will able to:

At the end of the course, student will be able to

CO1: Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.

CO2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on Bwireless, energy, power, and sensing modules

CO3: Market forecast for IoT devices with a focus on sensors

CO4: Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

SYLLABUS

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Sensors, Actuators,
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II: IoT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT-III: IoT Physical Devices and Endpoints

Introduction to Arduino and Raspberry Pi- Installation,
Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT-IV: Controlling Hardware-

Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors

Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

UNIT-V: IoT Physical Servers and Cloud Offerings–

Introduction to Cloud Storage models and
communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

B. TECH VII SEMESTER **OEC**

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20EC7T15 ANALOG AND DIGITAL IC APPLICATIONS (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1. To understand the analysis & design of different types of active filters using op-amps
2. To learn the internal structure, operation and applications of different analog ICs
3. In this course, students can study Integrated circuits for all digital operational designs like adder, subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM.
4. Design and to develop the internal circuits for different digital operations and simulate them using hardware languages using integrated circuits.
5. Understand the concepts of Latches and Flip-Flops and Design of Counters using Digital ICs, modeling of sequential logic integrated circuits using VHDL

Course Outcomes:

At the end of the course, student will be able to

CO1: Design circuits using operational Amplifier for various applications

CO2: Understand the concept of A/D & D/A Converters

CO3: Analyze and design amplifiers and active filters using Op-amp.

CO4: Understand the concepts of Combinational logic circuits in digital system

CO5: Understand the concepts of sequential logic circuits in digital system

SYLLABUS

UNIT-I: OPERATIONAL AMPLIFIER

The Ideal Operational Amplifier; Operational Amplifier Internal Circuit. Op-Amp parameters & Measurement, DC Characteristics, input & output off set voltages & currents, slew rate, CMRR, PSRR, drift, AC Characteristics and Compensation Techniques.

UNIT-II: OPERATIONAL AMPLIFIER APPLICATIONS

Basic Op-Amp Applications; Inverting and Non-inverting amplifier,. Integrator and differentiator, Difference amplifier, Instrumentation Amplifier; AC Amplifier; V to I and I to V Converters. Op-Amp Circuits using Diodes, Sample and Hold Circuit, Comparator, Regenerative Comparator (Schmitt Trigger).

D-A AND A-D CONVERTERS Introduction; Series Op-Amp Regulator; Basic DAC Techniques Weighted Resistor DAC,R-2R DAC ; AD Converters, Flash ADC and Successive approximation Converter.

UNIT-III: FILTERS USING OP-AMP & 555 TIMERS

Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Description of Functional Diagram of 555 Timer; Monostable Operation; Astable Operation and its Applications and PLL, Applications PLL. VCO and its applications.

UNIT-IV: Digital Design Using HDL

Design flow, program structure, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Objects and Classes, Subprograms, Comparison of VHDL and Verilog HDL.

UNIT-V: Combinational And sequential Logic Design

Combinational Logic Design: Adders & Sub tractors, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Barrel Shifter, Simple Floating-Point Encoder, Dual Priority Encoder.

Sequential Logic Design: Flip-Flops, Counters, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Register. Linear feedback shift register and applications.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGrawHill,4th Edition,2005
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.

REFERENCES:

1. "Fundamentals of Digital logic design with VHDL". Stephen Brown & Zvonko Vranesic, Tata McGraw Hill, 2nd edition.2004
2. Designing with TTL Integrated Circuits: Robert L. / John R. Morris & Miller.

B. TECH VII SEMESTER **OEC**

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3	0	0	3

20CS7T13 DATA ANALYTICS (OPEN ELECTIVE –IV)

Course Objectives:

1. To understand Data Analytics lifecycle and Business Challenges.
2. To understand Analytical Techniques
3. To understand various tools and technologies to handle big data

Course Outcomes:

CO1: Understand big data and data analytics life cycle.
CO2: Explore various supervised learning methods.
CO3: Explore various unsupervised learning methods.
CO4: Understand and apply ARIMA model on time series data.
CO5: Learn various technology and tools in big data analytics.

SYLLABUS

UNIT-I

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the new big data Ecosystem, Examples of Big Data Analytics. Data Analytics Life Cycle: Data Analytics life cycle Overview, Discovery, Data Preparation, Model,Planning, Model Building, Communicate Results, Operationalize, Case Study.

UNIT-II

Supervised Learning: Decision Trees – Overview of Decision Trees, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree. Naive Bayes: Baye's Theorem, Naïve Baye's Classifier, Diagnostics of Classifiers.
Regression –Linear Regression, Logistic Regression.

UNIT-III

Unsupervised Learning: Association Rule Mining–Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules. Cluster Analysis – Overview of Clustering, k-means

UNIT IV

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model
Text Analysis: Text Analysis Steps, Example, Collecting Raw Data, Representing Text, TFIDF, Categorizing Documents by Topics, Determining Sentiments, Gaining Insights.

UNIT-V

Technology and Tools: MapReduce and Hadoop- Analytics for Unstructured Data, The Hadoop Ecosystem In-DataBase Analytics: SQL Essentials, In-Database Text Analysis, Advanced SQL.

TEXT BOOKS:

1. David Dietrich, Barry Hiller, "Data Science and Big Data Analytics", EMC education services, Wiley publications, 2012.

REFERENCE BOOKS:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with
advanced analytics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O"
Reilly, 2011.
3. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

B. Tech VII Semester	OEC	L	T	P	C
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20CS7T14 BLOCK CHAIN TECHNOLOGY (OPEN ELECTIVE –IV)

Course Objectives

By the end of the course, students will be able to

- Understand how major block chain systems work.
- To securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

Course Outcomes

CO 1: Understand the design principles of Bitcoin and Ethereum.

CO 2: Understand and apply Nakamoto consensus.

CO 3: Analyze the differences between proof-of-work and proof-of-stake consensus.

CO 4: Understand cryptocurrency

CO 5: Understand cryptocurrency Regulations

SYLLABUS

Unit I: Basics:

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Unit II: Blockchain:

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Unit III: Distributed Consensus:

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV: Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Unit V: Cryptocurrency Regulation:

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.

Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Text Book

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,”Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

B. TECH VII SEMESTER	OEC	L	T	P	C
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20CS7T15 SOFTWARE PROJECT MANAGEMENT (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

CO1: Apply the process to be followed in the software development life-cycle models.

CO2: Apply the concepts of project management & planning.

CO3: Implement the project plans through managing people, communications and change

CO4: Conduct activities necessary to successfully complete and close the Software projects

CO5: Implement communication, modeling, and construction & deployment practices in software development.

SYLLABUS

UNIT I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

TEXT BOOKS:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

REFERENCES:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH VII SEMESTER	OEC	L	T	P	C
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20IT7T13 CLOUD COMPUTING (OPEN ELECTIVE –IV)

Course Objectives:

- Explain the technology and principles involved in building a cloud environment
- To implement Virtualization
- Understand various types of cloud and its services
- Contrast various programming models used in cloud computing

Course Outcomes:

CO1: Describe the principles of parallel and distributed computing and evaluation of cloud computing from existing technologies

CO2: Illustrate Virtualization for Data-Center Automation.

CO3: Explain and characterize different cloud deployment models and service models

CO4: Program data intensive parallel applications in cloud.

CO5: Understand commercial cloud computing technologies such as AWS, AZURE and AppEngine

SYLLABUS

UNIT-I: Introduction:

Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Microsoft Aneka.

UNIT-II: Virtualization:

Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen, VMware, Microsoft Hyper – V.

UNIT-III: Cloud Computing Architecture:

Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy.

UNIT-IV: Data Intensive Computing: Map-Reduce Programming:

What is Data-Intensive Computing? Characteristics, Challenges, Historical Perspective. Technologies for Data Intensive Computing: Storage Systems, Programming Platforms.

Cloud Applications: Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.

UNIT-V: Cloud Platform in Industry and Cloud Applications:

Cloud Platforms in Industry: Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

TEXTBOOKS:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud Computing McGraw Hill Education.

REFERENCES:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.
3. Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan Kaufmann, 2013.

B. TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
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20IT7T14 **BUSINESS INTELLIGENCE (OPEN ELECTIVE –IV)**

Course Objectives:

- Introduce the concepts and components of Business Intelligence (BI)
- Evaluate the technologies that make up BI (data warehousing, OLAP)
- Identify the technological architecture that makes up BI systems

Course Outcomes:

CO1: Understand concepts and components of Business Intelligence.

CO2: Explain the complete life cycle of BI development.

CO3: Illustrate technology and processes associated with Business Intelligence framework.

CO4: Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

CO5: Ability to design expert system using AI tools.

SYLLABUS

UNIT-I:

Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence

Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

UNIT-II:

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics. **Getting started with business intelligence:** Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

UNIT-III:

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete BI professional, Popular BI tools.

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart,OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

UNIT-IV:

Business Intelligence Applications:

Marketing models: Relational marketing, Sales force management,

Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.

Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices

UNIT-V:

Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management

Artificial Intelligence and Expert Systems:

Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems

TEXT BOOKS:

1. Fundamental of Business Intelligence" Grossmann W, Rinderle-Ma Springer, 2015
2. "Fundamentals of Business Analytics" – By R N Prasad and SeemaAcharya, Publishers: Wiley India.

REFERENCE BOOKS:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : TheCompleteProject Lifecycle for Decision Support Applications, Addison WesleyInformation Technology
2. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann.

B. Tech VII Semester	**OEC**	**L**	**T**	**P**	**C**
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20HS7T02 POLYMER CHEMISTRY (OPEN ELECTIVE –IV)

PREREQUISITES: Chemistry I and Chemistry II of AICTE syllabus

Course Outcomes

CO1: After studying this course, the learners are expected to: Relate polymer properties to their structure and conformation

CO2: Analyse different mechanisms of polymer formation and use this information in the synthesis of different polymers.

CO3: Distinguish between enthalpic and entropic contributions to polymerisation/crystallization.

CO4: Distinguish between absolute and relative methods for molecular weight determination.

CO5: Determine the flow properties of polymer melts and solutions.

CO6: Interpret experimental data and determine parameters such as polymerization ratesand copolymer composition.

CO7: Estimate the solubility of a given polymer in various solvents and blends.

CO8: Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.

CO9: Assess the effect of synthetic polymers on the environment.

SYLLABUS

Unit 1. Definitions, origin, nomenclature, classification and types of macromolecules; molecular weight (MW) and its distribution; Determination of molecular weight – methods for measuring number average, weight average, viscosity average MW; gel permeation chromatography; spectroscopic techniques to determine chemical composition and molecular microstructure, thermal transitions; melting temperature and glass transition temperature. Colligative properties, osmotic pressure, light scattering, refractive index, viscosity, small angle X-ray scattering (6)

Unit 2tep-Growth Polymerization: Reactivity of functional groups; kinetics; molecular weight in open and closed system cyclization vs. linear polymerization, cross-linking and gel point; process condition; step-copolymerization, examples of step polymers (3)

Unit 3. Free radical Polymerization: Nature of chain polymerization and its comparison with step polymerization; radical vs. ionic polymerizations; structural arrangements of monomer units; kinetics of chain polymerization; molecular weight and its distribution; chaintransfer, inhibition, retardation, auto-acceleration; energetic characteristics; techniques of radical polymerization – bulk, solution, emulsion, suspension polymerization; examples of polymers made by radical chain polymerization (4). Ionic Polymerization: Propagation and termination of cationic polymerization, anionic and ring opening polymerization, active polycarbanions (2)

Unit 4. Copolymerization: types of copolymers, copolymer compositions, reactivity ratio; radical and ionic co-polymerizations; Block and Graft copolymer synthesis, examples (2). Thermodynamics of polymer solutions; Flory-Huggins theory, theta conditions; solubility parameters; fractionation of macromolecules, osmotic pressure, lower criticalsolution temperature (3)

Unit 5. Naturally occurring polymers, biodegradability, biosynthesis, polymers frombio/renewable resources (2)

Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography, Electron beam, X-ray and ion sensitive resists, Conducting polymers, types, properties and applications, electroluminescence, molecular basis of electrical conductivity, Photonic applications and non-linear optics, optical information storage (3)

Text Books:

1. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur
2. Polymer chemistry and Physics of Modern Materials, 2nd edn, J. M. G. Cowie, Stanley Thornes, UK, 1998
3. Contemporary Polymer Chemistry, 3rd edn. H. R. Allcock, F. W. Lampe and J. E.Mark, Pearson
4. Polymers: Chemistry and Physics of Modern Materials, J.M.G. Cowie, CRC Press
5. Introduction to Physical Polymer Science, L. H. Sperling, Wiley
6. Introduction to Soft matter, I. W. Hamley, John Wiley and Sons, 2007
7. Polymer Chemistry, 2nd edn, P. C. Hiemenz and T. P. Lodge, CRC Press (2007)

B. TECH VII SEMESTER **OEC**

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20MB7T03 TOTAL ENGINEERING QUALITY MANAGEMENT (OPEN ELECTIVE –IV)

Course Objective

To understand the Engineering and Management aspects of Planning, Designing, Controlling and Improving Quality in Manufactured products.

Course Outcome

1. To understand the fundamentals of quality
2. To understand the role of TQM tools and techniques in elimination of wastages and reduction of defects
3. To develop quality as a passion and habit
4. To Facilitate the understanding of Quality Management principles and process.
5. The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

SYLLABUS

UNIT I

Quality Gurus And TQM Kitemarks: Definition, Need & Evolution of TQM – Contributions of Quality Guru's – Edward Deming – Joseph Juran – Philip Crosby – Genichi Taguchi – Walter Shewart – Criteria for Deming's Prize.

UNIT II

Product Design & Analysis : Dimensions of product and service quality, Basic Design Concepts and TQM – Design Assurance – Design Validation –Failure Mode Effect Analysis – Fault Tree Analysis – Design for Robustness – Value Analysis.

UNIT III

Process Improvement & Modern Production Management Tools

Control Charts – Process Capability, -Bench Marking, Six Sigma Approach – Total Productive Maintenance – Just-In-Time – Lean Manufacturing Paradigms.

UNIT IV

Quality Improvement Tools & Continuous Improvement

Traditional Q-7Tools, New Q-7 Tools, Quality Function Deployment (QFD), Kaizen 5S, Poka-Yoke, Failure Mode and Effects Analysis(FMEA) – Stages, Types, Taguchi Quality Loss Function(QFD) – Total Productive Maintenance (TPM).

UNIT V

Quality Management Systems ISO 9000, ISO 9001: 2008, QS 9000, ISO 14000, TS16949:2002 and EMS14001 certifications of quality systems- Elements, Documentation, Quality Auditing — Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.

TEXT BOOKS

1. Total Engineering Quality Management, Sunil Sharma, 1st Edition, MacMillan India Limited.
2. Total Quality Management, Poornima M. Charantimath, 2nd Edition, Pearson Education.
3. Dale H. Besterfiled, et at., “Total quality Management”, Pearson Education Asia, Third Edition, Indian Reprint 2006.

REFERENCES

1. “Quality and Performance Excellence”, James R Evans, Edition, 7th Edition, Cengage Learning.
2. “Quality Management”, Howard S Gitlow, Alan J Oppenheim, Rosa Oppenheim, David M Levine,3rd Edition , Tata McGraw Hill Limited.
3. “Fundamentals of Quality Control & Improvement”, Amitava Mitra, 3rd Edition, Wiley Publications, 2012.
4. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 8th Edition, First Indian Edition, Cengage Learning, 2012.

B. TECH VII SEMESTER **OEC**

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20MB7T04 STRESS MANAGEMENT (OPEN ELECTIVE –IV)

OBJECTIVES

This course examines different sources from where individuals experience a stress response. Through diligent individual and group study, students will be able to learn to apply stress management principles in order to achieve high levels of performance and understand the role of relationships to the management of stress and health.

Course Outcomes

1. Understand the physiological systems that are affected by stressors and the long-term effects and illnesses that can result from stressors.
2. Understand the specific applications of stress as it relates to the workplace and different target groups.
3. Create effective stress management plans for individual clients and for workplace environments. Enhancing significance of training and development, performance evaluation

SYLLABUS

UNIT I: UNDERSTANDING STRESS

Meaning – Symptoms – Work Related Stress – Individual Stress – Reducing Stress - Sources of stress –Consequence of stress-Burnout-symptoms of Burnout- Stress vs Burnout-Model of stress-strategies for coping stress (individual and organizational strategies)

UNIT II: TIME MANAGEMENT

Techniques – Importance of Planning the day –developing concentration – Prioritizing, Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say "No."

UNIT III:CAREER PLATEAU

Career plateau – Identifying Career plateaus – Structural and Content - Plateauing – Making a fresh start – Importance of Sabbaticals – Counseling out – Executive leasing – Sustaining a marketable Career.

UNIT IV:CRISIS MANAGEMENT

Implications – People issues – Structure issues – Environmental issues –Learning to keep calm - Preventing interruptions – Controlling crisis – Pushing new ideas – Empowerment – Work place Humour, Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit.

UNIT V: SELF DEVELOPMENT

Improving personality – Leading with Integrity – Enhancing Creativity – Effective Decision Making – Sensible Communication – The Listening Game – Managing Self – Mediation for peace – Yoga for Life

TEXT BOOKS

1. Bhatia R.L., The Executive Track: An Action Plan for Self Development Wheeler Publishing, New Delhi

2. Charavathy. S.K, "Human Values for Manager", McGraw Hill/Henely Management Series

REFERENCES

1. Jeffr Davison, Managing Stress, Prentice Hall of India, New Delhi

2. Jerrold S Greenberg, Comprehensive Stress Management, Jain Books, 2009

B. TECH VII SEMESTER	OEC	L	T	P	C
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20AD7T11 NATURAL LANGUAGE PROCESSING (OPEN ELECTIVE –IV)

Pre-requisite: Nil

Course Educational Objective: The Objective of the course is to make learn the basic elements of C programming, control structures, derived data types, Modular programming, user defined structures, basics of files and its I/O operations.

Course Outcomes: At the end of this course, the student will be able to

CO1: Familiar with the basic components of NLP.

CO2: Applying N-gram models to predict a sequence of text.

CO3: Build a basic language understanding system using preliminary concepts of NLTK library.

CO4: Exposure on advanced techniques for understanding patterns in text

CO5: Understand the semantics of linguistic components in a natural dialogue

Syllabus

UNIT – I:

Introduction

Knowledge in Speech and Language Processing; Ambiguity; Models and Algorithms; Language, Thought and Understanding; History Regular Expressions Regular Expression; Words; Corpora; Text Normalization; Minimum Edit Distance

UNIT – II

N-gram Language Models

N-Grams; Evaluating Language Models, Generalization and Zeros, Smoothing: Laplace Smoothing; Add-k Smoothing; Backoff and Interpolation; Kneser-Ney Smoothing

UNIT – III

Natural language processing tools in Python (NLTK Package)

Part-I: Introduction to NLTK; Tokenizing; Filtering Stop words; Stemming; Tagging parts of speech; Lemmatizing; Chunking; Chinking

Part-II: Using Named Entity Recognition (NER); Getting Text to Analyze; Using a Concordance; Making a Dispersion Plot;

UNIT – IV

Information Extraction:

Relation Extraction Algorithms; Using Patterns to extract relations; Relation extraction via supervised learning; Semi supervised relation extraction via

bootstrapping; Distant Supervision for Relation Extraction; Evaluation of Relation Extraction; Extracting Times; Extracting Events and their Times; Template Filling

UNIT – V

Word Senses and WordNet

• Defining Word Senses; How many senses do words have?

• Relations between senses

WordNet: Sense relations in WordNet; Word Sense Disambiguation; Alternate WSD algorithms and Tasks

Text Books:

1. Daniel Jurafsky, James H. Martin ,"Speech and Language Processing" , Third Edition, PHI, 2020.
2. https://realpython.com/nltk-nlp-python/#getting-text-to-analyze

Reference Books:

1. Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, 2011
2. Applied Text Analysis with Python: Enabling Language-Aware Data Products with Machine Learning, Benjamin Bengfort, Rebecca Bilbro, 2018
3. Speech and Language Processing, 2nd Edition, Daniel Jurafsky, James H. Martin, 2009

B. TECH VII SEMESTER **OEC**

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3	0	0	3

20AM7T11 DEEP LEARNING (OPEN ELECTIVE –IV)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains understanding basics of deep neural networks, CNN architectures of deep neural networks, concepts of Artificial Neural Networks, basics of Data science in Deep learning, applications of deep learning in AI and Data Science

Course Outcomes: At the end of the course, student will be able to

CO1: Explain the basics in deep neural networks

CO2: Apply Convolution Neural Network for image processing

CO3: Explain the basics of Artificial Intelligence using deep learning

CO4: Apply deep learning algorithms for data science

CO5: Apply deep learning algorithms for variety applications

SYLLABUS

Unit-1:

DEEP NETWORKS BASICS

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization – Machine Learning Basics: Capacity – Over fitting and under fitting – Hyper parameters and validation sets -- Estimators -- Bias and variance -- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization -- Optimization .

Unit-2:

CONVOLUTIONAL NEURAL NETWORKS

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.

Unit-3:

DEEP LEARNING ALGORITHMS FOR AI

Artificial Neural Networks – Linear Associative Networks – Perceptrons -The Back propagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Auto encoders - Deep Backprop Networks- Auto encoders

Unit-4:

DATA SCIENCE AND DEEP LEARNING

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

Unit-5:

APPLICATIONS OF DEEP LEARNING

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion -NLP tasks - dimensionality estimation - time series forecasting - building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016

2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019

3. Vance, William, Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science (Hardcover - 2020), Joiningthedotstv Limited

4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022

5. Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018.

		L	T	P	C
B.TECH MINOR	**MN**	**3**	**0**	**0**	**3**

20EEMN01 **BASICS OF POWER SYSTEMS**
(Minor Engineering Course)

Course Objective: To develop problem solving skills and understanding of Power System concepts through the application of techniques and principles of electrical Power Generation methods.

Course Outcomes: At the end of the course, student will be able to

CO1:	Various electrical Power System Components, Supply systems
CO2:	Thermal Power Station working procedure, each module path
CO3:	Hydro Power Station working procedure, clasificatons
CO4:	Nuclear Power Station working procedure, Chain Reaction
CO5:	Solar power generation & Wind Power Generation, Applications

SYLLABUS

UNIT-I: **Power System Components**

Single line Diagram of Power system, Different kinds of supply system, conventional and Non-conventional energy sources, Applications.

UNIT-II: **Thermal Power Stations**

Choice of site Selection, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super, heaters, Economizers, electrostatic precipitators

UNIT-III: **Hydro & Nuclear Power Stations**

Choice of site, arrangement of hydroelectric installations, Hydrology. Mass curve, flow duration curve, classification of Hydro Power Plants, Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components

UNIT-IV: **Solar power generation & Wind Power Generation**

Solar radiation spectrum. Radiation measurement. Applications of solar thermal systems Solar Photovoltaic (SPV) systems, Introduction to wind energy, basic principles of wind energy conversion.

UNIT-V: Transmission & Distribution

Transmission structure, classifications, types of conductors, primary & secondary distribution, Substation Equipments , layout.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagarand, A Chakrabarti, DhanpatRai& Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers
3. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006

B.TECH MINOR	MN	L	T	P	C
		3	0	0	3

20EEMN02 BASICS OF POWER ELECTRONICS
(Minor Engineering Course)

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

CO1: Identify power electronic devices in circuits.

CO2: Maintain triggering and commutation circuits.

CO3: Use phase controlled rectifiers in different applications.

CO4: Use choppers and inverters in different applications.

CO5: Maintain control circuits consisting of power electronic devices.

Unit I: Thyristor Family Devices

SCR: Construction, operating Principle with Two transistor analogy, V-I characteristics, latching current (IL) and holding current (Ih), applications of SCR. Thyristor family devices: LASCR, SCS, GTO and TR1AC, power MOSFET, IGBT.

Unit II: Turn ON and Turn OFF methods of SCR

Concept of turn ON mechanism of SCR: High voltage thermal triggering, Illumination triggering, dv/dt triggering, gate triggering of SCR. Turn OFF methods: Class A – Series resonant commutation circuit, class – B shunt resonant commutation circuit, class – C complimentary symmetry commutation circuit. Protection circuits of SCR: Over voltage, over current and snubber circuit.

Unit III: Phase controlled Rectifiers

Phase control parameters: Firing angle (alpha) and conduction angle – Single phase half wave controlled rectifier: circuit diagram, working and waveforms with R and RL load, effect of freewheeling diode with RL load Single phase centre tapped full wave controlled rectifier: circuit diagram, working and waveforms with R and RL load, effect of freewheeling diode with RL load

Unit IV: Choppers and Inverters

Convertors and its types. Block diagram and working of step up and step down choppers using power MOSFET. Inverters: circuit diagram, working of series inverter, parallel inverter

Unit V: Industrial Applications of power electronic devices

Light dimmer circuit using DIAC – TRIAC, Battery charger using SCR, Emergency lighting system, Block diagram and concept of UPS, Block diagram and concept of SMPS.

Suggested Learning Resources:

1. Power Electronics Moorthi, V.R. Oxford University Press , New Delhi 110001, 2013, ISBN 0-19-567092-2
2. Fundamentals of Power Electronics Bhattacharya, S. K. 1STE Learning materials centre,2006 , ISBN 9788125918530
3. Power Electronics Essentials and Applications Umanand, L Wiley India Pvt. Ltd, New Delhi, 2011, ISBN :9788126519453
4. Power Electronics Circuits Devices and Applications Rashid, Muhammad H. Pearson Education India, New Delhi, 1 2012,ISBN: 9780133125100
5. SCR Manual Including TR1ACS and other thyristors (6111 Edition. General Electric(Author. General Electric Co,2007, ISBN:9780137967636

Software/Learning Websites:

1. www.nptel.ac.in/courses /108101038
2. PS1M software for power electronics
3. www.en.wikibooks.org/wiki/Power_Electronics
4. www.books.google.co.in/books/about/Power Electronics

B.TECH MINOR	MN	L	T	P	C
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20EEMN02 FUNDAMENTALS OF ELECTRICAL AND ELECTRONIC MEASUREMENTS

(Minor Engineering Course)

Course Outcomes

CO1: Identify various electrical measuring instruments for measuring a given parameter.

CO2: Analyse the construction and working of different electrical and electronic measuring instruments.

CO3: Explain the measurement of resistance

CO4: Select appropriate Transducer for a specific application.

CO5: Describe the basic principle of electronic digital measuring instruments.

SYLLABUS

Unit 1: Basics of measuring instruments

List of important electrical quantities to be measured, their units and the names of the instruments to measure them- Classification of instruments - different types of torques (Deflection, Controlling and Damping torques) in the indicating instruments-definitions of accuracy, precision, error, resolution and sensitivity.

Unit 2: Electromechanical Measuring Instruments

M.C. and M.I types of Ammeters and Voltmeters - their Construction and working, Dynamometer type Ammeter, Voltmeter and Wattmeter –construction, working, use of Instrument transformers,single phase Induction type energy meter Construction and working.

Unit 3: Measurement of resistance

Classification of resistance- List of methods of measurement of resistance-explanation of basic Ohm meter circuit – difference in series and shunt type ohmmeters- Construction and workingof megger working principle.

Unit 4: Transducers

Definition of transducer-need of transducer - Classification of Transducers - Factors influencing While its selection -Applications of Transducers –

Thermocouple- Thermistor - working principle and use of Strain Gauge- construction, working and use of LVDT.

Unit 5: Electronic & Digital Instruments:

Basic components of analog electronic Instruments - Working of Rectifier type Voltmeter and Ammeter- basic components of Digital (Digital electronic) instruments- advantages of Digital Instruments over Analog Instruments- types of digital Voltmeters- specifications of digital voltmeter working of single phase digital energy meter with block diagram Working of Digital frequency meter with block diagram.

B.TECH MINOR	**MN**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EEMN03 BASICS OF SOLAR AND FUEL ENERGY SYSTEMS
(Minor Engineering Course)

Course Objectives: To know the basic principles of solar energy conversion, fuel cells and their applications.

Course out comes: At the end of the course, students will be able to

CO 1: Understand the concepts of solar radiation

CO 2: Understand the concepts of Solar Thermal Systems.

CO 3: Understand the concepts of Solar Photovoltaic Systems

CO 4: Analyse the performance of fuel cell.

CO 5: Compute the power generation capacity of a fuel cell

UNIT-I – Solar Radiation:

Sun as a source of energy, Solar radiation, Solar radiation at the Earth's surface, Measurement of Solar radiation and instrumentation, Prediction of available solar radiation, Solar energy-Importance, Storage of solar energy, Solar pond.

UNIT-II – Solar Thermal Systems:

Principle of conversion of solar radiation into heat, Collectors used for solar thermal conversion: Flat plate collectors and Concentrating collectors, Solar Thermal Power Plant, Solar hot water systems.

UNIT-III – Solar Photovoltaic Systems:

Conversion of Solar energy into Electricity - Photovoltaic Effect, Solar photovoltaic cell and its working principle and its I-V characteristics, Different types of Solar cells, Series and parallel connections, Photovoltaic applications: Battery chargers, domestic lighting, street lighting and water pumping.

UNIT - IV FUEL CELLS:

History – Principle - Working – Fuel cell basic chemistry and Thermodynamics – Types of fuel cells – construction features of PEMFC – merits and demerits - Performance evaluation of fuel cell – Comparison of battery Vs fuel cell.

UNIT - V APPLICATION OF FUEL CELL:

Fuel cell usage for power systems - Large scale power generation – Automobile - Space - Environmental analysis of usage of Hydrogen in Fuel cell - Future trends in fuel cells.

Text Books:

1. Solar Energy Utilization, G. D. Rai, Khanna Publishers.

2. Fuel Cells – Principles and Applications, Viswanathan, B and M Aulice Scibioh, Universities Press (2006).

Reference Books:

1. Solar Energy-Principles of thermal energy collection & storage, S.P. Sukhatme, Tata McGraw Hill Publishers, 1999.
2. Solar Photovoltaics- Fundamentals, technologies and applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.,
3. Fuel Cell and Their Applications, Kordesch, K and G.Simader, Wiley-Vch, Germany (1996).
4. Fuel Cells: Theory and Application, Hart, A.B and G.J.Womack, Prentice Hall, NewYork Ltd., London (1989).

B.TECH MINOR **MN**

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20EEMN04 BASICS OF ELECTRICAL MACHINES
(Minor Engineering Course)

SYLLABUS

UNIT-I: Fundamentals of D.C Generators

Dynamically induced E.M.F- Fleming's right hand rule - electromechanical energy conversion - simple loop generator - principle of D.C generator- functions of each part of D.C generator with legible sketches-E.M.F equation different types of D.C Generators- Power stages in DC generators- efficiency calculation-simple problems

UNIT-II: Fundamentals of D.C Motors

Fleming's left hand rule - working of D.C motors – classification - significance of back E.M.F- Formula for back E.M.F for different D.C motors-Problems on E.M.F equation – Torque-Torque equation of Dc motor - Different losses - Applications of D.C motors.

UNIT-III: Single phase Transformers

Types and constructional details - principle of operation - emf equation. Applications

Three Phase Induction Motors

Introduction – Constructional features and differences in respect of cage and wound rotor types. Principle of working, applications

UNIT-IV: Alternators

Types and constructional details - principle of operation - emf equation, applications

Synchronous Motors

Constructional details - principle of operation .applications

UNIT-V : Single phase Induction Motors

Essential parts and constructional features of single phase motors – self starting-split phase, capacitors start, capacitor run and shaded pole types and Principles of working –Applications and relative merits.

REFERENCES

1. B.L. Theraja Electrical Technology– S.Chand &Co.
2. J.B. Gupta -Electrical Technology
3. H. Cotton -Electrical Technology
4. T.K.Naga Sankar, M.S.Sukhija -Basic Electrical Engineering- Oxford publications.
5. Langsdorf-Performance of A.C. Machines

6. M.V. Deshpande-Electrical motors applications and control
7. DP Kothari, IJNagrath- Electrical machines-McGraw

B.TECH MINOR

MN	L	T	P	C
	3	0	0	3

20EEMN05 FUNDAMENTALS OF ELECTRIC CIRCUITS
(Minor Engineering Course)

Course Objective: This course introduces the basic concepts of network and circuit analysis which is the foundation of the Electrical Engineering discipline. The emphasis of this course if laid on the basic analysis of circuits which includes network analysis, 1-phase ac circuits, magnetic circuits.

Course Outcomes: At the end of the course, student will be able to

CO1: Various electrical networks in presence of active and passive elements

CO2: R, L, C network reduction techniques.

CO3: Solving electrical networks using theorems.

CO4: Fundamentals of ac circuits

CO5: Any magnetic circuit with various dot conventions.

SYLLABUS

UNIT-I: Introduction to Electrical Circuits

Concept of Network and Circuit, Types of elements, Types of sources, Source transformation. R-L-C Parameters, Voltage–Current relationship for Passive Elements, Kirchhoff's Laws, ohms law.

UNIT-II: Network Analysis

Network Reduction Techniques-Resistive networks, Inductive networks and capacitive networks-Series, Parallel, Series-Parallel combinations. Mesh Analysis, Nodal Analysis.

UNIT-III: Network Theorems (D.C&A.C)

Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, theorems.

UNIT-IV: Single Phase A.C. Circuits

Average value, R.M.S. value, form factor and peak factor for different periodic wave forms. J-notation, Complex and Polar forms of representation. Steady State Analysis of series R-L &R-C circuits. Concept of Power Factor, Real, Reactive power.

UNIT-V: Magnetic Circuits

Magnetic circuits: Faraday's laws of electromagnetic induction, concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, analysis of different magnetic circuits.

Text Books:

1. Engineering Circuit Analysis" by W H Hayt and J E Kemmerley
2. Fundamentals of Electric Circuits" by Charles K Alexander and Matthew N O Sadiku
3. Engineering Circuit Analysis - William Hayt, Jack E. Kemmerly, S M Durbin, Mc Graw Hill Companies.
4. Electric Circuits Fundamentals" by Thomas L Floyd
5. Fundamentals of Electric Circuit Theory" by D Chattopadhyaya

B.TECH MINOR	MN	L	T	P	C
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20EEMN06 ELECTRICAL SAFETY
(Minor Engineering Course)

Course Objective:

This course on 'Electrical and Safety' will introduce students to electricity, from generation to transmission to cities/ towns, to distribution up to the end user. Students will learn the elementary electrical, overview of electrical power system, Quality of electrical supply, general tools and tackle, Major substation equipment, Operation & maintenance practices for substation and transformer in the first part of this course.

Course Outcomes: At the end of the course, student will be able to

CO1: learn the elementary electrical, overview of electrical power system, Quality of electrical supply, general tools and tackle, Major substation equipment, Operation & maintenance practices for substation and transformer

CO2: Importance of earthing and guidelines for providing earthing arrangements,

CO3: Protection of the electrical equipment for safe use of electricity, Important electricity rules related to safety

CO4: take all precautions to avoid the unforeseen and will be introduced to the basic safety measures in case of accidents happens

CO5: learn about the essential First-Aid measures. Immediate First-Aid may save life. It is essential to restore the electrical system, at the earliest after any disaster; this is the issue of Disaster Management

SYLLABUS

UNIT-I: - Basics of Electricity - Necessity of electrical safety - Elementary Electrical Safety rules

UNIT-II: Exposure to General tools and tackles, testing of wiring installation

UNIT-III: Electrical power system: overview Quality of electrical supply power distribution system – basics of distribution line equipment

UNIT-IV: transformers, major substation equipment operation and maintenance practices

UNIT-V: Earthing, electrical system protection, importance of electricity rules related to safety and Accident prevention & protection, first aid and disaster management

Reference :

IGNOU course material available at eGyankosh

Course OEE-001: Electricity & Safety Measures; Course OEE-002; OEEL-001 of Programme “Certificate of Competency in Power Distribution” being offered by SOET, IGNOU

Block 2: Electrical Safety and Disaster Management of Course BEE-002: Energy Management, Block 2: Operation & Maintenance of course BEE-001: Power Distribution Sector of Programme “Advanced Certificate in Power Distribution” being offered by School of Engineering & Technology (SOET), IGNOU.

INFORMATION TECHNOLOGY
COURSE STRUCTURE
B. TECH I SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20IT1T01	BSC	Linear Algebra and Differential Equations	3	-	-	3	3
2	20IT1T02	BSC	Applied Chemistry	3	-	-	3	3
3	20IT1T03	HSMC	English	3	-	-	3	3
4	20IT1L04	ESC	Computer Engineering Workshop	1	-	4	3	3
5	20IT1T05	ESC	Problem Solving through C	3	-	-	3	3
6	20IT1L06	HSMC	English Communication Skills Lab	-	-	3	3	1.5
7	20IT1L07	BSC	Applied Chemistry Lab	-	-	3	3	1.5
8	20IT1L08	ESC	Problem Solving through C Lab	-	-	3	3	1.5
9	20IT1M09	MC	Environmental Science	2	-	-	2	-
Total Number of Credits								**19.5**

B. TECH II SEMESTER

S.No.	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20IT2T01	BSC	Transform Techniques	3	-	-	3	3
2	20IT2T02	BSC	Applied Physics	3	-	-	3	3
3	20IT2T03	ESC	Digital Logic Design	3	-	-	3	3
4	20IT2T04	ESC	Data Structures	3	-	-	3	3
5	20IT2T05	ESC	Python Programming	3	-	-	3	3
6	20IT2L06	BSC	Applied Physics Lab	-	-	3	3	1.5
7	20IT2L07	ESC	Data Structures Lab	-	-	3	3	1.5
8	20IT2L08	ESC	Python Programming Lab	-	-	3	3	1.5
Total Number of Credits								**19.5**

B. TECH III SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20IT3T01	BSC	Numerical Methods and Vector Calculus	3	0	0	3	3
2	20IT3T02	PCC	Object Oriented Programming through Java	3	0	0	3	3
3	20IT3T03	PCC	Data Base Management Systems	3	0	0	3	3
4	20IT3T04	PCC	Software Engineering	3	0	0	3	3
5	20IT3T05	PCC	Computer Organization	3	0	0	3	3
6	20IT3L06	PCC	Object Oriented Programming through Java Lab	0	0	3	3	1.5
7	20IT3L07	PCC	Data Base Management Systems Lab	0	0	3	3	1.5
8	20IT3L08	PCC	Software Engineering Lab	0	0	3	3	1.5
9	20IT3S09	SC	Basic Web Programming	0	0	4	4	2
10	20IT3M10	MC	Constitution of India	2	-	-	2	-
Total number of credits								**21.5**

B. TECH IV SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20IT4T01	BSC	Probability and Statistics	3	0	0	3	3
2	20IT4T02	ESC	Discrete Mathematical Structures	3	0	0	3	3
3	20IT4T03	PCC	Operating Systems	3	0	0	3	3
4	20IT4T04	PCC	Advanced Data Structures	3	0	0	3	3
5	20IT4T05	HSMC	Managerial Economics and Financial Analysis	3	0	0	3	3
6	20IT4L06	ESC	R Programming Lab	0	0	3	3	1.5
7	20IT4L07	PCC	Operating Systems Lab	0	0	3	3	1.5
8	20IT4L08	PCC	Advanced Data Structures Lab	0	0	3	3	1.5
9	20IT4S09	SC	Mobile Application Development	0	0	4	4	2
Total number of credits								**21.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH V SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week Lecture	Tutorial	Practical	Contact Hours	Credits
1	20IT5T01	PCC	Formal Languages & Automata Theory	3	0	0	3	3
2	20IT5T02	PCC	Data Warehousing & Data Mining	3	0	0	3	3
3	20IT5T03	PCC	Computer Networks	3	0	0	3	3
Professional Elective-I				3	0	0	3	3
4	20IT5T04	PEC-I	Computer Graphics					
5	20IT5T05		E-Commerce					
6	20IT5T06		Software Testing Methodologies					
Open Elective-I				3	0	0	3	3
7	20IT5L09	PCC	Computer Networks Lab	0	0	3	3	1.5
8	20IT5L10	PCC	Data Warehousing and Mining Lab Through Python	0	0	3	3	1.5
9	20IT5S11	SC	Testing Tools	0	0	4	4	2
10	20IT5M12	MC	Disaster Management	2	0	0	2	-
11	20IT5I13	I	Internship	0	0	0	1.5	1.5
Total number of credits								**21.5**
Honors/Minor course				**4**	**0**	**0**	**-**	**4**

B.TECH VI SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week Lecture	Tutorial	Practical	Contact Hours	Credits
1	20IT6T01	PCC	Machine Learning	3	0	0	3	3
2	20IT6T02	PCC	Cloud Computing	3	0	0	3	3
3	20IT6T03	PCC	Big Data Analytics	3	0	0	3	3
Professional Elective-II				3	0	0	3	3
4	20IT6T04	PEC-II	MEAN Stack Technologies					
5	20IT6T05		Compiler Design					
6	20IT6T06		Software Architecture and Design patterns					
	Open Elective-II			3	0	0	3	3
7	20IT6L09	PCC	Machine Learning Lab	0	0	3	3	1.5
8	20IT6L10	PCC	Cloud Computing Lab	0	0	3	3	1.5
9	20IT6L11	PCC	Hadoop Lab	0	0	3	3	1.5
10	20IT6S12	SC	Soft Skills	0	0	4	4	2
11	20IT6M13	MC	Essence of Indian traditional knowledge	2	0	0	2	-
12	20IT6P14	P	Community Service Project	-	-	-	-	4
Total number of credits								**25.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Contact Hours	Credits
				Lecture	Tutorial	Practical		
Professional Elective-III				3	0	0	3	3
1	20IT7T01	PEC-III	Intelligent Agents					
2	20IT7T02		Mobile Computing					
3	20IT7T03		Software Project Management					
Professional Elective-IV				3	0	0	3	3
4	20IT7T04	PEC-IV	Neural Networks and Deep Learning					
5	20IT7T05		Information Security					
6	20IT7T06		Business Intelligence					
Professional Elective-V				3	0	0	3	3
7	20IT7T07	PEC-V	Ethical Hacking					
8	20IT7T08		Information Retrieval Systems					
9	20IT7T09		Internet of Things					
10	**Open Elective-III**			3	0	0	3	3
11	**Open Elective-IV**			3	0	0	3	3
12	20IT7T14	HSMC	Universal Human Values 2: Understanding Harmony	0	0	3	3	3
13	20IT7S15	SC	Data Visualization using Tableau	0	0	4	4	2
14	20IT7I16	I	Industrial Internship	-	-	-	-	3
Total number of credits								**23**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH VIII SEMESTER

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20IT8P01	P	Project	-	-	-	-	8
Total number of credits								**8**

OPEN ELECTIVE –I:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE5T04	Architecture and Town Planning	3	0	0	3	CE
2	20CE5T05	Elements of Civil Engineering	3	0	0	3	CE
3	20EE5T04	Basics of Control Systems	3	0	0	3	EEE
4	20EE5T05	Special Electrical Machines	3	0	0	3	EEE
5	20ME5T04	Design Thinking & Product Innovation	3	0	0	3	ME
6	20ME5T05	Nanotechnology	3	0	0	3	ME
7	20EC5T04	Linear System Analysis	3	0	0	3	ECE
8	20EC5T05	Digital Logic Design	3	0	0	3	ECE
9	20EC5T06	Solid State Devices	3	0	0	3	ECE
10	20CS5T07	Introduction to Artificial Intelligence	3	0	0	3	CSE
11	20CS5T08	Operating System	3	0	0	3	CSE
12	20CS5T09	Software Engineering	3	0	0	3	CSE
13	20IT5T07	Computer Networks	3	0	0	3	IT
14	20IT5T08	Computer Graphics	3	0	0	3	IT
15	20HS5T02	Operations Research	3	0	0	3	BED
16	20MB5T01	Principles of Management	3	0	0	3	DMS
17	20MB5T02	Technology Management	3	0	0	3	DMS
18	20AD5T07	Foundations of Data Science	3	0	0	3	AIDS
19	20AM5T07	Introduction to Machine Learning	3	0	0	3	AIML

OPEN ELECTIVE –II:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE6T08	Remote Sensing and GIS	3	0	0	3	CE
2	20CE6T09	Environmental Impact Assessment	3	0	0	3	CE
3	20EE6T08	Renewable Energy Sources	3	0	0	3	EEE
4	20EE6T09	Energy Audit, Conservation and Management	3	0	0	3	EEE
5	20ME6T07	Industrial Robotics	3	0	0	3	ME
6	20ME6T08	Additive manufacturing	3	0	0	3	ME
7	20EC6T07	Electronic Circuits and Networks	3	0	0	3	ECE

8	20EC6T08	Principles of Communications	3	0	0	3	ECE
9	20EC6T09	Microcontrollers & its Applications	3	0	0	3	ECE
10	20CS6T07	Introduction to Machine Learning	3	0	0	3	CSE
11	20CS6T08	Information Security	3	0	0	3	CSE
12	20CS6T09	Agile Technologies	3	0	0	3	CSE
13	20IT6T07	Fundamentals of Machine Learning	3	0	0	3	IT
14	20IT6T08	Database Management Systems	3	0	0	3	IT
15	20HS6T02	Quantitative Aptitude & Reasoning	3	0	0	3	BED
16	20MB6T01	Organizational Behaviour	3	0	0	3	DMS
17	20MB6T02	Project Management	3	0	0	3	DMS
18	20AD6T07	Visual Analytics	3	0	0	3	AIDS
19	20AM6T07	Big data Analytics	3	0	0	3	AIML

OPEN ELECTIVE –III:

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CE7T13	Construction Technology and Management	3	0	0	3	CE
2	20CE7T14	Green Buildings	3	0	0	3	CE
3	20EE7T13	Concept of Power System Engineering	3	0	0	3	EEE
4	20EE7T14	Instrumentation	3	0	0	3	EEE
5	20ME7T10	Green Engineering Systems	3	0	0	3	ME
6	20ME7T11	Hybrid Electric Vehicles	3	0	0	3	ME
7	20EC7T10	Data Communications	3	0	0	3	ECE
8	20EC7T11	Mechatronics	3	0	0	3	ECE
9	20EC7T12	Bio Medical Instrumentation	3	0	0	3	ECE
10	20CS7T10	Artificial Neural Networks	3	0	0	3	CSE
11	20CS7T11	Cyber Security	3	0	0	3	CSE
12	20CS7T12	Software Testing Methodologies	3	0	0	3	CSE
13	20IT7T10	Internet of Things	3	0	0	3	IT
14	20IT7T11	Computer Vision	3	0	0	3	IT
15	20HS7T01	Fuzzy sets	3	0	0	3	BED
16	20MB7T01	Digital Media management	3	0	0	3	DMS
17	20MB7T02	Entrepreneurship Development	3	0	0	3	DMS

18	20AD7T10	Data Analysis and Visualization with Python	3	0	0	3	AIDS
19	20AM7T10	NOSQL Databases	3	0	0	3	AIML

OPEN ELECTIVE –IV:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE7T15	Waste water treatment	3	0	0	3	CE
2	20CE7T16	Repair and Rehabilitation of Concrete Structures	3	0	0	3	CE
3	20EE7T15	Power Quality	3	0	0	3	EEE
4	20EE7T16	Electric Vehicles	3	0	0	3	EEE
5	20ME7T12	Micro-Electro- Mechanical Systems	3	0	0	3	ME
6	20ME7T13	Solar Energy Systems	3	0	0	3	ME
7	20EC7T13	Introduction to Embedded Systems	3	0	0	3	ECE
8	20EC7T14	Internet of Things	3	0	0	3	ECE
9	20EC7T15	Analog and Digital IC applications	3	0	0	3	ECE
10	20CS7T13	Data Analytics	3	0	0	3	CSE
11	20CS7T14	Block Chain Technology	3	0	0	3	CSE
12	20CS7T15	Software Project Management	3	0	0	3	CSE
13	20IT7T13	Cloud Computing	3	0	0	3	IT
14	20IT7T14	Business Intelligence	3	0	0	3	IT
15	20HS7T02	Polymer Chemistry	3	0	0	3	BED
16	20MB7T03	Total Engineering Quality Management	3	0	0	3	DMS
17	20MB7T04	Stress Management	3	0	0	3	DMS
18	20AD7T11	Natural Language Processing	3	0	0	3	AIDS
19	20AM7T11	Deep Learning	3	0	0	3	AIML

HONORS/MINOR COURSES OFFERED BY THE DEPARTMENT

Honors/ Minor Course Fulfillments:

- The 20 additional credits need to be acquired, 16 credits can be earned by undergoing specified courses, with each carrying 4 credits.
- The remaining 4 credits must be acquired through two online MOOCs (SWAYAM /NPTEL), which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of Studies.
- Minor Engineering subjects are offered to other branches by IT Department (except for IT Students).
- Honors engineering subjects are offered to IT Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (SWAYAM/NPTEL).

MINOR COURSES

S.No.	Course code	Course Name	L	T	P	C	Offered by
1	20ITMN01	Computer Organization	3	1	0	4	IT
2	20ITMN02	Operating Systems	3	1	0	4	IT
3	20ITMN03	Database Management Systems	3	1	0	4	IT
4	20ITMN04	Internet of Things	3	1	0	4	IT
5	20ITMN05	E-Commerce	3	1	0	4	IT
6	20ITMN06	Web Technologies	3	1	0	4	IT
7	20ITMN07	MOOC1	-	-	-	2	IT
8	20ITMN08	MOOC2	-	-	-	2	IT

B.TECH I SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20IT1T01 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

Pre-requisite: Basic knowledge about matrices, differentiation and integration

Course Objective: Objective of the course is to impart

- Basic understanding of mathematical methods to solve simultaneous linear systems
- Understanding of formation and solutions of ordinary differential equations
- Knowing the mathematical methods to solve applications of differential equations

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the knowledge to solve a system of homogeneous and non homogeneous linear equations

CO2: Illustrate the methods of computing eigen values and eigen vectors

CO3: Able to analyze the real life situations, formulate the differential equations and then applying the methods

CO4: Determine the solutions of linear differential equations

CO5: Optimize functions of several variables and able to find extreme values of constrained functions

SYLLABUS

UNIT-I: Linear systems of equations:

Rank of a matrix, Echelon form, Normal form, PAQ is in normal form, linear dependence and independence of vectors, Consistency of linear system of equations, System of linear homogeneous equations, Gauss-elimination and Gauss -Jordan methods.

UNIT-II: Eigen values & Eigen vectors:

Eigen values, Eigen vectors, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), finding inverse and powers of a matrix using C-H theorem, Reduction to diagonal form, reduction of quadratic form to canonical form using orthogonal reduction, nature of quadratic forms.

UNIT-III: Ordinary Differential Equations of first order:

Linear equations, Bernoulli's equation, Exact differential equations. Equations reducible

to exact equations, **Applications:** Orthogonal Trajectories, Newton's Law of cooling, Rate of decay & growth, R-L series circuits.

UNIT-IV: Linear Differential Equations higher order:

Definitions, Complete solution (without proof), Operator D, Rules to find complementary function, Inverse operator, Rules to find the particular integral(nonhomogeneous term of the form e^{ax}, sin(ax+b), cos(ax+b), polynomials in x^m, $e^{ax}V(x)$, any other function), Method of variation of parameters.

UNIT-V: Partial Differentiation:

Functions of two variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Jacobian and functional dependence, Taylor's theorem for functions of two variables. **Applications:** Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

3. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
4. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH I SEMESTER **BSC**

L	T	P	C
3	0	0	3

20IT1T02 APPLIED CHEMISTRY

Pre-requisite: Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the availableresources

Course Objective: Objective of the course is to impart

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of green chemistry and molecular switches

Course Outcomes: At the end of the course, student will be able to

CO1: Analyze the different types of composite plastic materials and interpret the mechanism ofconduction in conducting polymers.

CO2: Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning newengineering products and categorize the reasons for corrosion and study methods to control corrosion.

CO3: Synthesize nanomaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystalsand superconductors.

CO4: Design models for energy by different natural sources. Analyze the principles of different analytical instruments and their applications.

CO5: Obtain the knowledge of green chemistry and molecular machines

SYLLABUS

UNIT-I: Polymer Technology

Polymerisation: Introduction, methods of polymerization (addition and Condensation), Physical and mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers: Natural rubber-Drawbacks-vulcanization, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics – GFRP and Aramid FRP

Conducting polymers: Intrinsic and extrinsic conducting polymers

Biodegradable polymers: preparation and applications

UNIT-II: Electrochemical Cells And Corrosion

Part I: ELECTROCHEMICAL CELLS: Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode,calomel electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Part II: Corrosion: Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings (cathodic coatings, anodic coatings, electroplating and electroless plating)

UNIT-III: Material Chemistry

Part I: Non-elemental semiconducting materials: Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling technique) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Super conductors:-Type –I, Type II-characteristics and applications

Part II: Nano materials: Introduction, sol-gel method, characterization by (Brunauer Emmet Teller[BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]),applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals: Introduction-types-applications.

UNIT-IV: Non-Conventional Energy Sources & Spectroscopy

Part I: NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Part II: **SPECTROSCOPY**

UV spectroscopy- Basic principle-Instrumentation-Applications

IR spectroscopy- Basic principle-Instrumentation-Applications

NMR spectroscopy- Basic principle-Instrumentation-Applications

UNIT-V: Advanced Concepts/Topics In Chemistry

Part-I: Green chemistry: Introduction, Principles of green chemistry, Green synthesis-Aquaeous Phase method-Microwave method-Phase transfer catalysis method, R4M4 principles (Econoburette).

PART-II: Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid- base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor.

Text Books:

1. P.C. Jain and M. Jain “Engineering Chemistry”, 15/e, Dhanpat Rai & Sons, Delhi,(Latest edition).
2. Shikha Agarwal, “Engineering Chemistry”, Cambridge University Press, New Delhi,(2019).
3. S.S. Dara, “A Textbook of Engineering Chemistry”, S.Chand & Co, (2010).
4. Shashi Chawla, “Engineering Chemistry”, Dhanpat Rai Publicating Co. (Latest edition).

References:

1. K. Sesha Maheshwaramma and Mridula Chugh, “Engineering Chemistry”, Pearson India
2. O.G. Palana, “Engineering Chemistry”, Tata McGraw Hill Education Private Limited,(2009).
3. CNR Rao and JM Honig (Eds) “Preparation and characterization of materials” Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, “Textbook of Nanoscience and Nanotechnology”,University press (latest edition)

B.TECH I SEMESTER	HSMC	L	T	P	C
		3	0	0	3

20IT1T03 ENGLISH

Pre-requisite:

Course Objective:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: At the end of the course, student will be able to

CO1	understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
CO2	ask and answer general questions on familiar topics
CO3	employ suitable strategies to master the art of letter writing and email writing
CO4	recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
CO5	form sentences using proper grammatical structures and correct word forms

SYLLABUS

UNIT-I	A Drawer full of happiness (Detailed Study) Deliverance (Non-detailed Study)
UNIT-II	Nehru's letter to his daughter Indira on her birthday(Detailed Study) Bosom Friend (Non-detailed Study)
UNIT-III	Stephen Hawking-Positivity 'Benchmark' (Detailed Study) Shakespeare's Sister(Non-detailed Study)
UNIT-IV	Liking a Tree, Unbowed: Wangari Maathai-biography (Detailed Study) Telephone Conversation(Non-detailed Study)

UNIT-V Stay Hungry-Stay foolish (Detailed Study)
Still I Rise(Non-detailed Study)

Text Books

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The Individual Society", Pearson Publications.(Non-detailed)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

		L	T	P	C
B.TECH I SEMESTER	**ESC**	**1**	**0**	**4**	**3**

20IT1L04 COMPUTER ENGIENERING WORKSHOP

Course Objectives:

Skills and knowledge provided by this subject are the following:

- **PC Hardware:** Identification of basic peripherals, Assembling a PC, Installation of system software like MS Windows, device drivers, etc. Troubleshooting of PC Hardware and Software issues.
- **Internet & World Wide Web:** Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber attacks.
- **Productivity Tools:** Understanding and practical approach of professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite office tools.

Course Outcomes:

CO1: Identify, assemble and update the components of a computer

CO2: Configure, evaluate and select hardware platforms for the implementation and execution of computer applications, services and systems

CO3: Make use of tools for converting pdf to word and vice versa

CO4: Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, HTML, LaTex

LIST OF EXERCISES

Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.

Task 2: Practicing disassembling and assembling components of a PC

Task 3: Installation of Device Drivers, MS Windows, Linux Operating systems and Disk Partitioning, dual boating with Windows and Linux.

Task 4: Introduction to Memory and Storage Devices, I/O Port, Assemblers, Compilers, Interpreters, Linkers and Loaders.

Task 5: Demonstration of Hardware and Software Troubleshooting

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DSL, and Dialup Connection.

Task 7: Surfing the Web using Web Browsers, Awareness of various threats on the Internet and its solutions, Search engines and usage of various search engines, Need of anti-virus, Installation of anti-virus, configuring personal firewall and windows update.

(Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and popup blockers)

Productivity Tools:

Task 8: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Task 9: Demonstration and Practice of various features of Microsoft Word

Assignment:

1. Create a project certificate.

2. Creating a news letter

Features to be covered:-Formatting Fonts, Paragraphs, Text effects, Spacing, Borders and Colors, Header and Footer, Date and Time option, tables, Images, Bullets and Numbering, Table of Content, Newspaper columns, Drawing toolbar and Word Art and Mail Merge in word etc.,

Task 10: Demonstration and Practice of various features Microsoft Excel

Assignment: 1. Creating a scheduler

2. Calculating GPA

3. Calculating Total, average of marks in various subjects and ranks of students based on marks

Features to be covered:Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel, Charts, Renaming and Inserting worksheets, etc.,

Task 11: Demonstration and Practice of various features Microsoft Power Point

Features to be covered:Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks Tables and Charts, Master Layouts, Types of views, Inserting – Background, textures, Design Templates, etc.,

Task 12: Demonstration and Practice of various features LaTeX – document preparation, presentation (Features covered in Task 9 and Task 11 need to be explored in LaTex)

Task 13: Tools for converting word to pdf and pdf to word

Task 14: Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Reference Books:

1. Computer Fundamentals, Anita Goel, Pearson India Education, 2017

2. PC Hardware Trouble Shooting Made Easy, TMH

3. Introduction to Information Technology, ITL Education Solutions Limited, 2nd Edition, Pearson, 2020

4. Upgrading and Repairing PCs, 18th Edition, Scott Mueller, QUE, Pearson, 2008

5. LaTeX Companion – Leslie Lamport, PHI/Pearson

6. Introducing HTML5, Bruce Lawson, Remy Sharp, 2nd Edition, Pearson, 2012

7. Teach yourself HTML in 24 hours, By Techmedia

8. HTML 5 and CSS 3.0 to the Real World by Alexis Goldstein, Sitepoint publication.

9. Internet of Things, Technologies, Applications, Challenges and Solutions, B K Tripathy, J Anuradha, CRC Press

10. Comdex Information Technology Course Tool Kit, Vikas Gupta, Wiley Dreamtech.

11. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme, CISCO Press, Pearson Education.

12. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N. B. Venkateswarlu, S. Chand Publishers

B.TECH I SEMESTER	ESC	L	T	P	C
		3	0	0	3

20IT1T05 PROBLEM SOLVING THROUGH C

Pre-requisite:

Course Objective:

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor. To assimilate about File I/O and significance of functions

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of programming

CO2: Understand and Apply loop construct for a given problem

CO3: Demonstrate the use pointers

CO4: Understand the use of functions and develop modular reusable code

CO5: Understand File I/O operations

SYLLABUS

UNIT-I:

INTRODUCTION TO COMPUTERS: Functional Components of computer, computer software, categories of memory, types of programming languages, Development of algorithms, flow charts, software development process, Computer Numbering system

BASICS OF C PROGRAMMING: Introduction to programming paradigms, Structure of C program, Data Types, C Tokens, Operators: Precedence and Associativity, Expressions Input/output statements, Assignment statements

UNIT-II:

Decision making statements: if, if else, nester if. Multi way decision making statements: else if, Switch statement. **Loop statements**: while, do while, for, Compilation process.

UNIT-III:

Introduction to Arrays: Declaration, Initialization, One dimensional array, Example Programs on one dimensional array, Selection sort, linear and binary search, two

dimensional arrays, Matrix Operations, Multi-dimensional Arrays

Strings: Declaration, String operations: length, compare, concatenate, copy, String handling functions.

UNIT-IV:

FUNCTIONS: Introduction to functions: Function prototype, function definition, function call, Built-in functions, Recursion, Storage classes, Passing Arrays & Strings to the functions, Preprocessor directives

POINTERS: Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers, Parameter passing: Pass by value, Pass by reference, Dynamic Memory Allocation

UNIT-V:

STRUCTURES AND UNIONS: Structure, Nested structures, Pointer and Structures, Array of structures, Example Program using structures and pointers, Self-referential structures, Unions.

FILE PROCESSING: Files, Types of file processing: Sequential access, Random access, Sequential access file, Random access file, Command line arguments

Text Books:

1. Krnighan. B.W and Ritche, D.M, “The C Programming Language”, Second Edition, Pearson Education, 2006

2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.

References:

1. Pradepdey, Manas Ghosh, “Fundamentals of Computing and programming in C”, First Edition, Oxford University Press, 2009.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh Edition, Pearson Publication.
3. E Balagursamy, “Programming in C, Sixth Edition, Tata McGraw Hill.
4. Ajay Mittal, “Programming in C A practical Approach”, Pearson education

		L	T	P	C
B.TECH I SEMESTER	**HSMC**	**0**	**0**	**3**	**1.5**

20IT1L06 ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

- Facilitate effective usage of functional English through role plays
- Focus on vocabulary enhancement
- Foster various nuances of phonetics and accent neutralization

Course Outcomes: At the end of the course, student will be able to

CO1: Acquire basic proficiency in English by learning functional aspects of English language

CO2: Learn the methods of enhancing vocabulary

CO3: Acquaint himself/herself with nuances of Phonetics

LIST OF EXPERIMENTS

1 Greetings and Introductions
2 Requesting Permission & Giving Directions
3 Inviting/Complaining/Congratulating
4 Root Words
5 Phonetics-Sounds and Symbols
6 Pronunciation Rules

References:

1. Strengthen Your Steps, Maruti Publications

2. Interact, Orient Blackswan

3. Word Power Made Easy, Pocket Books

		L	T	P	C
B.TECH I SEMESTER	**BSC**	**0**	**0**	**3**	**1.5**

20IT1L07 APPLIED CHEMISTRY LAB

Pre-requisite: Acquire some experimental skills.

Course Objective: Objective of the course is to impart

- The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations.
- A few instrumental methods of chemical analysis.

Course Outcomes:

At the end of the course, student will be able to

CO1: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

LIST OF EXPERIMENTS

1 Determination of HCl using standard Na_2CO_3 solution.

2 Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.

3 Determination of Mn^{+2} using standard oxalic acid solution.

4 Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.

5 Determination of Cu^{+2} using standard hypo solution.

6 Determination of temporary and permanent hardness of water using standard EDTA solution.

7 Determination of Fe^{+3} by a colorimetric method.

8 Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).

9 Determination of iso-electric point of amino acids using pH-metry method/conductometric method

10 Determination of the concentration of strong acid vs strong base (by conductometric method).

11 Determination of strong acid vs strong base (by potentiometric method).

12 Determination of Mg^{+2} present in an antacid.

13 Determination of $CaCO_3$ present in an egg shell.

14 Estimation of Vitamin C.

15 Determination of phosphoric content in soft drinks.

16 Adsorption of acetic acid by charcoal.

17 Preparation of nylon-6, 6 and Bakelite (demonstration only).

		L	T	P	C
B.TECH I SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20IT1L08 PROBLEM SOLVING THROUGH C LAB

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers &functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

- Demonstrate Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.

2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( )function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name
3. Write a program in C to remove a file from the disk.

		L	T	P	C
B.TECH I SEMESTER	**MC**	2	-	-	-

20IT1M09 : ENVIRONMENTAL SCIENCE

Course objective:

To understand the importance of Environment and the importance of biodiversity

Course outcomes:

- The importance of environment, Natural resources and current global environmental challenges for the sustenance of the life on planet earth.
- The concepts of the ecosystem and its function in the environment.
- 3.The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- The various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices.
- The environmental legislations of India and Social issues and the possible means
- Environmental assessment and the stages involved in EIA.

SYLLABUS

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Introduction- Scope of Environmental Studies- Importance of Environmental Studies- Need for public awareness, Environmental ethics- Contemporary Environmentalists- Environmental Global moves: Stockholm conference, Earth summit

Concept of an ecosystem - Structure of an ecosystem- function of an ecosystem- Food chains, food webs- ecological pyramids- Energy flow in the ecosystem- Ecological succession- Nutrient cycling- 1^{o}production& 2^{o}production- Major ecosystems: Forest ecosystem- Grassland ecosystem, Desert ecosystem- Aquatic ecosystem: pond, Lake Ecosystem- Streams, river ecosystem, Oceans

UNIT-II: NATURAL RESOURCES AND CONSERVATION

Introduction and classification of natural resources-Forest resources**:** Use and over-exploitation- Deforestation-Timber extraction-Mining- Conservation-Water resources**:** Use and over utilization of surface and ground water,- Floods, drought, Dams and associated problems- Water conservation, rain water harvesting, water shed management-Energy resources**:** renewable energy sources –solar-wind-hydro-

tidal- Ocean thermal-geo thermal-bio mass-bio gas-bio fuels- Hydrogen.- Non-renewable energy sources-coal-petroleum-natural gas-Nuclear energy

UNIT-III: **BIODIVERSITY AND ITS CONSERVATION**

Definition, classification- Value of biodiversity-Threats to biodiversity: habitat loss, man-wildlife conflicts- Endangered and endemic species of India-Conservation of biodiversity- Biodiversity at national and local levels, Hot-sports of biodiversity

UNIT-IV: ENVIRONMENTAL PROBLEMS

Global warming, Climate change- Acid rain, Ozone depletion- Air pollution- Water pollution- Soil pollution- Noise pollution, Nuclear hazards- Solid Waste Management: Causes, Consequences and Control methods- Solid Waste Management- Population growth and explosion, effects, control measures- Pollution case studies- Role of an individual in prevention of pollution

UNIT-V: ENVIRONMENTALLEGISLATION & MANAGEMENT

Sustainable development- Air (Prevention and Control of Pollution) Act-Drawbacks-Water (Prevention and control of Pollution) Act- Drawbacks- Wildlife Protection Act-Drawbacks- Forest Conservation Act- Drawbacks- Environmental Protection Act-Drawbacks- Environmental Impact Assessment and its significance- Preparation of Environmental Management Plan and Environmental Impact Statement- Ecotourism

TEXT BOOKS:

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age Publications, New Delhi

2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada

3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCES:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Delhi

B.TECH II SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20IT2T01 TRANSFORM TECHNIQUES

Pre-requisite: Linear Algebra and Differential Equations

Course Objective: Objective of the course is to impart

- Learning the techniques of Laplace transforms to solve ordinary differential equations
- knowledge of Fourier series & Fourier transforms for piecewise continuous functions
- knowledge of solving boundary valued problems

Course Outcomes: At the end of the course, student will be able to

CO1: Able to analyze a class of integrals in terms of beta and gamma functions

CO2: Provide the techniques of Laplace transformations and able to solve problems related to digital signal processing

CO3: Analyze the general periodic functions in the form of an infinite convergent sine and cosine series

CO4: Illustrate the methods to solve the boundary value problems

CO5: Determine a solution of a discrete system using Z- transforms

SYLLABUS

UNIT-I: Special functions:

Beta function, Properties & problems, Gamma function, properties & problems, Relation between Beta and Gamma functions, Evaluation of improper integrals.

UNIT-II: Laplace Transforms (all properties without proofs):

Definition, Transforms of elementary functions, properties of Laplace transforms, Transforms of periodic functions, Transforms of derivatives and integrals, Multiplication by t^n, Division by t, Evaluation of improper integrals.
Inverse Laplace transforms–Method of partial fractions, other methods of finding inverse transforms, Convolution theorem (without proof). **Application:** Application to differential equations.

UNIT-III: Fourier Series & Fourier Transforms:

Euler's formulae (without proof), Conditions of Fourier expansion, Functions having points of discontinuity, Change of inerval, Even and odd functions, Half-range series. Fourier Integral theorem (without proof), Fourier cosine & sine integral, complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, properties of Fourier transforms (without proof), Convolution theorem(without proof), finite & infinite Fourier sine & cosine transforms.

UNIT-IV: Partial Differential Equations:

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of Variables, Applications: One-dimensional wave and heat equations, two-dimensional heat equation.

UNIT-V: Z-Transforms: (all properties without proofs)

Introduction, definition, some standard z-transforms, linearity property, damping rule, some standard results, shifting U_n to the right, multiplication by n, initial and final value theorems, Inverse z-transforms, convolution theorem, evaluation of inverse z-transforms by partial fractions, applications to difference equations.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH II SEMESTER **BSC**

L	T	P	C
3	0	0	3

20IT2T02 APPLIED PHYSICS

Pre-requisite: Knowledge of basic concepts of waves, Optics, Electricity and Magnetism

Course Objective: Objective of the course is to impart

- ***Knowledge*** of fundamentals of Physics which helps them in the study of advanced topics of Engineering.
- ***Develop*** analytical capability and understand various Engineering concepts.

Course Outcomes:

At the end of the course, student will be able to

CO1: ***Impart*** knowledge of Physical Optics phenomenon Polarization and identify these phenomenon in natural processes

CO2: ***Gain*** knowledge of applications of lasers and optical fibers in various fields .

CO3: ***Classify*** magnetic and dielectric materials and their Engineering applications.

CO4: ***Understand*** basic quantum mechanics and free electron theories.

CO5: ***Obtain*** the concept of concept of holes and electrons in semiconductors.

SYLLABUS

UNIT-I: Wave Optics:

Interference*:* Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Colors in thin films-Newton's rings-Determination of wave length nd refractive index.

Diffraction: C Introduction- Fresnel and Fraunhofer diffraction - Fraunhofer Diffraction due to Single slit, Double slit, N –slits(Qualitative) - Diffraction Grating – Resolving Power of Grating(Qualitative).

Polarizations: Introduction- Types of polarization-polarization by reflection, refraction and Double refraction-Nicol's prism –Half and Quarter wave plates.

UNIT-II: Lasers and Fiber Optics:

Lasers:: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber-Construction- - Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes .

UNIT-III: Magnetic and Dielectric Materials:

Magnetic Materials: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para ferro, anti ferro & ferri – Domain concept of Ferromagnetism(Qualitative) - Hysteresis – soft and hard magnetic materials .

Dielectric Materials: Introduction - Dielectic polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation.

UNIT-IV: Quantum Mechanics,Free Electron Theory:

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of States(3D),Fermi energy.

UNIT-V: Band Theory of Solids and Semiconductors:

Band theory of Solids: Introduction- Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - V vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Semiconductors::Introduction– Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Drift and Diffusion currents – Einstein's equation-Hall effect- Hall coefficient - Applications of Hall effect.

Text Books

1. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G. Kshirsagar - S. Chand Publications, 2019.
2. "Engineering Physics" by D.K. Bhattacharya and Poonam Tandon, Oxford press (2015).

3. “Engineering Physics” by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference Books

1. Applied Physics by P.K. Palanisamy, Scitech publications (2014).
2. Engineering Physics by M. Arumugam, Anuradha Publication (2014).
3. Physics for Engineers by M.R. Srinivasan, New Age international publishers (2009).

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20IT2T03 DIGITAL LOGIC DESIGN

Course Objectives:

- To represent numbers and conversion between different representations.
- To analyze logic processes and implement logical operations.
- To develop the combinational logic circuits.
- To design and analyze the concepts of sequential circuits.
- To understand concept of programmable logic devices like PROM, PLA,PAL.

Course Outcomes

CO1: Understand different number systems and their conversions.
CO2: Analyze the logical operations and Boolean algebra
CO3: Develop combinational circuits and perform logical operations.
CO4: Design the sequential logic functions.
CO5: Know finite state machines and different programmable logic devices.

SYLLABUS

UNIT I

Number Systems: Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r‘s Complement- (r-1)‘s Complement- Subtraction of Unsigned Numbers- Problems- Signed Binary Numbers- Weighted and Non weighted codes.

UNIT II

Logic Gates and Boolean Algebra: Basic Gates- Universal Gates- Ex-Or and Ex-Nor Gates- SOP- POS- Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- K Map Method- Minimization of Boolean Functions.

UNIT III

Combinational Logic Circuits: Design of Half Adder- Full Adder- Half Subtractor- Full Subtractor- Ripple Adder, Carry Look Ahead adder and Subtractors- Design of Decoders- Encoders- Multiplexers- Demultiplexers- Priority Encoder- Code Converters- Magnitude Comparator. Cascading of Decoders & Multiplexers

Introduction to Programmable Logic Devices (PLDs): PLA- PAL- PROM- Realization of Switching Functions Using PROM- Comparison of PLA, PAL and PROM.

UNIT IV

Introduction to Sequential Logic Circuits: Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear).

Registers and Counters: Design of Registers- Control Buffer Registers- Bidirectional Shift Registers- Universal Shift Register- Design of Ripple Counters- Synchronous Counters and Variable Modulus Counters- Ring Counter- Johnson Counter.

UNIT V

Finite state Machine: Analysis of clocked sequential circuits- state diagrams- state tables- design procedures- Realization of circuits using various flip-flops- ASM- Meelay to Moore conversion and vice-versa.

TEXT BOOKS

1. Digital Design, M.Morris Mano, Michael D Ciletti, 4thEdition,PEA,2003.
2. Fundamentals of Logic Design, Roth, 5thEdition,Cengage2004

REFERENCE BOOKS

1. Switching and Finite Automata Theory,Kohavi, 3rd Edition, Jha, Cambridge2005
2. Digital Logic Design, Leach, Malvino, Saha,TMH,2000.

		L	T	P	C
B.TECH II SEMESTER	**ESC**	**3**	**0**	**0**	**3**

20IT2T04 DATA STRUCTURES

Course Objectives:

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

CO1: Understand the properties, interfaces, and behaviors of basic abstract data types.

CO2: Understand and apply linked lists

CO3: Apply Stacks and Queue data structures.

CO4: Demonstrate different methods for traversing trees.

CO5: Demonstrate the application of Graphs

SYLLABUS

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal, Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications- Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees sing Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

1. Data Structures Using C. 2ndEdition. Reema Thareja, Oxford.
2. Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

1. Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2. Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3. Data Structures with C, Seymour Lipschutz TMH

		L	T	P	C
B.TECH II SEMESTER	**ESC**	**3**	**0**	**0**	**3**

20IT2T05 PYTHON PROGRAMMING

Course Objectives:

- Identify/characterize/define a problem
- Design a program to solve the problem
- Create executable code
- Read most Python code

Course Outcomes:

CO1: Understand the fundamentals of Python programming language.

CO2: Understand Data Structures

CO3: Understand the use of functions in Python

CO4: Understand the Object-Oriented Programming concepts of Python

CO5: Apply regular expressions for different situations.

SYLLABUS

UNIT – I:

Introduction: History of Python, Need of Python Programming, Applications of Python Programming Variables, Assignment, Keywords, Input-Output, Indentation.

Types, Operators, and Expressions: Types – Integers, Strings, Booleans; Operators-Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while break, continue, pass

UNIT – II:

Data Structures Lists – Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT – III:

Functions – Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function-Global and Local Variables. Modules: Creating modules, import statements, from. The import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT – IV:

Object-Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error, and Exceptions: Difference between an error and Exception, Handling Exception, try except for block, Raising Exceptions, User Defined Exceptions

UNIT – V:

Regular expressions: Power of pattern matching and searching using regex in python, Meta characters and Sequences used in Patterns, Password, email, URL validation using regular expression, Pattern finding programs using regular expression.

Text Books:

1. Learning Python, Mark Lutz, Orielly
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19- 948017-3, Oxford University Press, 2017.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. "Python in easy steps In Easy Steps", Mike MC Grath, illustrated edition, In easy steps 2013 publishers.
5. Professional Python Frameworks: Web 2.0 Programming, Dana Moore, Raymond Budd, William Wright, Wrox Publication, ISBN: 978-0-470-13809-0, October 2007.

		L	T	P	C
B.TECH II SEMESTER	**BSC**	**0**	**0**	**3**	**1.5**

20IT2L06 APPLIED PHYSICS LAB

Pre-requisite: Fundamental understanding of usage of an instrument with proper care.

Course Objective: Objective of the course is to impart

- Training Engineering graduates to handle instruments and their usage methods to improve the accuracy of measurements.

At the end of the course, student will be able to

CO1: **Outcomes**: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

CO2: Implement the basic principles of Mechanics to measure different physical parameters.

CO3: Enhance the knowledge of Usage of electronic devices in various applications

SYLLABUS

1. Newton's rings –Determination of radius of curvature of Plano Convex Lens.
2. Determination of wavelength of spectral lines -Diffraction Grating
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of wavelength of laser source using diffraction grating
5. Determination of Numerical Aperture and bending loss of a given Optical Fiber.
6. Determination of dispersive power of prism.
7. Determination of Rigidity modulus of a material- Torsional Pendulum.
8. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
9. Determination of Young's modulus by method of single cantilever oscillations
10. Verification of laws of vibrations in stretched strings – Sonometer.
11. Estimation of Planck's Constant using Photo electric Effect

12. Study of I /V Characteristics of Semiconductor diode.
13. I/V characteristics of Zener diode.
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
15. Energy Band gap of a Semiconductor using p - n junction diode

Reference Books

1. A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers, 2017.

		L	T	P	C
B.TECH II SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20IT2L07 DATA STRUCTURES LAB

Course Objectives:

The objective of this lab is to

- Demonstrate the different data structures implementation.

Course Outcomes:

- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

List of Experiments:

Exercise -1 (Searching)

a) Write C program that use both recursive and non-recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non-recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order.

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order.

Exercise -3 (Sorting-II)

a) Write C program that implement radix sort, to sort a given list of integers in ascending order

b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4 (Singly Linked List)

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion operation on a singly linked list

c) Write a C program that uses functions to perform deletion operation on a singly linked list

d) Write a C program to reverse elements of a single linked List.

Exercise -5 (Queue)

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists

Exercise -6 (Stack)

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

c) Write C program for implementing infix to postfix conversion

d) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7 (Binary Tree)

Write a recursive C program for traversing a binary tree in preorder, in-order and post-order.

Exercise -8 (Binary Search Tree)

a) Write a C program to Create a BST

b) Write a C program to insert a node into a BST.

c) Write a C program to delete a node from a BST.

Exercise-9

Write a program for implementing Heap Sort.

		L	T	P	C
B.TECH II SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20IT2L08 PYTHON PROGRAMMING LAB

Course Objectives:

The objective of this lab is to

- To elucidate problem solving through python programming language.
- To introduce function-oriented programming paradigm through python.
- To train in development of solutions using modular concepts.
- To teach practical Python solution patterns

Course Outcomes

CO1: Develop fundamental programs in python programming language.

CO2: Develop Python programs for numerical and text-based problems.

CO3: Develop Python programs on object-oriented programming and regular expressions.

CO4: Develop python programs on data structures.

LIST OF EXPERIMENTS

1. Write a program to perform various list of operations (eg: Arithmetic, logical, bitwise etc) in python.
2. Write a program to implement control flow statements.
3. Write a program implementing various predefined function of Lists, Sets, Tuples and Dictionaries.
4. Write a program covering various arguments for a function.
5. Write a program to implement various types of functions.
6. Write a program to implement recursion.
7. Write a program to implement command line arguments.
8. Write a program to create a class and its constructors.
9. Write a program to implement inheritance.
10. Write a program for exception handling.
11. Write a program to perform various linear algebra operations like finding eigen values and vectors, determinant and trace for a matrix.
12. Write a program to perform matrix operations like addition, subtraction, multiplication of matrices using Numpy Module.

13. Write a program to use System, math etc., packages.
14. Write a Python program to find the occurrence and position of the substrings within a string.
15. Write a Python program to replace all occurrences of space, comma, or dot with a colon.
16. Write a Python program to match a string that contains only upper and lowercase letters, numbers, and underscores.

B.TECH III SEMESTER	BSC	L	T	P	C
		3	0	0	3

20IT3T01 NUMERICAL METHODS AND VECTOR CALCULUS

Course objectives:

- Understand the basic numerical methods to solve simultaneous linear equations
- Knowledge of numerical methods to solve ordinary differential equations
- The types of integration over the lines, surfaces & volumes

Course Outcomes:

By the end of the course students will be able to

CO1: Determine the solution of transcendental equations by different numerical methods

CO2: Provide the interpolation techniques which analyze the data of an unknown function

CO3: Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries

CO4: Evaluate areas and volumes using double & triple integrals.

CO5: Apply the concepts of calculus to scalar and vector fields and establish the relation between line, surface and volume integrals.

SYLLABUS

UNIT I: Numerical Solution of Equations:

Solution of Algebraic and transcendental equations: Bisection method, Method of false position and Newton-Raphson method. Iterative methods of solution of linear simultaneous equations: Jacobi's and Gauss-Seidel iteration methods.

UNIT II: Interpolation:

Forward and backward, relation between these operators, Differences of a polynomial, Interpolation with unequal intervals: Lagrange's interpolation formula, Newton's forward & backward interpolation formulae & problems.

UNIT III: Numerical Integration & Numerical Solutions of ordinary differential equations with initial conditions:

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rules.

Numerical Solution of ODE: Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method of 4^{th} order.

UNIT IV: Multiple Integrals:

Double integrals in Cartesian & polar coordinates, Change of order of integration, Triple integrals, Change of variables (Cartesian to Polar, Rectangular coordinates to Cylindrical & Rectangular coordinates to Spherical polar coordinate systems). **Applications:** Area enclosed by plane curves, Volume of solids.

Unit-V: Vector Differentiation & Vector Integration:

Introduction, Scalar and Vector point functions, Del applied to scalar point functions-Gradient, directional derivatives, Del applied to vector point functions-Div& Curl, physical interpretation of div & curl, Del applied twice to point functions, Del applied to products of point functions (Identities without proofs).

Line integral, Green's theorem in the plane (without proof), Surface integrals, Stoke's theorem (without proof), Volume integral, Gauss Divergence theorem (without proof).

Text Books:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014.
2. **B. V. RAMANA,** Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

3. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
4. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

		L	T	P	C
B.TECH III SEMESTER	**PCC**	**3**	**0**	**0**	**3**

20IT3T02 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- To learn the fundamentals of object-oriented programming.
- To implement object-oriented concepts using Java.
- To understand how to design object-oriented applications using Java.

Course Outcomes:

By the end of the course, the student will be able to

CO1: Understand the concepts of Object-Oriented Programming and Java programming constructs.

CO2: Demonstrate the concepts – Strings, Inheritance and Interfaces.

CO3: Build efficient and error-free codes using exception handling and demonstrate multi-threading.

CO4: Design GUI applications using Event Handling and Abstract Window Toolkit.

CO5: Develop real-time applications using Applets and Swings.

SYLLABUS

UNIT-I:

Introduction to OOP, procedural programming language vs. object-oriented language, principles of OOP, applications of OOP, history of java, java features, JVM. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting.

Control Statements: Introduction, if statement, Nested if statement, if–else statements, Ternary Operator, Switch Statement, **Iteration Statements:** while statement, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

Classes and objects: class declaration, creating objects, methods, method overloading, constructors and constructor overloading, garbage collector.

UNIT-II:

Basic Input-Output Operations. String, String Buffer and String Tokenizer classes.

Inheritance: types of inheritance, super keyword, final keyword, overriding and abstract class.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, importance of static keyword, this keyword, arrays, command line arguments, nested classes.

UNIT-III:

Packages and Java Library: creating and using packages, importance of CLASSPATH and java. Lang package.

Exception handling: importance of try, catch, throw, throws and finally block, user-defined exceptions, Assertions.

Multithreading: Introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. File Handling: Reading data from files and writing data to files, random access file.

UNIT-IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Event Delegation model, handling mouse and key board events, Adapter classes, inner classes.

AWT: Class hierarchy, user- interface components- labels, button, canvas, scrollbars, text components, checkbox, checkbox groups, choices, list panes-scroll pane, dialogs, menu bar, graphics, layout manager- layout manager types-boarder, grid, flow, card and grid bag.

UNIT-V

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swings: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing – J Applet, J Frame and J Component, Icons and Labels, text fields, buttons-The J Button class, Check boxes, Radio Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees and Tables.

TEXT BOOKS:

1. Herbert Schildt —Java The Complete Reference, 11th Edition, McGraw-Hill Education.
2. E Balagurusamy —Programming with Java: A Primer, 4th Ed, Tata McGraw Hill Education Pvt Ltd.

REFERENCE BOOKS:

1. Java Programming, K.Rajkumar. Pearson
2. Core Java, Black Book, R Nageswara rao, Wiley, Dream Tech
3. Core Java for Beginners, Rashmi Kanta Das, vikas.
4. Object Oriented Programming Through java, P. Radha Krishna, Universities Press.
5. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

B.TECH III SEMESTER	PCC	L	T	P	C
		3	0	0	3

20IT3T03 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases.

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models.

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS:

Unit – I:

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

Unit – II:

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

Unit – III: SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL.

Unit-IV: **Schema Refinement (Normalization):** Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.

Unit-V: Transaction Management and Concurrency Control: Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

Text Books:

1. Raghu rama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL” by Shashan k Tiwari, 2011, WROX Press.

Reference Books:

1. Peter Rob & Carlos Coronel, “Data base Systems design, Implementation, and Management”, 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, “Data base System Concepts”, 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
4. C.J.Date, “Introduction to Database Systems”, 7th Edition, Pearson Education, 2002.

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20IT3T04 SOFTWARE ENGINEERING

Course Objectives

- Gain knowledge about software process models.
- Familiarize the basic software engineering methods, practices and its applications.
- Facilitate students in software design.

Course Outcomes

CO1: Understand the software life cycle models.
CO2: Understand the scrum approach to agile project management.
CO3: Analyze the software requirements and generate SRS document.
CO4: Understand some of the different models that may be used to design.
CO5: Understand various software testing approaches and quality control to ensure good quality software.

SYLLABUS

UNIT – I

INTRODUCTION TO SOFTWARE ENGINEERING: Nature of software, Software engineering, The Software Processes, Software Myths.

PROCESS MODELS: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialised Process models, The Unified Process, Personal and Team Process Models.

UNIT – II

REQUIREMENTS ENGINEERING: Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

REQUIREMENTS MODELLING: Requirement Analysis, Scenario-Based Modelling, Data Modelling Concepts, Class-Based Modelling.

UNIT – III

DESIGN CONCEPTS: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

UNIT – IV

Understanding of UML diagrams: Structural diagrams - class diagram, object diagram, component diagram, deployment diagram, Behavioural diagrams - Use-case diagram, activity diagram, sequence diagram, collaboration diagram, state chart diagram.

UNIT – V

IMPLEMENTATION: Structured coding Techniques, Coding Styles-Standards and Guidelines, Implementation Issues.

SOFTWARE TESTING STRATEGIES: A Strategic approach to Software Testing, Strategic Issues and Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing, Software Quality concepts.

TEXT BOOKS:

1. Roger S. Pressman (2010), Software Engineering, A Practitioner's Approach, 7th Edition, McGraw-Hill International Edition, India.
2. Ian Sommerville (2011), Software Engineering, 9th Edition, Pearson education, India.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.Jim ConallenKelli A. Houston," Object-Oriented Analysis and Design with Applications", 3rd edition.

REFERENCES BOOKS:

1. Pankaj Jalote (2010), Software Engineering, A Precise Approach, Wiley India.
2. Waman S. Jawadekar (2008), Software Engineering: A Primer, McGraw-Hill, India.
3. Hans Van Vilet (2008), Software Engineering Principles and Practice, 3rd Edition, John Wiley & Sons Ltd.
4. Rajib Mall (2005), Fundamental of Software Engineering, PHI.
5. Deepak Jain, Software Engineering, Principles and Practices, Oxford, University Press, India.

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20IT3T05 COMPUTER ORGANIZATION

PREREQUISITES: Digital logic design

Course Objectives:

- To understand the design of various functional units and components of computers.
- Emphasizes basic organization, design, and programming of a simple digital computer.
- To explain the function of each element of a memory hierarchy.
- To identify and compare different methods for computer IO.

Course Outcomes:

CO1: Understand the architecture of a modern computer with its various processing units.

CO2: Understand RTL, micro-operations, instruction cycle.

CO3: Understand the features of hardwired and micro programmed control units.

CO4: Analyze the memory hierarchy system and performance improvement by cache memory.

CO5: Analyze the communication methods of I/O devices and standard I/O interfaces.

SYLLABUS:

UNIT I:

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation, Other Binary codes (Gray Code), Other decimal codes (BCD, Weighted code, Excess-3), Error Detection codes.

UNIT II:

Register Transfer and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT III:

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: Stack Organization**,** Instruction formats, Addressing modes, Data Transfer and Manipulation Instructions, Program control Instructions, RISC

UNIT IV:

Computer Arithmetic: Addition and subtraction, Booth multiplication Algorithm.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, virtual Memory, Memory Management hardware.

UNIT V:

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

Input - Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct memory Access, IOP, Serial Communication.

TEXT BOOKS

1. Computer Systems Architecture — M. Morris Mano, Pearson Education Publishers, 3rd edition.

REFERENCE BOOKS:

1. William Stallings, — Computer Organization and Architecture, 6th Edition Pearson/ PHI publishers.
2. Andrew S. Tanenbaum, —Structured Computer Organization, Pearson / PHI publishers,
   4th edition.
3. John D Carpinelli, — Computer Systems Organization and Architecture ‖, Pearson Education, 1st edition.
4. Carl Hamacher, ZvonkoVranesic, Safwat Zaky, — Computer Organization, TMH publications, 5th edition.

		L	T	P	C
B.TECH III SEMESTER	**PCC**	**0**	**0**	**3**	**1.5**

20IT3L06 **OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**

Course Objectives:

- Understand fundamentals of Object-Oriented Programming in java including defining classes, invoking methods using class libraries etc.,
- Demonstrate an understanding of graphical user interfaces, multi-threaded programming and event driven programming.

Course Outcomes: By the end of the course student will be able to

CO1: Implement java applications using OOP principles and proper program structuring.

CO2: Develop java programs using packages, inheritance and interfaces.

CO3: Implement error and exception handling techniques.

CO4: Design event driven GUI and real-time web related applications.

LIST OF EXPERIMENTS

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3 (Class, Objects)

Implement java programs using the concept of

a) Class mechanism. Create a class, methods and invoke them inside main method.

b) Constructor.

c) Constructor overloading.

b) Method overloading.

Exercise -4 (Inheritance)

Implement java programs using the concept of

a) Single Inheritance

b) Multilevel Inheritance

c) Abstract class

Exercise - 5 (Inheritance - Continued)

Implement java programs using the concept of

a)"super" keyword. b) Interfaces

Exercise – 6 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

Exercise – 7 (Exception)

Implement the programs by using the concepts of

a. Exception handling mechanism

b. Multiple catch clauses

c. Finally

d. Creating user defined exceptions

Exercise – 8 (Threads)

a) Write a JAVA program that creates threads by extending Thread class. First thread displays "Good Morning" every 1 sec, the second thread displays "Hello" every 2 seconds and the third display "Welcome" every 3 seconds,(Repeat the same by implementing Runnable)

b) Write a program illustrating isAlive and join ()

c) Write a Program illustrating Daemon Threads.

Exercise – 9 (Packages)

a) Create a user defined package and demonstrate different ways of importing packages

Exercise - 10 (Applet)

a) Write a JAVA program to paint like paint brush in applet.

b) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise -11 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.

b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

		L	T	P	C
B.TECH III SEMESTER	**PCC**	0	0	3	1.5

20IT3L07 DATABASE MANAGEMENT SYSTEMS LAB

PREREQUISITES: -

Course Objectives:

- Populate and query a database using SQL - DDL/DML commands.
- Understand various advanced query executions such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.
- Develop solutions using PL/SQL for database applications using procedures, cursors and triggers

COURSE OUTCOMES:

1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation.
3. Develop solutions for database applications using procedures, cursors and triggers
4. Develop solutions using PL/SQL procedures.

LIST OF EXPERIMENTS

1. Introduction to SQL: DDL, DML, DCL, TCL.
2. Queries for Creating Tables with Constraints, Views.
3. Example SQL Queries using select.
4. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN).
5. Queries using Group By, Order By, and Having Clauses and Working with Index, Sequence, Synonym.
6. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.
7. Queries on Joins and Correlated Sub-Queries.
8. Write a PL/SQL Code using Basic Variable, Anchored declarations, and Usage of Assignment Operation.
9. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL.
10. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
11. Write a PL/SQL Code using Cursors, Exceptions and Triggers.
12. Write a PL/SQL Code using Procedures, Functions, and Packages.

Text Books:

1. ORACLE PL/SQL by example, Benjamin Rosen Zweig, Elena Silvestrova,

Pearson.

2. ORACLE database log PL/SQL programming SCOTT URMAN, TMH.
3. SQL and PL/SQL for ORACLE 10g, Black Book, Dr. P.S Deshpande.
4. Data Base Management System, Oracle SQL and PL/SQL, Pranab Kumar Das Gupta, P Radha Krishna, PHI.

		L	T	P	C
B.TECH III SEMESTER	**PCC**	**0**	**0**	**3**	**1.5**

20IT3L08 SOFTWARE ENGINEERING LAB

COURSE Objectives:

- To provide hands-on experience with different aspects of Software Engineering including requirements identification, implementation, testing, and so on.
- To draw DFD, behavioural and structural design using UML diagrams.

COURSE OUTCOMES:

CO1: Prepare SRS document, design document, test cases and software configuration management and risk management related document.

CO2: Develop function oriented and object-oriented software design using tools like rational rose.

CO3: Design and develop Test Cases for a system

CO4: Track the progress of a project using various tools.

LIST OF EXPERIMENTS

1. Create the problem statement for a specific system of relevance.
2. Perform requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. To carry out the function-oriented diagram: Data Flow Diagram (DFD) and Structured chart.
4. To draw UML diagrams.
5. To illustrate the test cases, test case preparation and perform Manual Tests.
6. Perform Estimation of effort using FP Estimation for chosen system.
7. To prepare time line chart/Gantt Chart/PERT Chart for selected software project

S. No	Case Study
1	Credit Card Processing
2	Stock Maintenance System
3	Online course reservation system
4	Recruitment system
5	Passport automation System
6	Online Exam Registration

Note: Students shall prepare a document related to all the above activities for at least three real time Case Studies listed below.

			L	T	P	C
B.TECH III SEMESTER		**SC**	**0**	**0**	**4**	**2**

20IT3S09 **BASIC WEB PROGRAMMING (Skill Oriented Course)**

Course Objectives:

- To acquire skills in developing web pages
- To understand the use of HTML and CSS in designing web pages
- To gain knowledge on Java Script for performing validations

Course Outcomes: By the end of this lab the student is able to

- Understand and use various HTML Tags and apply CSS
- Develop websites that include static pages
- Design Front end for Web Applications

List of Experiments

1) Exercises to demonstrate the use of Basic HTML tags.
2) Exercises to demonstrate Tables, Lists and Forms
3) Implement forms using HTML Frames and CSS
4) Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, lines and words in the text entered using an alert message. Words are separated with white space and lines are separated with new line character.
5) Write an HTML page that contains a selection box with a list of 5 countries In the above page when the user selects a country, its capital should be printed next to the list, and add CSS to customize the properties of the font of the capital.
6) Create a website using the HTML and CSS to create your personal portfolio.
7) Create a website using HTML and CSS for a Book Store.
8) Write a JavaScript to design a simple calculator to perform the operations: sum, product, difference and quotient
9) Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in HTML table format.
10) Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.

11) Demonstrate the Login page with userid and password validations.
12) Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:
    a. Parameter: A string Output: The position in the string of the left-most vowel
    b. Parameter: A number Output: The number with its digits in the reverse order
13) Write an HTML page with Javascript that takes a number from one text field in the range 0-999 and display it in other text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.

B.TECH III SEMESTER	**MC**	**L**	**T**	**P**	**C**
		2	**-**	**-**	**-**

20IT3M10 CONSTITUTION OF INDIA

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand historical background of the constitution making, importance for building a democratic India, features and principles of Indian Constitution.

CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO3: Understand the roles and powers of State Government and its Administration and value of the fundamental rights and duties for becoming good citizen of India.

CO4: Understand and analyze the decentralization of power between Union, State and Local self-Government and local administration.

CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission, UPSC, Welfare commissions for sustaining democracy.

SYLLABUS

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution -Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, CentreState relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, Rajya Sabha, The Supreme

Court and High Court: Powers and Functions;

UNIT III

State Government and its Administration Governor, Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV

A.Local Administration, District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy(Different departments),

Village level, Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V

Election Commission: Election Commission, Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.

2) Subash Kashyap, Indian Constitution, National Book Trust

3) J.A. Siwach, Dynamics of Indian Government & Politics

4) D.C. Gupta, Indian Government and Politics

5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

6) J.C. Johari, Indian Government and Politics Hans

7) J. Raj Indian Government and Politics

8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-sources:

1) nptel.ac.in/courses/109104074/8

2) nptel.ac.in/courses/109104045/

3) nptel.ac.in/courses/101104065/

4) www.hss.iitb.ac.in/en/lecture-details

5)www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

B.TECH IV SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20IT4T01 PROBABILITY AND STATISTICS

Course objectives:

- Computation of expectation and variance for probability distributions of a random variable
- Description of sampling, distribution of means, proportions & variances
- Knowledge of different distributions to test statistical hypothesis

Course Outcomes:

By the end of the course students will be able to

CO1: Understand random variables and discrete probability distributions

CO2: Determine probabilities based on practical situations using the normal distributions

CO3: Apply different distributions to compute confidence intervals

CO4: Test the hypothesis concerning means and proportions

CO5: Understand the concept of least square estimation linear regression

Syllabus:

UNIT I: Discrete Random variables and Distributions:

Introduction-Random variables- Discrete Random variable-Distribution function-Expectation-Moment Generating function-Moments and properties. Discrete distributions: Binomial and Poisson distributions.

UNIT II: Continuous Random variable and distributions:

Introduction-Continuous Random variable-Distribution function- Expectation-Moment Generating function-Moments and properties. Continuous distribution: Normal distributions, Normal approximation to Binomial distribution.

UNIT III: Sampling Theory:

Introduction - Population and samples- Sampling distribution of means (s known)-Central limit theorem- t-distribution- Sampling distribution of means (s unknown)-Sampling, distribution of variances, Point estimation- Maximum error of estimate -Interval estimation.

UNIT IV: Tests of Hypothesis:

Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors –Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences- ANOVA for one-way and two-way classified data.

UNIT V: Regression Analysis:

The method of Least squares, Curvilinear Regression, Multiple Regression, Correlation.

Text Books:

1. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition, PHI.
2. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8^{th} edition, Cengage.

Reference Books:

3. **ShronL.Myers, Keying Ye, Ronald E Walpole,** Probability and StatisticsEngineers and the Scientists,8th Edition, Pearson 2007.
4. **William Menden Hall, Robert J. Bever and Barbara Bever**, Introduction toprobability and statistics, Cengage learning, 2009.

B.TECH IV SEMESTER	ESC	L	T	P	C
		3	0	0	3

20IT4T02 DISCRETE MATHEMATICAL STRUCTURES

Course objectives:

- The validity or the strength of any particular argument or reasoning
- Knowledge of the theory of relations and functions
- Knowledge of types of graphs to apply in real life problems

Course Outcomes:

By the end of this course the student will be able to

CO1: Apply mathematical logic to design new programming languages

CO2: Illustrate the properties of sets and functions to design a modeling software system

CO3: Explain a structure of an algebra which is useful to understand the theory of sequential machines, formal languages and coding theory.

CO4: Apply the techniques of recursion for representing the data in the analysis of algorithms

CO5: Provide the knowledge of graphs such as trees which is useful in maintaining files and directories by Operating Systems.

SYLLABUS

UNIT-I: Mathematical Logic:

Introduction, Statements and Notation, Connectives and Truth tables, Normal forms, Theory of inference for Statement Calculus, The Predicate Calculus, Inference theory of Predicate calculus.

UNIT-II: Set Theory & Functions:

Introduction, Basic concepts of set theory, Principle of Inclusion and Exclusion, Properties of Binary relations, Relation matrix and Digraph, operations on relations, Partition and covering, Transitive closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, Bijective functions, Inverse functions, Composition of functions, Recursive functions, Pigeonhole principle and its applications.

UNIT-III: Algebraic Structures & Number Theory:

Algebraic systems and examples, general properties, semigroup, monoid, groups and subgroups. Properties of integers, Division algorithm, Greatest common divisor, Euclidean algorithm (without proof), Least common multiple, testing of prime numbers, The fundamental theorem of Arithmetic, Fermat's theorem and Euler's

theorem (without proofs) and its applications.

UNIT-IV

Recurrence Relations: Recurrence relations, solving recurrence relations by substitution, the method of characteristic roots, Solutions of Inhomogeneous recurrence relations.

UNIT -V:

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Coloring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

TEXT BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Mathematical Foundation for Computer science, S. Santha, E.V. Prasad, Cengage publications.

REFERENCE BOOKS:

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H.Rosen, 7th Edition, Tata McGraw Hill.
2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI.

B.TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20IT4T03 OPERATING SYSTEMS

Course Objectives

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes

CO1: Understand the importance, functions and structures of operating systems.

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

SYLLABUS

UNIT-I:

Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication.

UNIT-II:

Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multithreading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT-III:

Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures.

UNIT-IV:

Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock-Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Dead lock

UNIT-V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling.

Text Books

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley, 9thedition.(Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition–2005.(Unit-5)

Reference Books

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley ,Operating Systems: A Design-Oriented Approach, Tata Mc Graw Hill Education,1996

		L	T	P	C
B.TECH IV SEMESTER	**PCC**	**3**	**0**	**0**	**3**

20IT4T04 ADVANCED DATA STRUCTURES

Course Objectives:

- Describe variety of advanced data structures.
- Understand operations on various search trees.

Course Outcomes:

CO1: Illustrate several sorting algorithms.

CO2: Construct Priority queues such as min heap and max heap for the given data.

CO3: Apply various operations on AVL and Red Black trees

CO4: Build Multi-Way Search Trees and perform various operations.

CO5: Demonstrate various operations of Digital Search Structures and Multi-Way Trees.

Syllabus:

UNIT - I:

Sorting: Medians and order statistics, External Sorting: Introduction, K-way Merging, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs.

Hashing: Introduction, Hash Table, Hash Function, Types of Hashing: Linear Probing, Quadratic Probing, Double Hashing.

UNIT - II:

Priority Queues: Introduction, types of priority queues, implementation methods of priority queues, Applications of Priority queues,

Heaps: Binary heap: min heap and max heap, Applications of heap.

UNIT – III: Advanced and Efficient Binary Search Trees

Optimal Binary Search Trees: Red Black Trees Definition- Representation of a Red- Black Tree- Searching a Red-Black Tree- Inserting into a Red Black Tree- Deletion from a Red-Black Tree- Joining Red-Black Trees, Splitting a Red-Black tree.

Splay and Scapegoat Trees:

Scapegoat Tree-Definition-Insertion and Deletion operations, Splay tree-Definition-Insertion and Deletion operations.

UNIT - IV: Multi-way Trees

M-Way Search Trees: Definition and Properties, Searching an M-Way Search Tree, B-Trees, Definition and Properties, Number of Elements in a B-tree, Insertion into B-Tree, Deletion from a B-Tree, B+-Tree Definition, Searching a B+-Tree, Insertion into B+-tree, Deletion from a B+-Tree.

UNIT - V: Digital Search Trees and Multi - way Trees

Digital Search Trees: Definition, Search, Insert and Delete. Binary Tries, Compressed Binary Tries.

Multi-way Trees: Definition, searching a Tree, sampling strategies, Insertion, Deletion, Height of a Tree. Prefix Search and applications. Suffix Trees.

Text Books:

1. Richard F Gilberg, Behrouz A Forouzan, “Data Structures, a Pseudo code Approach with C”, Cengage Learning. (Unit 1,2,3,4 & 5)
2. Horowitz, Sahni, Anderson-Freed, “Fundamentals of Data Structures in C”, 2nd edition, University Press.

Reference Books:

1. Reema Thareja, S.RamaSree, “Advanced Data Structures“Oxford Higher Education.
2. Mark Allen Weiss, “Data structures and Algorithm Analysis in C”, Pearson, 2nd edition
3. Introduction to Algorithms”, T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.

		L	T	P	C
B.TECH IV SEMESTER	**HSMC**	**3**	**0**	**0**	**3**

20IT4T05 **MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

Course Objectives:

- The Learning objectives of this course are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product

CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs

CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units

CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis

CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

SYLLABUS

UNIT I: Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II: Theories of Production and Cost Analyses: Theories of Production function- Law of Variable Proportions - Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III: Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles: Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV: Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V: Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.

2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition

3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.

4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd

5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd

6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

		L	T	P	C
B.TECH IV SEMESTER	**ESC**	**0**	**0**	**3**	**1.5**

20IT4L06 R PROGRAMMING LAB

Course Outcomes:

CO1: Understand the use of operators in R

CO2: Use Data Structures to implement programs in R

CO3: Implement Mathematical functions in R

CO4: Understand reading and writing files

CO5: Analyze data from various sources

LIST OF EXPERIMENTS

Exercise 1: Implement programs in R to work with different types of operators

Exercise 2: Implement programs in R with data structures

Exercise 3: Implement programs in R using the concept of functions

Exercise 4: Working with simulation in R

Math functions

Calculus

Linear algebraic operations

Set operations

Exercise 5: Reading in your own data

Working with files

Accessing the keyboard and monitor

Exercise 6: Data visualization

Charts and plots

Exercise 7:

a) Program to implement simple and multiple linear regression.

b) Program to implement non- linear regression.

Exercise 8:

a) Program to implement logistic regression.

Exercise 9:

a) Program to perform ANOVA test (one-way, two way)

B.TECH IV SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20IT4L07 OPERATING SYSTEMS LAB

Course Objectives

- To develop the concepts of process and memory management techniques.
- To know the problems of deadlock and study the various handling mechanisms.
- To impart knowledge on developing shell scripts.

Course Outcomes

CO1: Implement CPU and disk scheduling algorithms.

CO2: Demonstrate memory management techniques.

CO3: Demonstrate algorithms for Deadlock Detection and prevention.

CO4: Develop shell scripts in order to perform shell programming.

List of Experiments

1. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF
2. Simulate the following CPU scheduling algorithms
   a) Priority b) Round Robin
3. Simulate MVT and MFT
4. Simulate the following page replacement algorithms
5. Simulate the following page replacement algorithms
6. Implement FIFO page replacement algorithm.
7. Implement LRU page replacement algorithm.
8. Illustrate Dead Lock Avoidance Algorithm
9. Illustrate Dead Lock Detection Algorithm
10. Simulate the following disk scheduling algorithms
    a) FCFS b) SSTF
11. Simulate the following disk scheduling algorithms
    a) SCAN b) CSCAN
12. Illustrate UNIX commands and Vi editor
13. Write a Shell program to check the given number is even or odd
14. Write a shell script to print the factorial of first n natural numbers.
15. Write shell scripts to find the length of a given string and to extract a substring from a given string.
16. Write a shell script that counts the number of lines and words present in a given file.

B.TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20IT4L08 ADVANCED DATA STRUCTURES LAB

Objectives:

• To make the student learn a object oriented way of solving problems.

• To make the student learn different sorting algorithms.

• To make the student learn different algorithm design techniques.

Course Outcomes

CO1 - Develop programs for sorting.

CO2 - Develop programs for implementing trees and their traversal operations.

CO3 - Implement graph traversal algorithm. .

List of Experiments

1. Construct a Hash Table and illustrate
   a) Linear Probing b) Quadratic Probing c) Double Hashing
2. Write programs for the implementation of Priority Queue.
3. Write a program to implement operations on binary heap.
4. Write a program to perform the following operations
   a) Insertion into an AVL-tree b) Deletion from an AVL-tree
5. Write a program to perform the following operations
   a) Insertion into a B-tree b) Deletion from a B-tree
6. Write a program to perform the following operations
   a) Insertion into Scapegoat tree b) Deletion from an Scapegoat tree
7. Write a program to perform the following operations
   a) Insertion into Splay tree b) Deletion from an Splay tree
8. Write a program to implement Kruskal's algorithm to generate a minimum cost spanning tree.
9. Write a program to implement Prim's algorithm to generate a minimum cost spanning tree.
10. Write a program to implement operations on graph.
    a)vertex insertion b) Vertex deletion c) finding vertex d))Edge addition and deletion
11. Write programs for the implementation of BFS for a given graph.
12. Write programs for the implementation of DFS for a given graph
13. Write a program to implement operations on graph.
    a) Finding vertex b) Edge addition and deletion
14. Write a program to implement Dijkstra's algorithm to find shortest path in the graph.
15. Write a program to implement Bellman-Ford algorithm to find shortest path in the graph

B.TECH IV SEMESTER	SC	L	T	P	C
		0	0	4	2

20IT4S09 **MOBILE APPLICATION DEVELOPMENT**
(Skill Oriented Course)

Course Objectives:

• To understand the components and structure of mobile application development frameworks
for Android and windows OS based mobiles.

• To understand various mobile application development frameworks.

• To learn the basic and important design concepts and issues of development of mobile applications.

• To understand the capabilities and limitations of mobile devices.

Course Outcomes:

At the end of this course, students will be able to:

1. Identify various concepts of mobile programming that make it unique from programming for other platforms.
2. Critique mobile applications on their design pros and cons
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
4. Program mobile applications for the Android operating system that use basic and advanced phone features and
5. Deploy applications to the Android marketplace for distribution.

LIST OF EXPERIMENTS

1. Introduction to mobile technologies and device, Android platform and applications overview
2. Setting Android development environments
3. Writing Android applications, Understanding anatomy of an Android application
4. Develop an application that uses GUI components, Font and Colors
5. Develop an application that uses Layout Managers and event listeners.
6. Write an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of databases.
8. Develop an application that makes use of Notification Manager
9. Implement an application that uses Multi-threading
10. Develop a native application that uses GPS location information
11. Implement an application that writes data to the SD card.

12. Implement an application that creates an alert upon receiving a message
13. Write a mobile application that makes use of RSS feed
14. Develop a mobile application to send an email.
15. Develop a Mobile application for simple needs- Case Study

References:

1. Android Programming unleashed, B.M. Harwani, Pearson, 2013.
2. Android Programming (Big Nerd Ranch Guide), by Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano, Pearson, 2016
3. Android Programming – Pushing the limits by Hellman by Erik Hellman, WILEY, 2013

B. TECH V SEMESTER

PCC	L	T	P	C
	3	0	0	3

20IT5T01 FORMAL LANGUAGES & AUTOMATA THEORY

Course Objectives:

- Introduce the concepts of Theory of computation in computer science.
- To understand the relation between Regular Expression and Finite Automata.
- The students should acquire insights into the relationship among formal languages, formal Grammars and automata.
- To understand the concepts of Context Free Languages, PDA and TM

Course Outcomes:

By the end of the course students shall be able to

CO1: Understand the basic concepts of Automata Theory

CO2: Infer the equivalence of languages described by finite automata and regular expressions.

CO3: Devise regular, context free grammars while recognizing the strings and tokens and able to Normalize grammars.

CO4: Apply Pushdown Automata for problem solving.

CO5: Understand basic properties and compute using Turing Machines.

SYLLABUS

UNIT-I: Finite Automata:

Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automation, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT-II: Regular Expressions:

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closures Properties of regular sets, Regular Grammars

UNIT-III: Context Free Grammars:

Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy

Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Applications of Context Free Grammars.

UNIT-IV: Pushdown Automata:

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata.

UNIT-V: Turning Machine:

Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of TMs, Types of Turing Machines, Decidable and Un-Decidable Problems

TEXT BOOKS:

1. Introduction to Automata Theory, Languages and Computation, J.E. Hopcroft, R. Motwani and J.D. Ullman, 3rd Edition, Pearson, 2008. (Units 1, 2, 3, 4, 5)
2. Theory of Computer Science-Automata, Languages and Computation, K.L.P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007. (Units 1, 2, 3, 4, 5)

REFERENCE:

1. A Text book on Automata Theory, Nasir S F B, P.K Srimani [Delhi] : Foundation Books, 2007
2. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015.
3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013.
4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGrawHill.

B. TECH V SEMESTER

PCC	L	T	P	C
	3	0	0	3

20IT5T02 DATA WAREHOUSING & DATA MINING

Course Objective:

- Understand Warehousing Architectures and tools for systematically organizing large data base and use data to make strategic decisions.
- Understand data mining as a process of knowledge discovery and also about the preprocessing techniques to improve the quality of mining.
- Understand the kinds of patterns that can be discovered by Supervised and Unsupervised learning techniques.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the fundamentals concepts of data warehousing

CO2: Understand KDD Process and data preprocessing**.**

CO3: Discover interesting patterns from large volumes of Data using supervised (classification) learning techniques

CO4: Characterize the kinds of patterns that can be discovered by Association Rule Mining

CO5: Demonstrate unsupervised (clustering) learning techniques

SYLLABUS

Unit-I: Data Warehousing and Online Analytical Processing:

Basic Concepts: What is a Data Warehouse? Differences between Operational Databases system (OLTP) and Data warehouses (OLAP). Data warehousing Architecture, Fundamentals of ETL architecture, A Multidimensional Data Model, Data Marts and Star Schema Design.

Unit-II: Introduction: Fundamentals of data mining:

Kinds of data, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Discretization.

Unit-III: Classification and Prediction:

Basic concepts: What is Classification? General Approach to solving a Classification problem. Decision Tree Induction: Working of Decision Tree, building a Decision Tree, methods for expressing an Attribute test Conditions, measures for selecting the best split, Algorithm for Decision Tree Induction. Bayes Classification Methods: Bayes' Theorem, Naive Bayesian Classification, Bayesian Belief Networks, K-Nearest-Neighbor Classifiers.

Unit-IV: Association Analysis:

Basic Concepts and Algorithms: Frequent Item Set generation: The Apriority Principle, Frequent Item set Generation in the Apriori Algorithm, Candidate Generation and Pruning, Support counting. Rule generation: Confidence- Based Pruning, Rule Generation in Apriori Algorithm. Compact Representation of Frequent Item sets: Maximal Frequent Item sets, Closed Frequent Item sets. FP-Growth Algorithm: FP Tree Representation, Frequent Itemset Generation in FP-Growth Algorithm.

Unit-V: Cluster Analysis:

What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.

TEXT BOOKS:

1. Jiawei Han Micheline Kamber, "Data mining & Techniques", Morgan Kaufmann Publishers. (Units-1,2,5)
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Publications. (Units-3,4)

REFERENCES:

1. S.N.Sivanandam, S.Sumathi, "Data Mining – Concepts, Tasks and Techniques", Thomson
2. Ralph Kimball, "The Data Warehousing Toolkit", Wiley.
3. Margaret H. Dunham, "Data mining - Introductory and advanced topics", Pearson
   Education.
4. D.Hand, H. Mannila and P.Smyth, "Principles of Data mining", PHI (2001).

B. TECH V SEMESTER

PCC	L	T	P	C
	3	0	0	3

20IT5T03 COMPUTER NETWORKS

Pre-requisite: Fundamental Operating System Concepts, Introduction to C Programming and Data Structures

Course Objectives:

- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the students to basic principles of networking using the goals like protocol layering and top down approach.
- Build an understanding of the basics of the internetworking and routing used in the computer networks.
- To provide guidelines in developing network applications

Course Outcomes:
At the end of the course, student will be able to

CO1- Independently enumerate the layers of the OSI model and TCP/IP.
CO2- Identify the different types of network topologies and protocols.
CO3- Compare and contrast methods to identify Errors and correct them
CO4- Differentiate between various network routing algorithms.
CO5- Understand WWW and HTTP Architectures.

SYLLABUS

UNIT - I: Introduction:
OSI overview, TCP/IP and other networks models, Examples of Networks: Arpanet, Internet, Network Topologies Wide Area Networks (WAN), Local Area Networks (LAN), Metropolitan Area Networks (MAN).

UNIT - II: Physical Layer and overview of PL Switching:
Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, introduction to switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT – III: Data link layer:
Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction, CRC, Checksum: idea, one’s complement internet checksum, services provided to Network.

Elementary Data Link Layer protocols: Simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.

Sliding window protocol: One bit, Go-back N, Selective Repetitive protocol, Stop and wait protocol.

UNIT - IV: Random Access:

ALOHA, MAC addresses, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access(CDMA).

Network layer: Shortest Path, Distance Vector Routing Algorithm, Hierarchal routing algorithm.

UNIT - V: Application layer (WWW and HTTP):

WWWARCHITECTURE: Client (Browser), Server, Uniform Resource Locator, Resource Record, HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Request Message Format, HTTP Response Message Format

TEXT BOOKS:

1. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH. (Units 1,2,4,5)
2. Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education(Units 1, 3, 4)

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

B. TECH V SEMESTER

	L	T	P	C
PEC	3	0	0	3

20IT5T04 COMPUTER GRAPHICS
(PROFESSIONAL ELECTIVE-I)

Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

Course Outcomes:

After learning the course, the student will be able:

CO1: Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations.

CO2: Apply projections and visible surface detection techniques for display of 3D scene on 2D screen.

CO3: Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics.

CO4: Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).

CO5: Know and be able to discuss hardware system architecture for computer graphics. This Includes, but is not limited to: graphics pipeline, frame buffers, and graphic accelerators/co-processors.

SYLLABUS

UNIT - I: Introduction to Graphics:

Application area of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT - II: 3D Concepts:

Parallel and Perspective projections, Three dimensional object representation-Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT – III: Graphics Programming:

Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Key frame. Graphics programming using OPENGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes

UNIT – IV: Rendering:

Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadow of objects, Building a camera in a program, Creating shaded objects

UNIT - V: Overview of Ray Tracing:

Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics– C Version, second edition, Pearson Education, 2004

REFERENCES:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007

B. TECH V SEMESTER

	L	T	P	C
PEC	3	0	0	3

20IT5T05 E-COMMERCE
(PROFESSIONAL ELECTIVE-I)

Course Objectives:

- Identify the major categories and trends of e-commerce applications.
- Discuss the benefits and trade-offs of various e-commerce clicks and bricks alternatives.
- Understand the main technologies behind the e-commerce systems and how these technologies interact.
- Define various electronic payment types and associated security risks and the ways to protect against them

Course Outcomes:

CO1: Identify, interpret and analyze stake holder needs

CO2: Identify and apply relevant problem solving methodologies.

CO3: Design components, systems and/or processes to meet required specifications.

CO4: Design components, systems and/or processes to meet required specifications.

CO5: Demonstrate research skills.

SYLLABUS

UNIT-I:

Electronic Commerce-Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce –Mercantile Process models

UNIT–II:

Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter Organizational Commerce - EDI, EDI Implementation, Value added networks

UNIT–III:

Intra Organizational Commerce-work Flow, Automation Customization and internal Commerce, Supply chain Management

UNIT–IV:

Corporate Digital Library-Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research

UNIT–V:

Consumer Search and Resource Discovery-Information search and Retrieval, Commerce Catalogues, Information Filtering Multimedia-key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.

TEXT BOOKS:

1. Frontiers of electronic commerce– Kalakata, Whinston, Pearson.

REFERENCES:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S. Jaiswal–Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H. Michael Chang.
4. Electronic Commerce – Gary P. Schneider– Thomson.
5. E-Commerce–Business, Technology, Society, Kenneth C. Taudon, Carol Guyerico Traver.

B. TECH V SEMESTER

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20IT5T06 SOFTWARE TESTING METHODOLOGIES (PROFESSIONAL ELECTIVE-I)

Course Objectives:

- To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing.
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing
- To understand software test automation problems and solutions
- To learn how to write software test documents and communicate with engineers in Various forms

Course Outcomes: At the end of the course, the students will be able to:

CO1: Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

CO2: Design and conduct a software test process for a software project Analyze the needs of software test automation

CO3: Use various communication methods and skills to communicate with their team mates to conduct their practice –oriented software testing projects

CO4: Basic understanding and knowledge of contemporary issues in software testing, such as component -based, web based and object oriented software testing problems.

CO5: Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web based applications

SYLLABUS

UNIT-1:

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation.

UNIT-2:

Dynamic Testing – Black Box Testing Techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause – Effect Graphing based testing, Error guessing.

White – Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.

UNIT-3:

Static Testing: Inspections, Structured Walk throughs, Technical Reviews.

Validation Activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing.

Regression Testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques

UNIT-4:

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite Software. **Quality Management**: Software Quality metrics, SQA models.

Debugging: Process, techniques, correcting bugs.

UNIT-5:

Automation and Testing Tools: need for automation, categorization of testing tools, selection of Testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool.

Testing Object Oriented Software: basics, Object oriented testing. **Testing Web based Systems**: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems.

TEXT BOOKS:

1. Software Testing, Principles and Practices, Naresh Chauhan, Oxford
2. Software Testing, Yogesh Singh, CAMBRIDGE

REFERENCES:

1. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson
2. Software testing techniques –Baris Beizer, Dreamtech, second edition.
3. Software Testing, Principles, techniques and Tools, M GLimaye, TMH
4. EffectiveMethodsforSoftwaretesting,WillianEPerry,3ed,Wiley

B. TECH V SEMESTER	**PCC**	**L**	**T**	**P**	**C**
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20IT5L09 COMPUTER NETWORKS LAB

Pre-requisite: Operating Systems lab, C programming

Objectives:

- To provide Practical orientation of networking concepts and commands.

Course Outcomes:
At the end of the course, student will be able to

CO1: Practical orientation of networking concepts.

CO2: To teach students various forms of IPC through UNIX and socket Programming.

LIST OF EXPERIMENTS

1. Understanding and using of commands like ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whoisetc. Usage of elementary socket system calls (socket (), bind(), listen(), accept(), connect(), send(), recv(),sendto(),recvfrom()).
2. Implement the data link layer farming methods such as character stuffing and bit stuffing.
3. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
4. Implement Dijkstra's algorithm to compute the Shortest path thru a graph.
5. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm.
6. Take an example subnet of hosts. Obtain broadcast tree for it.
7. Design TCP iterative Client and server application to reverse the given input sentence
8. Design UDP Client and server application to reverse the given input sentence
9. Implementation of getsockopt (), setsockopt () system calls.
10. Implementation of SMTP

B. TECH V SEMESTER

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20IT5L10 DATA WAREHOUSING AND MINING LAB THROUGH PYTHON

Course Objective:

- Explore on data mining features.
- Create and perform preprocessing on new and existing datasets.
- Generate association rules on transactional data.
- Build the data models by using various classification and clustering algorithms.
- Analyze the data models accuracy by varying the sample size.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand Data Mining concepts and knowledge discovery process

CO2: Explore on data insights and preprocessing techniques

CO3: Extract association rules on frequent items in transaction data

CO4: Build and analyze the classification model using various algorithms

CO5: Perform clustering using partition algorithms

LIST OF EXPERIMENTS

Exercise 1: INTRODUCTION

1. Introduction to Python libraries for Data Mining: NumPy, Pandas, Matplotlib etc.

Exercise 2: UNDERSTANDING DATA

Write Python programs to do the following operations:

1. Loading data from CSV file
2. Compute the basic statistics of given data - shape, no. of columns, mean
3. Splitting a data frame on values of categorical variables
4. Visualize data using Scatter plot

Exercise 3: CORRELATION MATRIX

Write a python programs to load the dataset and understand the input data

1. Load data, describe the given data and identify missing, outlier data items
2. Find correlation among all attributes
3. Visualize correlation matrix

Exercise 4: DATA PREPROCESSING – HANDLING MISSING VALUES

Write a python program to impute missing values with various techniques on given dataset.

1. Remove rows/ attributes
2. Replace with mean or mode
3. Write a python program to perform transformation of data using Discretization (Binning) and normalization (MinMaxScaler or MaxAbsScaler) on given dataset.

Exercise 5: ASSOCIATION RULE MINING- APRIORI

Write a python program to find rules that describe associations by using Apriori algorithm

Exercise 6: CLASSIFICATION - DECISION TREES

Write a python program

1. To build a decision tree classifier to determine the kind of flower by using given dimensions.
2. Training with various split measures (Gini index, Entropy and Information Gain)
3. Compare the accuracy

Exercise 7: CLASSIFICATION – BAYESIAN NETWORK

1. Build Bayesian network model using existing default data
2. Visualize Tree Augmented Naïve Bayes model

Exercise 8: CLUSTERING – K-MEANS

Write a python program

1. To perform preprocessing
2. To perform clustering using k-means algorithm to cluster the records

B. TECH V SEMESTER

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20IT5S11 TESTING TOOLS
(Skill Oriented Course)

Objectives:

- Learn the importance of web testing tool and bug tracking tool.
- Develop test case and test plan document for banking application.
- Learn to write system specifications of any application and report various bugs in it.
- Use automated functional testing tool like Quick Test Professional

Course Outcomes

CO1: Completely got an idea about testing tools.

CO2: Use the tools and their importance of testing tools.

LIST OF EXPERIMENTS

Exercise 1: CONSTRUCTS

1. Write programs in C language to demonstrate the working of the following constructs:

   a) while b) switch c) for d) if-else e) do-while

Exercise 2: SYSTEM SPECIFICATIONS

1. Study the system specifications of ATM system and report various bugs in it
2. Study the system specifications of banking application and report various bugs in it

Exercise 3: TEST CASES

1. Write the test cases for ATM system
2. Write the test cases for banking application

Exercise 4: TEST PLAN

1. Create a test plan document for any application (e.g. Library management system).

Exercise 5: TESTING TOOL

1. Study of any testing tool (e.g. Win runner)

Exercise 6: SELENIUM

1. Study of web testing tool (e.g. Selenium).

Exercise 7: BUG TRACKING TOOL

1. Study of bug tracking tool (e.g. Bugzilla).

Exercise 8: BUGBIT

1. Study of bug tracking tool (e.g. Bugbit).

Exercise 9: TEST MANAGEMENT TOOL

1. Study of any test management tool (e.g. Testdirector).

Exercise 9: OPEN SOURCE TESTING TOOL

1. Study of any Open Source Testing Tool (e.g. Test Link).

Exercise 10: AUTOMATED FUNCTIONAL TESTING TOOL

1. Study of QTP (Quick Test Professional) automated functional testing tool.

Exercise 10: INTROSPECTION OF MATRIX MULTIPLICATION

1. A program written in C language for matrix multiplication fails, introspect the causes for its failure and write down the possible reasons for its failure.

REFERENCS:

1. Boris Beizer, ―Software Testing Techniques‖, DreamTech Press, 2 nd Edition, 2000.
2. Dr. K. V. K. K. Prasad, ―Software Testing Tools‖, DreamTech Press, Revised Edition, 2004.
3. Perry, ―Effective methods of Software Testing‖, John Wiley, 2 nd Edition, 1999.

B.TECH V SEMESTER

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20IT5M12 DISASTER MANAGEMENT

Course Learning Objectives: The objective of this course is to

1. Understand Types of disasters like Earthquake, Landslide, Flood, Drought, Fire
2. Know Panchayati Raj Institutions/ Urban Local Bodies (PRIs/ ULBs), States, Centre, and other stakeholders
3. Understand Climate Change Adaptation - IPCC Scenario and Scenarios in the context of India
4. Understand Role of GIS and Information Technology Components in Preparedness, Risk Assessment
5. Know various case studies

Course Learning Outcomes:

On successful completion of this course, the students will be able to

CO1: Differentiate the types of disasters, causes and their impact on environment and society

CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation.

CO3: Draw the hazard and vulnerability profile of India, Scenarios in the Indian context

CO4: Analyze the Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

CO5: Understand about Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment

SYLLABUS

UNIT-I:

INTRODUCTION TO DISASTERS Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT-II:

APPROACHES TO DISASTER RISK REDUCTION (DRR) Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT-III:

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT-IV:

DISASTER RISK MANAGEMENT IN INDIA Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT-V:

DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Text Books:

1. Singhal J.P."Disaster Management", Laxmi Publications, 2010. ISBN-10: ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

Reference Books:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009

B. TECH VI SEMESTER

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20IT6T01 MACHINE LEARNING

Course Objectives:

This course will enable students to,

- Differentiate supervised, unsupervised and reinforcement learning
- Covers the techniques on how to make learning by a model, evaluate it and understand different algorithms to construct a learning model.
- Formulate machine learning problems corresponding to various applications.

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with it.

CO3: Apply effectively neural networks for appropriate applications.

CO4: Apply Bayesian techniques and derive effectively learning rules.

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I: Introduction:

Well posed learning problems, designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II: Decision Tree Learning:

Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Backpropagation algorithm.

UNIT-III: Bayesian Learning:

Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm

Evaluating Hypothesis: Motivation, estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

UNIT-IV: Learning Sets of Rules:

Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning.

UNIT-V: Genetic Algorithms:

Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Reinforcement Learning: Introduction, Learning Task, Q Learning.

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
2. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER **PCC**

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20IT6T02 CLOUD COMPUTING

Course Objectives:

- Explain the technology and principles involved in building a cloud environment
- To implement Virtualization
- Understand various types of cloud and its services
- Contrast various programming models used in cloud computing

Course Outcomes:

CO1: Describe the principles of parallel and distributed computing and evaluation of cloud computing from existing technologies

CO2: Illustrate Virtualization for Data-Center Automation.

CO3: Explain and characterize different cloud deployment models and service models

CO4: Program data intensive parallel applications in cloud.

CO5: Understand commercial cloud computing technologies such as AWS, AZURE and AppEngine

SYLLABUS

UNIT-I: Introduction:

Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Microsoft Aneka.

UNIT-II: Virtualization:

Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen, VMware, Microsoft Hyper – V.

UNIT-III: Cloud Computing Architecture:

Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy.

UNIT-IV: Data Intensive Computing: Map-Reduce Programming:

What is Data-Intensive Computing? Characteristics, Challenges, Historical Perspective. Technologies for Data Intensive Computing: Storage Systems, Programming Platforms.

Cloud Applications: Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.

UNIT-V: Cloud Platform in Industry and Cloud Applications:

Cloud Platforms in Industry: Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

TEXTBOOKS:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud Computing McGraw Hill Education.

REFERENCES:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.
3. Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan Kaufmann, 2013.

B. TECH VI SEMESTER

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20IT6T03 BIG DATA ANALYTICS

Course Objectives:

- Learning Java concepts for developing different Data Models in Big Data.
- Understanding the architectural concepts of HDFS and its Configuring Modes.
- Introducing MapReduce Paradigm.
- Introducing Programming tools PIG & HIVE in Hadoop echo System.

Course Outcomes:

CO1: Applying Java concepts for developing MapReduce Programs.

CO2: List the components of Hadoop and its eco-system.

CO3: Working with Building Blocks of HDFS and Big Data.

CO4: Building various MapReduce Programs using Java.

CO5: To introduce Programming tools like PIG and HIVE in Hadoop eco-system.

SYLLABUS

UNIT-I: Data structures in Java:

Stacks, Queues, Linked List, Sets, Maps; **Generics:** Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization.

UNIT-II: Working with Big Data:

Google File System, Hadoop Distributed File System (HDFS) –Building blocks of Hadoop (Namenode, Datanode, Secondary Name node, Job Tracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-III: Writing MapReduce Programs:

A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), **Basic Programs of Hadoop MapReduce:** Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner.

UNIT-IV: Hadoop I/O:

The Writable Interface, Writable Comparable and comparators, **Writable Classes:** Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections.

UNIT-V: Pig: Hadoop Programming Made Easier:

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

UNIT-VI: Applying Structure to Hadoop Data with Hive:

Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analysing Data.

TEXT BOOKS:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B. Melnyk, Bruce Brown, Rafael Coss

REFERENCE BOOKS:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne.

SOFTWARE LINKS:

1. Hadoop: http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Pig Latin: http://pig.apache.org/docs/r0.7.0/tutorial.

B. TECH VI SEMESTER

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PEC	**3**	**0**	**0**	**3**

20IT6T04 MEAN STACK TECHNOLOGIES

(PROFESSIONAL ELECTIVE-II)

Course Objectives:

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- Writing optimized front end code HTML and JavaScript
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
- Design and implementation of Robust and Scalable Front End Applications

Course Outcomes:

CO1: Enumerate the Basic Concepts of Web & Markup Languages

CO2: Develop web Applications using Scripting Languages & Frameworks

CO3: Make use of Express JS and Node JS frameworks

CO4: Illustrate the uses of web services concepts like restful, React JS

CO5: Apply Deployment Techniques & Working with cloud platform

SYLLABUS

UNIT-I: Introduction to Web:

Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT-II: JavaScript:

The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions.

Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

UNIT-III: Node.js:

Introduction, Advantages, Node.js Process Model, Node JS Modules.

Express.js: Introduction to Express Framework, Introduction to Nodejs, What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling, API Handling, Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

UNIT-IV: RESTful Web Services: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests.

React js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, React DOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

UNIT-V: Mongo DB:

Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

TEXT BOOKS:

1. Programming the World Wide Web, Robet W Sebesta, 7ed,Pearson.
2. Web Technologies, Uttam K Roy,Oxford
3. Pro Mean Stack Development, ELadElrom,Apress
4. Restful Web Services Cookbook, SubbuAllamraju,O'Reilly
5. JavaScript & jQuery the missing manual, David sawyer mcfarland,O'Reilly
6. Web Hosting for Dummies, Peter Pollock, John WileyBrand

REFERENCES:

1. Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly(2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, DreamTech
4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, CengageLearning
5. Express.JS Guide, The Comprehensive Book on Express.js, AzatMardan, LeanPublishing.

B. TECH VI SEMESTER

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20IT6T05 COMPILER DESIGN
(PROFESSIONAL ELECTIVE-II)

Course Objectives:

- Create an overall view of various types of translators, linkers, loaders, and phases of a compiler.
- Understand the syntax analysis phase; various types of parsers- top down approach, bottom up parsers.
- Various aspects of the run-time environment into which the high-level code is translated.
- To apply the code generation algorithms to get the machine code for the optimized code.

Course Outcomes:

CO1: Acquire knowledge in different phases and passes of Compiler.

CO2: Demonstrate knowledge about scanning of tokens and perform the syntax analysis by using Top-down parsing techniques.

CO3: Perform the syntax analysis by using Bottom Up parsing techniques for more complex grammars.

CO4: Compare different memory management techniques in runtime environment.

CO5: Generate effective code by applying code optimization techniques.

SYLLABUS

UNIT–I:

Language Processors, Phases of Compilation – Lexical Analysis, Regular Grammar and regular expression for common programming language features, pass and Phases of translation, interpretation, bootstrapping.

Lexical Analysis: The role of lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, The lexical analyzer generator - LEX.

UNIT–II: Syntax Analysis:

The Role of a parser, Context free Grammars, Writing a grammar, Top down parsing - Backtracking, LL (1) Grammars, Recursive descent parsing, Non – recursive Predictive parsing, Error recovery in Predictive Parsing.

Bottom up parsing: Reductions, Handle Pruning, Shift – Reduce Parsing, Conflicts during Shift – Reduce Parsing.

UNIT –III: Simple LR Parser:

LR Parsing Algorithm, SLR - Parsing Table.

More Powerful LR parser – Constructing Canonical LR1, LALR parsing tables, Using Ambiguous Grammars, Error Recovery in LR parser.

UNIT – IV: Intermediated Code Generation:

Variants of Syntax trees, 3 Address code – Quadruples, Triples.

Runtime Environments: Stack allocation of space, Access to Non Local data on the stack, Heap Management.

UNIT – V: Code Generation:

Issues in design of code generation, the target Language, peephole Optimization, A simple Code Generator. Basic Blocks & Flow Graphs, Optimization of Basic Blocks – DAGs, Local Common sub expression elimination.

Machine independent code optimization:

The principle sources of Optimization: Global Common sub expression elimination - Constant folding - Copy propagation - Dead code elimination – Induction Variable & Strength reduction - Loop optimization - Procedure in-lining.

TEXT BOOKS:

1. Compilers – Principles, Techniques and Tools. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffery D. Ullman, 2nd edition, Pearson - 2007.

REFERENCES:

1. Implementations of Compiler, A New approach to Compilers including the algebraic methods, Yunlinsu, SPRINGER.
2. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3. LEX & YACC – John R. Levine, Tony Mason, Doug Brown, O'reilly.
4. Principles of compiler design, 2nd edition, Nandhini Prasad, Elsevier.

B. TECH VI SEMESTER

PEC	L	T	P	C
	3	0	0	3

20IT6T06 SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

(PROFESSIONAL ELECTIVE-II)

Course Objectives:

- To understand interrelationships, principles and guidelines governing architecture and evolution over time.
- To understand various architectural styles, design patterns of software systems.
- To understand implementation of design patterns and providing solutions to real world software design problems.
- To understand patterns with each other and understanding the consequences of combining patterns on the overall quality of a system.

Course Outcomes:

At the end of the course, a student will be able to

CO1: Understand Software Architecture

CO2: Analyze the Software Architectures.

CO3: Classify Design Patterns.

CO4: Describe Behavioral Patterns.

CO5: Discuss usage of Architectural Structures.

SYLLABUS

UNIT-I:

Envisioning Architecture: The Architecture Business Cycle, what is Software Architecture? Architectural patterns, reference models, reference architectures, architectural structures and views.

Creating and Architecture: Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT-II:

Analyzing Architectures: Architecture Evaluation, Architecture design decision making, ATAM, CBAM

Moving from One System to Many: Software Product Lines, Building systems from off the shelf components, Software architecture in future.

UNIT-III:

Patterns: Pattern Description, organizing catalogs, role in solving design problems, Selection and usage.

Creational Patterns: Abstract factory, Builder, Factory method, Prototype, Singleton

UNIT-IV:

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, PROXY.

Behavioral Patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

UNIT-V:

A Case Study (Designing a Document Editor): Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003. (Units 1,2,3,4)
2. Design Patterns, Erich Gamma, Pearson Education, 1995. (Unit 3)

REFERENCE BOOKS:

1. Beyond Software architecture, Luke Hohmann, Addison Wesley, 2003.
2. Software Architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR.
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006

B. TECH VI SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20IT6L09 MACHINE LEARNING LAB

Course Objectives:

This course will enable students to,

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes:

After studying this course, the students will be able to

CO1: Understand the implementation procedures for the machine learning algorithms

CO2: Design Java/Python programs for various Learning algorithms.

CO3: Apply appropriate data sets to the Machine Learning algorithms

CO4: Identify and apply Machine Learning algorithms to solve real world problems

LAB EXPERIMENTS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

B. TECH VI SEMESTER

	L	T	P	C
PCC	0	0	3	1.5

20IT6L10 CLOUD COMPUTING LAB

LIST OF EXPERIMENTS

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

		L	T	P	C
B. TECH VI SEMESTER	**PCC**	**0**	**0**	**3**	**1.5**

20IT6L11 HADOOP LAB

Course Outcomes:

- Developing different Data Models in Big Data.
- Building HDFS.
- Building various MapReduce Programs.
- Programming using PIG.
- Working with Hive.

LIST OF LAB EXPERIMENTS

Exercise 1:

1. Implement the following Data structures in Java.
   a) Linked Lists b) Stacks c) Queues d) Set e) Map

Exercise 2:

2. Perform setting up and Installing Hadoop in its three operating modes:
   a) Standalone, b) Pseudo distributed, c) Fully distributed
3. Use web-based tools to monitor your Hadoop setup.

Exercise 3:

4. Implement the following file management tasks in Hadoop:
   a) Adding files and directories b) Retrieving files c) Deleting files.

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Exercise 4:

5. Run a basic Word Count Map Reduce program to understand MapReduce Paradigm.

Exercise 5:

6. Write a Map Reduce program that mines weather data. Weather Sensors collecting data every hour at many locations across the Globe gathers a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi-structured and record oriented.

Exercise 6:

7. Implement Matrix Multiplication with Hadoop Map Reduce.

Exercise 7:

8. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Exercise 8:

9. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

B. TECH VI SEMESTER

	L	T	P	C
SC	0	0	4	2

20IT6S12 SOFT SKILLS
(Skill Oriented Course)

Course Outcomes

The student will acquaint himself with various nuances of Soft Skills and Personality Development besides aspects related to Campus Recruitment Process.

SYLLABUS

1 Life Skills
2 JAM
3 Presentation Skills
4 Resume Writing
5 Group Discussion
6 Interview Skills

References:

1. ***Interact*****,** Orient Blackswan
2. **Communication Skills,** Sanjay Kumar and Pushp Latha.OUP,2011

B. TECH VI SEMESTER

	L	T	P	C
MC	2	-	-	-

20IT6M13 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing.
- Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Understand the significance of Indian Traditional Knowledge
CO2: Classify the Indian Traditional Knowledge
CO3: Compare Modern Science with Indian Traditional Knowledge system.
CO4: Analyze the role of Government in protecting the Traditional Knowledge
CO5: Understand the impact of Philosophical tradition on Indian Knowledge System.

SYLLABUS

Unit I

Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in Global Economy.

Unit II

Basic structure of Indian Knowledge System: Astadash Vidya- 4 Ved - 4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi),6vedanga (Shisha, Kalppa, Nirukha,Vykaran, Jyothisha & Chand),4upanga (Dharmashastra, Meemamsa, purana & Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System: Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge - Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain &Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, Nruthya Yevam Sahithya.

Text Books

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.

References

1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, BharatiyaVidya
2. Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan
3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
4. Pramod Chandra, India Arts, Howard Univ. Press, 1983.
5. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html
2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf
3.https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_tex t.pdf

B. TECH VII SEMESTER

	L	T	P	C
PEC	3	0	0	3

20IT7T01 INTELLIGENT AGENTS
(Professional Elective-III)

Course Objectives:

The objective of this course is to enable the students to:

- Understand the basic concepts of intelligent agents
- Develop general-purpose problem solving agents, logical reasoning agents, and agents that reason under uncertainty
- Employ AI techniques to solve some of today's real world problems.

Course Outcomes:

At the end of the course, student will be able to:-

CO1: Explain autonomous agents that make effective decisions in fully informed, partially observable and adversarial settings.

CO2: Choose appropriate algorithms for solving given AI problems.

CO3: Design and implement logical reasoning agents

CO4: Design and implement agents that can reason under uncertainty

SYLLABUS

UNIT I: Intelligent Agents:

Introduction to AI – Agents and Environments – Concept of rationality – Nature of environments – Structure of agents --Problem solving agents – search algorithms – uninformed search strategies.

UNIT II: Problem Solving

Heuristic search strategies – heuristic functions Local search and optimization problems – local search in continuous space – search with nondeterministic actions – search in partially observable environments – online search agents and unknown environments.

UNIT III: Game Playing and CSP

Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.

UNIT IV: Logical Agents

Knowledge-based agents – propositional logic – propositional theorem proving –

propositional model checking – agents based on propositional logic First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining -- resolution.

UNIT V: Knowledge Representation and Planning

Ontological engineering – categories and objects – events – mental objects and modal logic – reasoning systems for categories – reasoning with default information Classical planning – algorithms for classical planning – heuristics for planning – hierarchical planning – non-deterministic domains – time, schedule, and resources -- analysis

TEXT BOOKS:

1. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.

REFERENCES:

1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (http://nptel.ac.in/)
5. Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases - by Dennis Rothman, 2018.

B. TECH VII SEMESTER

	L	T	P	C
PEC	3	0	0	3

20IT7T02 MOBILE COMPUTING
(Professional Elective-III)

Course Objectives:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
- To understand the typical mobile networking infrastructure through a popular GSM protocol.
- To understand the issues and solutions of various layers of mobile networks,
- To understand the database issues in mobile environments & data delivery models.

Course Outcomes:

CO1: Understand the fundamental concepts of Mobile Communication.
CO2: Identify solutions to the technical issues in the mobile communication paradigm.
CO3: Understand the ad hoc network applications and/or algorithms/protocols.
CO4: Understand & develop any existing or new protocol related to mobile environment.
CO5: Understand the platforms and protocols used in mobile environment

SYLLABUS

UNIT-I: Introduction:

Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices. GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

UNIT-II: (Wireless) Medium Access Control (MAC):

Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

UNIT-III: Mobile Network Layer:

IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route

Optimization, DHCP.

UNIT-IV: Mobile Transport Layer:

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks. Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT-V: Data Dissemination and Synchronization:

Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols.

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2009.(Units 1,2,3)
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772 (Units 4,5)

REFERENCE BOOKS:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing, Technology Applications and Service Creation" Second Edition, McGraw Hill.
2. UWE Hansmann, LotherMerk, Martin S. Nocklous, Thomas Stober, "Principles of Mobile Computing," Second Edition, Springer

B. TECH VII SEMESTER

		L	T	P	C
	PEC	3	0	0	3

20IT7T03 SOFTWARE PROJECT MANAGEMENT
(Professional Elective-III)

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

CO1: Apply the process to be followed in the software development life-cycle models.

CO2: Apply the concepts of project management & planning.

CO3: Implement the project plans through managing people, communications and change

CO4: Conduct activities necessary to successfully complete and close the Software projects

CO5: Implement communication, modeling, and construction & deployment practices in software development.

SYLLABUS

UNIT I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

TEXT BOOKS:

2. Software Project Management, Walker Royce, Pearson Education, 2005.
3. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

REFERENCES:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH VII SEMESTER

	L	T	P	C
PEC	3	0	0	3

20IT7T04 NEURAL NETWORKS AND DEEP LEARNING
(Professional Elective-IV)

Course Objectives:

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

Course Outcomes:

CO1: Ability to understand the concepts of Neural Networks Ability to select the Learning Networks in modeling real world systems

CO2: Ability to use an efficient algorithm for Deep Models.

CO3: Ability to apply optimization strategies for large scale applications

SYLLABUS

UNIT-I:

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II:

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT-III: Cloud Computing Architecture:

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

UNIT-IV: Data Intensive Computing: Map-Reduce Programming:

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse

Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

UNIT-V: Cloud Platform in Industry and Cloud Applications:

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate SecondOrder Methods, Optimization Strategies and Meta-Algorithms Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.

TEXTBOOKS:

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

B. TECH VII SEMESTER

	L	T	P	C
PEC	**3**	**0**	**0**	**3**

20IT7T05 INFORMATION SECURITY
(Professional Elective-IV)

Pre-requisite: Basic Concepts of Computer Science

Course Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Understand Intrusions and intrusion detection
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

Course Outcomes: At the end of the course, student will be able to

CO1: Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues

CO2: Ability to identify information system requirements for both of them such as client and server.

CO3: Ability to understand the current legal issues towards information security

SYLLABUS

UNIT - I:

Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.

Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT - II:

Symmetric key Ciphers: Block Cipher principles & Algorithms (DES, AES, Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4,Location and placement of encryption function, Key distribution

Asymmetric key Ciphers: Principles of public key cryptosystems, Algorithms (RSA, Diffie-Hellman, ECC), Key Distribution

UNIT – III:

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm.

Authentication Applications: Kerberos, X.509 Authentication Service, Public — Key Infrastructure, Biometric Authentication.

UNIT - IV:

E-Mail Security: Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, key management.

UNIT - V:

Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction.

Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls .

Case Studies on Cryptography and security: Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections.

TEXT BOOKS:

1. Cryptography and Network Security : William Stallings, Pearson Education,411iEdition
2. Cryptography and Network Security : Atul Kahate, Mc Graw Hill, 2" Edition

REFERENCES:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2"d Edition
3. Information Security, Principles and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Sceurity: WM.Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGELearning
6. Network Security and Cryptography: Bernard Menezes, CENGAGELearning

B. TECH VII SEMESTER

	L	T	P	C
PEC	**3**	**0**	**0**	**3**

20IT7T06 BUSINESS INTELLIGENCE
(Professional Elective-IV)

Course Objectives:

- Introduce the concepts and components of Business Intelligence (BI)
- Evaluate the technologies that make up BI (data warehousing, OLAP)
- Identify the technological architecture that makes up BI systems

Course Outcomes:

CO1: Understand concepts and components of Business Intelligence.
CO2: Explain the complete life cycle of BI development.
CO3: Illustrate technology and processes associated with Business Intelligence framework.
CO4: Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.
CO5: Ability to design expert system using AI tools.

SYLLABUS

UNIT-I:

Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence

Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

UNIT-II:

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics. **Getting started with business intelligence:** Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

UNIT-III:

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in

BI/DW, The complete BI professional, Popular BI tools.

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart, OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

UNIT-IV:

Business Intelligence Applications:

Marketing models: Relational marketing, Sales force management,

Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.

Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices

UNIT-V:

Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management

Artificial Intelligence and Expert Systems:

Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems

TEXT BOOKS:

1. Fundamental of Business Intelligence" Grossmann W, Rinderle-Ma Springer, 2015
2. "Fundamentals of Business Analytics" – By R N Prasad and SeemaAcharya, Publishers: Wiley India.

REFERENCE BOOKS:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : TheCompleteProject Lifecycle for Decision Support Applications, Addison WesleyInformation Technology
2. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann.

B. TECH VII SEMESTER

	L	T	P	C
PEC	**3**	**0**	**0**	**3**

20IT7T07 ETHICAL HACKING

(Professional Elective-V)

Prerequisites:

- A course on "Operating Systems"
- A course on "Computer Networks"
- A course on "Network Security and Cryptography"

Course Objectives:

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration).

Course Outcomes:

CO1: Gain the knowledge of the use and availability of tools to support an ethical hack

CO2: Gain the knowledge of interpreting the results of a controlled attack

CO3: Understand the role of politics, inherent and imposed limitations and metrics for planning of a test.

CO4: Comprehend the dangers associated with penetration testing

SYLLABUS

UNIT - I:

Introduction: Hacking Impacts, The Hacker

Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration

Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture

Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

UNIT - II:

The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges.

Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement.

UNIT – III:

Preparing for a Hack: Technical Preparation, Managing the Engagement

Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance.

UNIT - IV:

Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase

Exploitation: Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNIT - V:

Deliverable: The Deliverable, The Document, Overal Structure, Aligning Findings, Presentation

Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion

TEXT BOOKS:

1. James S. Tiller, “The Ethical Hack: A Framework for Business Value Penetration Testing”, Auerbach Publications, CRC Press

REFERENCES:

1. EC-Council, “Ethical Hacking and Countermeasures Attack Phases”, Cengage Learning
2. Michael Simpson, Kent Backman, James Corley, “Hands-On Ethical Hacking and Network Defense”, Cengage Learning.

B. TECH VII SEMESTER

	L	T	P	C
PEC	3	0	0	3

20IT7T08 INFORMATION RETRIEVAL SYSTEMS

(Professional Elective-V)

Course Objectives:

- To learn the different models for information storage and retrieval
- To learn about the various retrieval utilities
- To understand indexing and querying in information retrieval systems

Course Outcomes:

CO1: Understand the storage and retrieval of textual documents using appropriate models

CO2: Apply various retrieval utilities for improving search.

CO3: Understand indexing and compressing documents to improve space and time efficiency

CO4: Formulate SQL like queries for unstructured data.

CO5: Understand the issues involved in providing an IR service on a web scale, including distributed index construction and user modeling for recommendation engines.

SYLLABUS

UNIT-I:

Introduction Retrieval Strategies: Vector space model, Probabilistic retrieval strategies: Simple term weights, Non binary independence model Language Models.

UNIT-II:

Retrieval Utilities: Relevance feedback, Clustering, N-grams, Regression analysis, Thesauri.

UNIT-III:

Retrieval Utilities: Semantic networks, parsing.

Cross-Language Information Retrieval: Introduction, crossing the language barrier.

UNIT-IV:

Efficiency: Inverted index, Query processing, Signature files, Duplicate document detection

UNIT-V:

Integrating Structured Data and Text: A Historical progression, Information retrieval as a relational application, Semi-structured search using a relational schema.

Distributed Information Retrieval: A Theoretical model of distributed retrieval, Web search.

TEXT BOOKS:

1. David A. Grossman, Ophir Frieder, Information Retrieval – Algorithms and Heuristics, Springer, 2nd Edition (Distributed by Universities Press), 2004. (Units 1,2,3)
2. Modern Information Retrival By Yates Pearson Education. (Units 4,5)

REFERENCE BOOKS:

1. Gerald J Kowalski, Mark T Maybury. Information Storage and Retrieval Systems, Springer, 2000.
2. Soumen Chakrabarti, Mining the Web : Discovering Knowledge from Hypertext Data, Morgan-Kaufmann Publishers, 2002.
3. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, An Introduction to Information Retrieval, Cambridge University Press, Cambridge, England, 2009

B. TECH VII SEMESTER

	L	T	P	C
PEC	3	0	0	3

20IT7T09 INTERNET OF THINGS
(Professional Elective-V)

Course Objectives:

- Understand the architecture of Internet of Things and connected world.
- Explore on use of various hardware, communication and sensing technologies to build IoT applications
- Develop the real time IoT applications to make smart world.
- Understand challenges and future trends in IoT.

Course Outcomes:

CO1: Design and Deployment of IoT.

CO2: Design and comparing M2M with IoT.

CO3: Understand Platform design and modeling of IoT

CO4: Apply IoT in different devices using Python

CO5: Implement IoT and cloud platforms.

SYLLABUS

UNIT-I: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT Enabling Technologies, IoT levels and deployment, domains Specific IoTs.

UNIT-II: IoT and M2M:

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

UNIT-III: IoT Platforms Design Methodology:

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data Structures, control flow, functions, modules, packages, file handling. Raspberry PI with Python, other IoT devices.

UNIT-IV: IoT Protocols:

Messaging Protocols- MQ Telemetry Transport (MQTT), Constrained Application Protocol (CoAP) Transport Protocols-Light Fidelity (Li-Fi), Bluetooth Low Energy

(BLE) IoT Protocols: Addressing and Identification: Internet Protocol Version 4 (IPV4), Internet Protocol Version 6(IPV6), Uniform Resource Identifier (URI)

UNIT-V: IoT Physical Servers And Cloud Offerings:

Introduction to cloud storage models and communication APIs, WAMP –Auto Bahn for IoT, Xively cloud for IoT, case studies illustrating IoT design –home automation, smart cities, smart environment.

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-on-Approach", VPT, 1st Edition, 2014. (Units1,2,3,5)
2. Matt Richardson, Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 3rd Edition, 2014. (Unit 3)
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram " Internet of Things" Wiley (Unit 4).

REFERENCE BOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons2014

B.TECH VII SEMESTER	HSMC	L	T	P	C
		3	0	0	3

20IT7T14 UNIVERSAL HUMAN VALUES 2
Understanding Harmony

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcome

On completion of this course, the students will be able to

CO1: Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society

CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.

CO3: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society

CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.

CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

SYLLABUS

UNIT- I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I

2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance'

and Experiential

Validation- as the process for self-exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT- II

Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT- III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and

differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

22. Definitiveness of Ethical Human Conduct

23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

24. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

25. Case studies of typical holistic technologies, management models and production systems

26. Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations

27. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Readings

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

B. TECH VII SEMESTER

SC	L	T	P	C
	0	0	4	2

20IT5S15 DATA VISUALIZATION USING TABLEAU
(Skill Oriented Course)

Course Objectives: At the end of the course, students will be able to:

- Use Tableau's visualization tools to conduct data analysis, especially exploration of an unfamiliar dataset.
- Discuss concepts and principles of data visualization particularly related to decision making
- Use data visualizations, dashboards, and Tableau Stories to support relevant communication for diverse audiences.

Course Outcomes: At the end of the course, students will learn

- To design effective dashboard for decision making at various levels.
- To visualize data using charts, maps, tables, and other visual representations of data.

Experiments:

1) **Creating Your First visualization**
    - Getting started with Tableau Software
    - Using Data file formats
    - Connecting your Data to Tableau
    - Creating basic charts (line, bar charts, Treemaps)
    - Using the Show me panel
2) **Tableau Calculations**
    - Overview of SUM, AVR, and Aggregate features
    - Creating custom calculations and fields
    - Applying new data calculations to your visualization
3) **Formatting Visualizations**
    - Formatting Tools and Menus
    - Formatting specific parts of the view
    - Editing and Formatting Axes
4) **Manipulating Data in Tableau**
    - Cleaning-up the data with the Data Interpreter
    - Structuring your data
    - Sorting and filtering Tableau data

- Pivoting Tableau data

5) Advanced Visualization Tools

- Using Filters
- Using the Detail panel
- Using the Size panels
- Customizing filters
- Using and Customizing tooltips
- Formatting your data with colors

6) Creating Dashboards & Stories

- Using Storytelling
- Creating your first dashboard and Story
- Design for different displays
- Adding interactivity to your Dashboard

7) Distributing & Publishing Your Visualization

- Tableau file types
- Publishing to Tableau Online
- Sharing your visualization
- Printing and exporting

References:

1) Pro Tableau - A Step By Step Lab Guide ISBN-13: 978-1484223512, publisher – Apress.
2) Show me the Numbers: Designing Tables and Graphs to Enlighten. by Stephen Few
3) The Data Loom: Weaving Understanding by Thinking Critically and Scientifically with Data. by Stephen Few
4) The Big Book of Dashboards: Visualizing your Data using Real-World Business Scenarios by Steve Wexler, Jeffrey Shaffer, and Andy Cotgreave
5) Tableau 10 Business Intelligence Cookbook: *https://www.packtpub.com/big-data-and-businessintelligence/tableau-10-business-intelligence-cookbook*
6) Tableau Desktop: Students should download and install the free version of Tableau for class use here*: http://www.tableau.com/academic/students*

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B.TECH V SEMESTER	**OEC**	**3**	**0**	**0**	**3**

20CE5T04 ARCHITECTURE AND TOWN PLANNING

(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

- Initiating the students to different architectures of the world.
- Salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization.
- Architectural Design concepts, Principles of Planning and Composition.
- To understand town planning from ancient times to modern times.
- To impart the concepts of town planning standards.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Student should be able to distinguish architectural styles of eastern and Western world.

CO2: Student should understand the importance of Orders of Architecture.

CO3: Should be able to compose spaces of buildings using design concepts, planning principles.

CO4: Student should understand the town planning standards, landscaping features.

SYLLABUS

UNIT-I:

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace – Fort - Tomb.

UNIT-II:

Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT-III:

Principles of Planning: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements,

Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wright, Walter Groping.

UNIT-IV:

Histroical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT-V:

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- neighbor hood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation planning regulations and limitations.

Text books:

1. 'The great ages of World Architecture' by G.K. Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y. S.Sane.
3. 'Professional Practice' by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, NewDelhi.
4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning'by G.K. Haraskar.

Reference Books:

1. 'Drafting and Design for Architecture' by Hepler, Cengage
2. Learning 'Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.
3. 'Mordern Ideal Homes for India' by R. S. Deshpande.
4. 'Town and County Planning' by A.J. Brown and H.M. Sherrard.
5. 'Town Design' by Federik Glbbard, Architectural press, London.

B.TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20CE5T05 ELEMENTS OF CIVIL ENGINEERING

(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources, Water Supply, Sanitary, Electrical Works in Building and Highway engineering.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: The student should be able to know the basics of civil engineering and concepts of surveying.

CO2: The student should be able to know various properties of building materials and various types of building.

CO3: The student should be able to know the fundamentals of Water Resources, Water Supply, Sanitary and Electrical Works in Building.

CO4: The student should be able to know the fundamental concepts highway engineering.

SYLLABUS

UNIT-I:

Introduction. Introduction of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on economy of country.

UNIT-II:

Surveying Introduction: Definition of Surveying, Fundamental principles of surveying, Classification of surveying.

Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining and Ranging.

Angular Measurement: Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing local attraction.

Levelling: Objectives and applications-terminology-Instruments, component parts of dumpy level, Types of levelling, levelling staff

UNIT-III:

Building Materials and Construction Materials: Introduction to construction materials - Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen. Construction: Classification of buildings, Building components and their functions.

UNIT-IV:

Water Resources Hydrologic cycle, water use and its conservation, Introduction to dams, barrages and check dams. Water Supply, Sanitary and Electrical Works in Building Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

UNIT–V:

Transportation Engineering, classification of roads, Introduction of flexible and rigid pavements, Introduction to road traffic and traffic control mechanism.

Text Books:

1. Elements of Civil Engineering, Mimi Das Saikia, Bhargab Mohan Dasand Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, Publisher: McGraw Hill Education, India Pvt. Ltd.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, Arun kumar Jain, 16^{th} Edition Publisher: Laxmi Publication Delhi.

Reference Books:

1. Surveying Theory and Practice, James M Anderson and Edward, 7^{th} Edition, M Mikhail Publisher: McGraw Hill Education, India Pvt. Ltd.
2. Surveying and Leveling, R. Subramanian Publisher, Oxford University.
3. Building drawing, M.G. Shah, C.M.Kale and S.Y. Patki Publisher: TataMcGraw Hill.

		L	T	P	C
B.TECH V SEMESTER	**OEC**	**3**	**0**	**0**	**3**

20EE5T04 BASICS OF CONTROL SYSTEMS
(OPEN ELECTIVE-I)

Course Objectives:

- To Enable the student to understand the importance of Modelling of Control systems
- To understand the First order & second order systems
- To understand the transfer function analysis
- To understand the Stability of the systems
- To understand the States Space Analysis

Course Outcomes:

At the end of the course, the student will be able to

CO1: Understand the different Classification of control systems and modelling

CO2: Understand the functioning of Signals & time response analysis

CO3: Understand the concept of Root Locus & Construction of Root Loci

CO4: Understand the concept of Bode plot & Nyquist Plot

CO5: Understand the concept of States Space Analysis of LTI System

SYLLABUS

UNIT – I

Mathematical Modeling of Control Systems: Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems

UNIT-II

Time Response Analysis: Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III

Stability and Root locus Technique: The concept of stability – Routh's stability criterion –limitations of Routh's stability –Root locus concept - construction of root loci

UNIT–IV

Frequency Response Analysis: Introduction to Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots.

UNIT–V

State Space Analysis of LTI Systems: Concepts of state variables and state model, state space representation of transfer function, Diagonalization- Solving the time invariant state equations.

Text Books:

1. Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4^{th} Edition.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2^{nd} Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems, Manik Dhanesh N, Cengage publications.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International
   Publications, 5th Edition.
4. Control Systems Engineering, S.Palani,TataMcGraw Hill Publications.

B.TECH V SEMESTER	**OE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE5T05 SPECIAL ELECTRICAL MACHINES

(OPEN ELECTIVE-I)

Course Objective:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor.
- To explain the theory of travelling magnetic field and applications of linear motors.

Course Outcomes:

The student should be able to

CO1: Distinguish between brush dc motor and brush less dc motor.

CO2: Explain the performance and control of stepper motors, and their applications.

CO3: Explain theory of operation and control of switched reluctance motor.

CO4: Explain the theory of travelling magnetic field and applications of linear motors.

CO5: Understand the significance of electrical motors for traction drives.

SYLLABUS

Unit I: Stepper Motors: Classification and construction details of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of stepper motors – Applications of stepping motors.

Unit II: Switched Reluctance Motors: Construction – Comparison of conventional and switched reluctance motors –Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

Unit III : Brushless DC Motor: Construction – Principle of operation of BLDM – sensing and logic scheme, basic drive circuit, power converter circuit, transient analysis Theory of brushless DC motor as variable speed synchronous motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency.

UNIT-IV: **Linear motors:** Linear induction motor: Construction– principle of operation– applications. Linear synchronous motor: Construction – principle of operation– applications.

Unit V: Electric Motors for traction drives: AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:

1. Special electrical Machines, K. Venkata Ratnam, University press, 2009, New
2. "Linear Electric Motors: Theory, Design and Practical application" , Naser A and Boldea I, Prentice Hall Inc, New Jersey, 1987.

Reference Books:

1. Generalized Theory of Electrical Machines – PS Bhimbra, Khanna Publishers.
2. "Brushless Permanent Magnet and Reluctance Motor Drives" , Miller T.J.E. Clarendon Press, Oxford, 1989.
3. Electric Machines – Theory, operation, Applications and Control - Charles I. Hubert – Pearson Publications.

B.TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME5T04 **DESIGN THINKING & PRODUCT INNOVATION (OPEN ELECTIVE-I)**

Pre-requisite: Managerial Economics and Financial Analysis, Management Science.

Course Objective: At the end of the course, The student will able to

1. Design and develop the new product
2. Explain the basics of design thinking.
3. Describe the role of reverse engineering in product development.
4. Identify the needs of society and convert into demand.
5. Explain the product planning and product development process

Course Outcomes: At the end of the course, student will be able to

CO1: To bring awareness on innovative design and new product development.

CO2: To explain the basics of design thinking.

CO3: To familiarize the role of reverse engineering in product development.

CO4: To train how to identify the needs of society and convert into demand.

CO5: To introduce product planning and product development process.

SYLLABUS

UNIT-I: SCIENCE TO ENGINEERING:

Job of engineers, engineering units and measurement, elements of engineering analysis, forces and motion, energy, kinematics and motion, conversion of linear motion to rotary and vice versa, motion transmission. Physics to Engineering: Application of Newton laws, Pascal's law, Bouncy, Bernoulli's theorem, Ohm's law, electrical induction in engineering products.

UNIT-II: HISTORICAL DEVELOPMENT:

Invention wheel, early mechanics in design, mechanical advantages, industrial revolution, steam and petrol for mobility. Innovations in Electrical and Electronics: Electrical energy generation, electrical bulb, electrical equipment, electronics and automation, computing for early days to present, innovations in communications.

UNIT-III: SYSTEMATIC APPROACH TO PRODUCT DEVELOPMENT:

Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation. Solution finding methods: Conventional, intuitive, discursive, methods for combining solution, decision making for new design.

UNIT-IV: REVERSE ENGINEERING IN PRODUCT DEVELOPMENT:

Reversing engineering methods, identifying the bad features in a product, reduction in size and weight, usage of new materials, 3D printing, study of introducing electrical and electronic controls to the old products, importance of ergonomics in product development, environmental considerations in design, safety considerations in design.

UNIT-V:

Study of Product Development- Agriculture, development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy. Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of electrical vehicles, unmanned vehicles, design principles in drones.

Text Books:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, "Exploring Engineering: An Introduction to Engineering and Design", 4th edition, Elsevier, 2016.
2. David Ralzman, "History of Modern Design", 2nd edition, Laurence King Publishing Ltd., 2010
3. An AVA Book, "Design Thinking", AVA Publishing, 2010.

Reference Books:

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, "Engineering Design: A Systematic Approach", 3rd edition, Springer, 2007.
2. Tom Kelley, Jonathan Littman, "Ten Faces in Innovation", Currency Books, 2006.

B.TECH V SEMESTER		**OEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME5T05	**NANOTECHNOLOGY (OPEN ELECTIVE-I)**					

Pre-requisite: Materials Science

Course Objective:

- To familiarize with principles of quantum mechanics on which nano materials behave
- To elucidate applications of nanotechnology

Course Outcomes:

At the end of the course, student will be able to

CO1: Analyze the concepts and preparation methods of Nano materials

CO2: Understand the nano material properties and their behavior

CO3: Use various techniques for investigating nano material

CO4: Know the importance of Nano Technology for advanced materials processing

CO5: Know the importance of Nano structured Materials for Various Energies.

SYLLABUS

UNIT-I: Introduction to Nano technology:

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects

UNIT-II: Unique Properties of Nanomaterials:

Microstructure and Defects in nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple, and disclinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility, Magnetic Properties: Soft magnetic Nanocrystalline alloy, Permanent magnetic Nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT-III: Synthesis Routes :

Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method ,Self assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

UNIT-IV: Nanomaterials for Energy Conversion Systems:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy, Conversion Systems, Fuel Cells, Principles and nanomaterials design for Proton exchange membrane fuel cells (PEMFC); Direct methanol fuel cells (DMFC).

UNIT-V:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy Storage Systems, Primary and Secondary Batteries (Lithium ion Batteries), Cathode and anode materials, Nanostructured Carbon based materials, Nano-Oxides, Novel hybrid electrode materials, Current status and future trends.

Text books:

1. Electrochemical methods: Fundamentals and Applications, Allen J.Bard and Larry R. Faulkner, 2ndEdition John Wiley & Sons. Inc (2004)
2. D. Linden Ed., Handbook of Batteries, 2nd edition, McGraw-Hill, New York (1995)
3. G.A. Nazri and G. Pistoia, Lithium Batteries: Science and Technology, KulwerAcdemic Publishers, Dordrecht, Netherlands (2004).
4. J. Larmine and A. Dicks, Fuel Cell System Explained, John Wiley, New York (2000).

Reference Books:

1. Science and Technology of Lithium Batteries-Materials Aspects: An Overview, A. Manthiram, Kulwer Academic Publisher (2000).
2. M. S. Whittingham, A. J. Jacobson, Intercalation Chemistry, Academic Press, New York (1982).
3. M. Wakihara, O. Yamamoto, (Eds.) Lithium Ion Batteries: Fundamentals and Performance, Wiley –VCH ,Weinheim (1998).

B. Tech V SEMESTER	OEC	L	T	P	C
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20EC5T04 LINEAR SYSTEM ANALYSIS (OPEN ELECTIVE –I)

Pre-requisite: Basic knowledge about vectors, differentiation and integration

COURSE OBJECTIVES:
The main objectives of this course are given below:

	At the end of the course, student will be able to
1	To understand basics of Signals and Systems required for all Engineering related courses.
2	To understand the behaviour of signal in time and frequency domain.
3	To understand the characteristics of LTI systems.
4	To understand concepts of Signals and Systems and its analysis using different transform techniques.
5	To understand sampling, convolution and correlation.

COURSE OUTCOMES:
At the end of this course the student will able to:

	At the end of the course, student will be able to
CO1:	Differentiate various signal functions.
CO2:	Represent any arbitrary signal in time and frequency domain.
CO3:	Understand the characteristics of linear time invariant systems.
CO4:	Analyse the signals with different transform technique.
CO5:	Understand the concept of sampling.

SYLLABUS

UNIT-I: Signal Analysis

Analogy between Vectors and Signals, Orthogonal Signal Space, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function

UNIT-II: Fourier series & Fourier transforms

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series.Deriving Fourier Transform from Fourier series,

Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform.

UNIT-III: Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Pauley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time.

UNIT-IV: Laplace Transforms & Z–Transforms

Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal.

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms

UNIT-V: Sampling theorem & Correlation

Graphical and analytical proof for Band Limited Signals, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parseval's Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation.

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2nd Ed.

Reference Books:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH

B. TECH V SEMESTER

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20EC5T05 DIGITAL LOGIC DESIGN (OPEN ELECTIVE –I)

Course Objectives:
At the end of the course, student will be able to

1. To represent numbers and conversion between different representations.
2. To analyze logic processes and implement logical operations.
3. To develop the combinational logic circuits.
4. To understand concept of programmable logic devices like PROM, PLA, PAL.
5. To design and analyze the concepts of sequential circuits.

Course Outcomes:
At the end of this course the student will able to:

CO1: Understand different number systems and their conversions.
CO2: Analyze the logical operations and Boolean algebra
CO3: Develop combinational circuits and perform logical operations.
CO4: Understand different programmable logic devices.
CO5: Design the sequential logic functions.\

SYLLABUS

UNIT-I:

Number Systems: Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r‘s Complement- (r-1)‘s Complement- Subtraction of Unsigned Numbers- Signed Binary Numbers- Problems.

UNIT-II:

Logic Gates and Boolean Algebra: Basic Gates- Universal Gates- Ex-Or and Ex-Nor Gates- SOP- POS- Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- K Map Method- Minimization of Boolean Functions.

UNIT-III: Signal Transmission through Linear Systems

Combinational Logic Circuits: Design of Half Adder- Full Adder- Half Subtractor- Full Subtractor- Ripple Adder and Subtractor- Design of Decoders- Encoders- Multiplexers- Demultiplexers- Magnitude Comparator.

UNIT-IV: Laplace Transforms & Z–Transforms

Introduction to Programmable Logic Devices (PLDs): PLA- PAL- PROM- Realization of Switching Functions Using PROM- Comparison of PLA, PAL and PROM.

UNIT-V: Sampling theorem & Correlation

Introduction to Sequential Logic Circuits: Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear)- Design of Registers- Universal Shift Register- Ring Counter- Johnson Counter.

TEXT BOOKS

1. Digital Design, M.Morris Mano, Michael D Ciletti, 4thEdition, PEA, 2003.

2. Fundamentals of Logic Design, Roth, 5thEdition, Cengage, 2004

REFERENCE BOOKS

1. Switching and Finite Automata Theory, Kohavi, 3rd Edition, Jha, Cambridge, 2005

2. Digital Logic Design, Leach, Malvino, Saha, TMH, 2000.

B. TECH V SEMESTER **OEC**

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SOLID STATE DEVICES
20EC5T06 (OPEN ELECTIVE –I)

Course Objectives: Students undergoing this course, are expected to

1. Familiarize with the fundamentals of Semiconductor physics
2. Familiarize with various diodes and characteristics.
3. Familiarize with the transistors and their configurations.
4. Disseminate Amplifications with transistors
5. Understand the operation and working of Oscillators

Course Outcomes:

After undergoing the course, students will be able to

CO1: Understand importance of semiconductors.

CO2: Analyze Diode characteristics.

CO3: Differentiate various Transistor BJT configurations.

CO4: Design amplifiers at different applications using transistor.

CO5: Analyze different Feedback amplifiers & oscillators design

SYLLABUS.

Unit I: Basics Concepts of Semiconductor Physics, Charged Particles, Field Intensity, Potential, Energy, the eV unit of energy, Energy Band theory of Crystals, Insulators, Semiconductors and metals, Mobility and Conductivity, Electrons and Holes, Donor and Acceptor impurities, Charge Densities in a Semiconductor, Electrical properties of Ge and Si, Hall Effect, Diffusion and Drift Currents, Mass action Law, Fermi-Dirac distribution.

Unit II: Diodes: PN junction diode- Energy band diagram of PN junction Diode- V-I Characteristics –Current components in PN junction Diode- Diode equation- Diode resistance and capacitance, Characteristics of Zener Diode, Varactor Diode- SCR and UJT.

Unit III: Transistors Bipolar Junction Transistor: Transistor current components- Transistor equation- Transistor configurations- Characteristics of a transistor in CB, CC&CE configurations- Transistor as a Switch,Transistor as an amplifier. Field Effect Transistors (FET): Junction Field Effect Transistor construction & operation, characteristics of CS, CD & CG

Unit IV: Small Signal Transistor Amplifier models: Low Frequency Transistor Amplifier Models: Two port network, Transistor hybrid model, determination of h- parameters, generalized analysis of transistor amplifier model using h-parameters

Unit V: Feedback Amplifiers and Oscillators: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and their analysis. Generalized analysis of LC Oscillators, Hartley and Colpitt‘s oscillators with BJT and their analysis.

Text Books:

1) Millman, Halkias, ―Integrated Electronics- Analog and Digital Circuits and Systems, TMH.

2).Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGrawHill,Second Edition.

Reference Books:

1) Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.

2) . Basic Electronic Circuits -V.K.Mehta, S-chand Publications,2008

B. TECH V SEMESTER **OEC**

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20CS5T07 INTRODUCTION TO ARTIFICIAL INTELLIGENCE (OPEN ELECTIVE –I)

Course Objectives:

- To gain a historical perspective of Artificial Intelligence and its foundations.
- To familiarize the basic principles of Artificial Intelligence towards problem solving Inference, Perception, Knowledge representation and Learning.
- To understand advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems.

Course Outcomes: At the end of the course, the students will be able to:

CO1: To Understand the history of Artificial Intelligence and its foundations.

CO2: Apply various Artificial Intelligence Techniques for problem solving.

CO3: Formalization of knowledge using the framework of predicate logic.

CO4: Ability to apply knowledge representation and reasoning to real world problems.

CO5: Derive conclusions from uncertain knowledge and quantify the uncertainty in the Conclusions obtained.

SYLLABUS

UNIT-1:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT-2: Problem Solving:

State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem Reduction and Game Playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT-3: Logic Concepts:

Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-4: Knowledge representation:

Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT-5: Expert system and applications:

Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning (Units 1,2,3,4,5)

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
4. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

B. TECH V SEMESTER

OEC	L	T	P	C
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OPERATING SYSTEMS
20CS5T08 (OPEN ELECTIVE –I)

Course Objectives:

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes:

CO1: Understand the importance, functions and structures of operating systems.

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

SYLLABUS

UNIT - I: Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication

UNIT - II: Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multithreading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT – III: Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures

UNIT - IV: Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock- Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Dead lock.

UNIT - V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling

TEXT BOOKS:

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley, 9thedition.(Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition–2005.(Unit-5)

REFERENCES:

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley ,Operating Systems: A Design-Oriented Approach, Tata Mc Graw Hill Education,1996.

B. TECH V SEMESTER

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SOFTWARE ENGINEERING
20CS5T09 (OPEN ELECTIVE –I)

Course Objective:

- Gain knowledge about software process models.
- Familiarize the basic software engineering methods, practices and its applications.
- Facilitate students in software design.

Course Outcomes:

CO1: Understand the software life cycle models

CO2: Understand the scrum approach to agile project management**.**

CO3: Analyze the software requirements and generate SRS document

CO4: Understand some of the different models that may be used to design

CO5: Understand various software testing approaches and quality control to ensure good quality software

SYLLABUS

Unit-I:

Introduction to Software Engineering: Nature of software, Software engineering, The Software Processes, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialised Process models, The Unified Process, Personal and Team Process Models.

Unit-II:

Requirements Engineering: Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

Requirements Modelling: Requirement Analysis, Scenario-Based Modelling, Data Modelling Concepts, Class-Based Modelling

Unit-III:

Design Concepts: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Unit-IV:

Understanding of UML diagrams: Structural diagrams - class diagram, object diagram, component diagram, deployment diagram, Behavioural diagrams - Use-case diagram, activity diagram, sequence diagram, collaboration diagram, state chart diagram.

Unit-V:

Implementation: Structured coding Techniques, Coding Styles-Standards and Guidelines, Implementation Issues.

Software Testing Strategies: A Strategic approach to Software Testing, Strategic Issues and Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing, Software Quality concepts.

TEXT BOOKS:

1. Roger S. Pressman (2010), Software Engineering, A Practitioner's Approach, 7th Edition, McGraw-Hill International Edition, India.
2. Ian Sommerville (2011), Software Engineering, 9th Edition, Pearson education, India.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.Jim ConallenKelli A. Houston," Object-Oriented Analysis and Design with Applications", 3rd edition.

REFERENCES:

1. Pankaj Jalote (2010), Software Engineering, A Precise Approach, Wiley India.
2. Waman S. Jawadekar (2008), Software Engineering: A Primer, McGraw-Hill, India.
3. Hans Van Vilet (2008), Software Engineering Principles and Practice, 3rd Edition, John Wiley & Sons Ltd.
4. Rajib Mall (2005), Fundamental of Software Engineering, PHI.
5. Deepak Jain, Software Engineering, Principles and Practices, Oxford, University Press, India.

B. TECH V SEMESTER

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COMPUTER NETWORKS
20IT5T07 (OPEN ELECTIVE –I)

Course Objectives:

- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the students to basic principles of networking using the goals like protocol layering and top down approach.
- Build an understanding of the basics of the internetworking and routing used in the computer networks.
- To provide guidelines in developing network applications

Course Outcomes:

At the end of the course, student will be able to

CO1- Independently enumerate the layers of the OSI model and TCP/IP.

CO2- Identify the different types of network topologies and protocols.

CO3- Compare and contrast methods to identify Errors and correct them

CO4- Differentiate between various network routing algorithms.

CO5- Understand WWW and HTTP Architectures.

SYLLABUS

UNIT - I: Introduction:

OSI overview, TCP/IP and other networks models, Examples of Networks: Arpanet, Internet, Network Topologies Wide Area Networks(WAN), Local Area Networks(LAN), Metropolitan Area Networks(MAN).

UNIT - II: Physical Layer and overview of PL Switching:

Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, introduction to switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT – III: Data link layer:

Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction, CRC, Checksum: idea, one's complement internet checksum, services provided to Network.

Elementary Data Link Layer protocols: Simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.

Sliding window protocol: One bit, Go-back N, Selective Repetitive protocol, Stop and wait protocol.

UNIT - IV: Random Access:

ALOHA, MAC addresses, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access(CDMA).

Network layer: Shortest Path, Distance Vector Routing Algorithm, Hierarchal routing algorithm.

UNIT - V: Application layer (WWW and HTTP):

WWWARCHITECTURE: Client (Browser), Server, Uniform Resource Locator, Resource Record, HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Request Message Format, HTTP Response Message Format

TEXT BOOKS:

1. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH. (Units 1,2,4,5)
2. Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education(Units 1, 3, 4)

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

B. TECH V SEMESTER

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COMPUTER GRAPHICS
20IT5T08 (OPEN ELECTIVE –I)

Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

Course Outcomes:

After learning the course, the student will be able:

CO1: Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations.

CO2: Apply projections and visible surface detection techniques for display of 3D scene on 2D screen.

CO3: Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics.

CO4: Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).

CO5: Know and be able to discuss hardware system architecture for computer graphics. This Includes, but is not limited to: graphics pipeline, frame buffers, and graphic accelerators/co-processors.

SYLLABUS

UNIT - I: Introduction to Graphics:

Application area of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT - II: 3D Concepts:

Parallel and Perspective projections, Three dimensional object representation-Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT – III: Graphics Programming:

Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Key frame. Graphics programming using OPENGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes

UNIT – IV: Rendering:

Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadow of objects, Building a camera in a program, Creating shaded objects

UNIT - V: Overview of Ray Tracing:

Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics– C Version, second edition, Pearson Education, 2004

REFERENCES:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007

B. TECH V SEMESTER

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OPERATIONS RESEARCH
20HS5T02 (OPEN ELECTIVE –I)

Course Objectives:

1) Identify and develop operational research models from the verbal description of the real system.
2) Understand the mathematical tools that are needed to solve optimization problems.
3) Use mathematical software to solve the proposed models.
4) Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

Course Outcomes:

CO1: Understand the methodology of Operations Research& concepts of linear programming

CO2: Formulate the solutions to transportation problems

CO3: Explain the solutions for various sequencing problems

CO4: Illustrate the solutions to different replacement policies

CO5: Apply game theory to solve real world problems

SYLLABUS

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

UNIT-II

Transportation Problem. Formulation, Solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.

UNIT-III

Assignment model. Formulation. Hungarian Method for optimal solution. Solving Unbalanced problem. Sequencing Models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines Processing n Jobs through m Machines.

UNIT-IV

Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

UNIT-V

Game Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

Inventory models. Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

TEXT BOOKS:

1) P. SankaraIyer,"Operations Research", Tata McGraw-Hill, 2008.
2) A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

REFERENCES:

1) J K Sharma. "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2) P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.

B. TECH V SEMESTER	OEC	L	T	P	C
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PRINCIPLES OF MANAGEMENT
20MB5T01 (OPEN ELECTIVE –I)

COURSE OBJECTIVE

This course ensures that the students understand

1 Management Concepts

2 Applications of Concepts in Practical aspects of business and Development of Managerial Skills.

3 Managers manage business organizations in the dynamic global environment and maintain competitive advantage.

4 Business decisions are made using various tools and techniques to remain competitive

5 Managers use problem-solving strategies, critical thinking skills in real-life situations and implement successful planning.

COURSE OUTCOME

After learning the contents of this course, the student would be able to know

CO1: What are the circumstances that lead to management evolution and how it will affect future managers.

CO2: Analyze and evaluate the influence of historical forces on the current practice of management

CO3: Develop the process of management's functions: Planning and Organizing.

CO4: Evaluate leadership styles to anticipate the consequences of each leadership style and directing.

CO5: Identify the areas to control and selecting the appropriate controlling methods/techniques.

SYLLABUS

UNIT I

Introduction to Management: Definition, Functions, Process, Scope and Significance of Management.

Nature of Management, Functions of Management, Managerial Roles, Levels Managerial Skills and Activities, Difference between Management and Administration, Significance of Values and Ethics in Management.

Challenges of Management

UNIT II

Evolution of Management Thought: Approaches to Management - Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT III

Planning and Organizing: Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing.

UNIT IV

Directing: Effective Directing, Supervision, Motivation, Different Theories of Motivation-Maslow, Herzberg, McClelland, Vroom, Porter and Lawler, Job Satisfaction. Concept of Leadership- Theories and Styles. Communication Process, Channels and Barriers, Effective Communication.

UNIT V

Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

TEXT BOOKS

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Management-Tasks, Responsibilities & Practices, Drucker, F. Peter
4. Principles of Management, Terry and Franklin

REFERENCES

1. Essentials of Management, Koontz Weihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

NPTEL WEB COURSE:

nptel.ac.in/courses/122108038/

NPTEL VIDEO COURSE:

nptel.ac.in/courses/122108038/#

B. TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
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TECHNOLOGY MANAGEMENT
20MB5T02 (OPEN ELECTIVE –I)

Course Objective

- The course aims at providing an overview of various issues connected with Management of Technology in organizations.

Course Outcomes

CO1: To understand the importance of technology and innovation management

CO2: To understand the technology absorption, incremental innovation, research and development, technovation and technology fusion that dominate the contemporary world industry.

CO3: To understand the nature, significance, dimensions requirements, concepts, issues, themes, policies and structure of the management of technology and technovation.

SYLLABUS

UNIT-I

Evolution of Technology-Effects of New Technology- Technology Innovation.-Invention-Innovation- Diffusion- Revolutionary and Evolutionary Innovation- Product and Process Innovation- Strategic Implications of Technology- Technology – Strategy Alliance -Convergent and Divergent Cycle- The Balanced Approach.

UNIT-II

Technology Assessment- Technology Choice- Technological Leadership and Followership- Technology Acquisition- Technological Forecasting- Exploratory, Intuitive, Extrapolation, Growth Curves, Technology Monitoring- Normative: Relevance Tree, Morphological Analysis, Mission Flow Diagram.

UNIT-III

Diffusion of Technology- Rate of Diffusion; Innovation Time and Innovation CostSpeed of Diffusion- Technology Indicators- Various Indicators- Organizational Implications of Technology- Relationship between Technical Structure and Organizational Infrastructure- Flexible Manufacturing Management System (FMMS).

UNIT-IV

Financial Aspects in Technology Management- Improving Traditional Cost -Management System- Barriers to the Evaluation of New Technology- Social Issues in Technology Management- Technological Change and Industrial Relations- Technology Assessment and Environmental Impact Analysis.

UNIT-V

Human Aspects in Technology Management- Integration of People and Technology Organizational and Psychological Factors- Organizational Outcome- Technology Transfer-Technology Management Scenario in India.

Text Books

1. Sharif Nawaz: Management of Technology Transfer & Development, APCFT, Bangalore, 1983.

2. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,New Delhi.

References

1. Betz Fredrick: Managing Technology, Prentice Hall, New Jersey.
2. Gaynor: Handbook of Technology Management, McGraw Hill.
3. Tarek Khalil: Management of Technology, McGraw Hill International, 2000.
4. “Managing Technology and Innovation”, Robert & Roland, 1st Edition, Routledge.

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

FOUNDATIONS OF DATA SCIENCE
20AD5T07 (OPEN ELECTIVE –I)

Course Objective: *This* ***course*** explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

UNIT-1: Data science in a big data world: Benefits and uses of data science and big data, Facets of data, The data science process, The big data eco system and data science, An introductory working example of Hadoop.

UNIT-2:

The data science process: Overview of the data science process, Step 1: Defining research goals and creating a project charter, Step 2: Retrieving data, Step 3: Cleansing, integrating, and transforming data, Step 4: Exploratory data analysis, Step 5: Build the models, Step 6: Presenting findings and building applications on top of them. Machine learning: What is machine learning and why should you care about it?, The modeling process, Types of machine learning, Semi-supervised learning.

UNIT-3:

Handling large data on a single computer: The problems you face when handling large data, General techniques for handling large volumes of data, General programming tips for dealing with large data sets, Case study 1: Predicting malicious URLs, Case study 2: Building a recommender system inside a database.

UNIT-4: First steps in big data: Distributing data storage and processing with frameworks, Case study: Assessing risk when loaning money, Join the NoSQL movement: Introduction to NoSQL, ACID: the core principle of relational databases,

CAP Theorem: the problem with DBs on many nodes, The BASE principles of NoSQL databases, NoSQL database types, Case study: What disease is that?

UNIT-5: The rise of graph databases: Introducing connected data and graph databases , Introducing Neo4j: a graph database, Connected data example: a recipe recommendation engine, Text mining and text analytics: Text mining in the real world, Text mining techniques, Case study: Classifying Reddit posts.

Text Book:

Introducing Data Science by Davy Cielen, Arno D. B. Meysman, and Mohamed Ali

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

20AM5T07 INTRODUCTION TO MACHINE LEARNING (OPEN ELECTIVE –I)

Pre-requisite: Probability and Statistics, Linear Algebra

Course Objective: *This* ***course*** explains basic concepts of Machine Learning and teaches you to use recent machine learning software for solving problems and understanding supervised and unsupervised learning methods

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the characteristics of machine learning.

CO2: Summarize the Model building and evaluation approaches.

CO3: Apply Bayesian learning and regression algorithms for real-world Problems.

CO4: Apply supervised learning algorithms to solve the real-world Problems.

CO5: Apply unsupervised learning algorithms for the real world data.

SYLLABUS

Unit-1: Introduction to Machine Learning and Preparing to Model:

Introduction to Machine Learning- Introduction, What is Human Learning? Types of Human Learning, What is Machine Learning? Types of Machine Learning, Problems Not To Be Solved Using Machine Learning, Applications of Machine Learning.

Preparing to Model- Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

Modeling & Evaluation, Basics of Feature Engineering:

Modeling & Evaluation - Introduction, Selecting a Model, Training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model.

Basics of Feature Engineering - Introduction, Feature Transformation, Feature Subset Selection.

Unit-2: Bayesian Concept Learning and Regression:

Bayesian Concept Learning - Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network.

Regression: Introduction, Regression Algorithms - Simple linear regression, Multiple linear regression, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

Unit-3: Supervised Learning: Classification, Ensemble Learning: Classification- Introduction, Example of Supervised Learning, Classification Model, Classification

Learning Steps, Common Classification Algorithms - k-Nearest Neighbour (KNN), Decision tree, Random forest model, Support vector machines.

Ensemble Learning- Boosting, Bagging

Unit-4: Basics of Neural Network

Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network, Learning Process in ANN, Backpropagation, Deep Learning

Unit-5: Unsupervised Learning:

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning.

Principle Component Analysis: Introduction, Probabilistic PCA- Maximum Likelihood PCA, EM Algorithm for PCA, Bayesian PCA, Factor Analysis; Kernel PCA

Clustering: Clustering as a Machine Learning task, Different types of clustering techniques, Partitioning methods, Hierarchical clustering, Density-based methods: DBSCAN.

Finding Pattern using Association Rule - Definition of common terms, Association rule, Apriori algorithm.

Text Books:

1. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, “Machine Learning”, Pearson Education India ,1st edition.
2. Christopher M. Bishop, “Pattern Recognition and Machine Learning”. New York :Springer, 2006.

Reference Books:

1. Tom M. Mitchell, “Machine Learning’, MGH, 1997.
2. Shai Shalev-Shwartz, ShaiBen David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge.
3. Peter Harington, “Machine Learning in Action” , Cengage, 1st edition, 2012.

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE6T08 REMOTE SENSING AND GIS (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Learn various types of sensors and platforms
- learn concepts of visual and digital image analyses
- Understand the principles of spatial analysis
- Appreciate application of RS and GIS to Civil engineering

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Be familiar with ground, air and satellite based sensor platforms.

CO2: Interpret the aerial photographs and satellite imageries

CO3: Create and input spatial data for GIS application

CO4: Apply RS and GIS concepts in water resources engineering

SYLLABUS

UNIT–I:

Introduction to remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems. Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

UNIT–II:

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT–III:

Geographic Information System: Introduction, key components, application areas of GIS, map projections. Data entry and preparation: spatial data input, raster data models, vector data Models.

UNIT – IV:

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT–V:

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications. Application to Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management.

Text Books:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

Reference Books:

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A KW Yeung, Prentice Hall (India), 2006
3. 'Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. 'Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE6T09 ENVIRONMENTAL IMPACT ASSESSMENT (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- impart knowledge on different concepts of Environmental Impact Assessment
- know procedures of risk assessment
- learn the EIA methodologies and the criterion for selection of EIA methods
- pre-requisites for ISO 14001 certification
- know the procedures for environmental clearances and audit
- appreciate the importance of stakeholder participation in EIA

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Prepare EMP, EIS, and EIA report

CO2: Identify the risks and impacts of a project

CO3: Selection of an appropriate EIA methodology

CO4: Evaluation the EIA report

CO5: Estimate the cost benefit ratio of a project

CO6: Know the role of stakeholder and public hearing in the preparation of EIA

SYLLABUS

UNIT–I:

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA.

UNIT–II:

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP.

UNIT-III:

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV:

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with

reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT–V:

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

Reference Books:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

B.TECH VI SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE6T08 RENEWABLE ENERGY SOURCES (OPEN ELECTIVE-II)

Course Objective:

- To give sufficient knowledge about the promising new and renewable sources of energy
- Explain the concept of various forms of renewable energy
- Learn the present energy scenario
- Analyse the environmental aspects of renewable energy resources.

Course Outcomes:

CO1: Know the need of various renewable energy systems

CO2: understand the concepts of bio-energy,

CO3: Acquire the knowledge of OTEC, tidal,

CO4: Acquire the knowledge of geothermal and Alternative energy sources

SYLLABUS

UNIT-I

Introduction: Introduction to energy sources, reserves and estimates, global energy scenario, renewable energy -environment implications, global warming and climate change, limitations of conventional energy sources, classification of non-conventional energy sources - solar energy, wind energy, bio-energy, Ocean Thermal Energy Conversion (OTEC), tidal, geothermal and hydro.

UNIT-II

Bio-energy: Biomass and its sources, energy plantation, production of fuel wood, bio-conversion processes, bio-gas, bio-diesel and ethanol production and utilization, thermo-chemical processes, biomass gasification, process, types of reactors, utilization of producer gas for thermal and electricity generation.

UNIT-III

Ocean thermal energy conversion, tidal, geothermal: Tidal energy, wave energy, data, technology options; open and closed *Ocean thermal energy conversion* cycles, geothermal energy sources, power plant and environmental issues.

UNIT-IV

Fuel Cells: Hydrogen generation-storage, transport and utilization, applications, power generation. Fuel cells-Technologies, types, economics and power generation.

UNIT-V

Solar Energy Storage and Applications:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2006
2. Renewable Energy Resources – Twidell&Wier, CRC Press(Taylor & Francis), 2012
3. *Y. W. B. Charles*, *B.H. Essel*, *―Biomass Conversion and Technology‖*, John Wiley, Latest Edition

Reference Books:

1. Renewable energy resources by G. N. Tiwari, M. K. Ghosal, Alpha Science International, 2005.
2. Renewable Energy Technologies by R. Ramesh, K. Uday Kumar, M. Anandakrishnan, Narosa Publishing House, 1997
3. Non-Conventional Energy Systems by K Mittal, A. H. Wheeler Publishing Company Limited, 01-Jan-1999.
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, P.H.I.
5. Godfrey Boyle, ―Renewable Energy- Power for a Sustainable Future‖, Oxford University Press, U.K.,
6. Twidell, J.W. & Weir, A., ―Renewable Energy Sources‖, E.F.N Spon Ltd., UK.

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE6T09 ENERGY AUDIT, CONSERVATION AND MANAGEMENT (OPEN ELECTIVE-II)

Course Objective:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Course Outcomes:
At the end of the course student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

SYLLABUS

UNIT-I

Basic Principles of Energy Audit and management: Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Piecharts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions –Language – Questionnaire – Check list for top management.

UNIT-II

Lighting: Modification of existing systems – Replacement of existing systems – Priorities**:** Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level –Illumination of inclined surface to beam – Luminance or brightness – Types of lamps –Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT-III

Power Factor and energy instruments: Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters– Tong testers – Power analyzer.

UNIT-IV

Space Heating and Ventilation: Ventilation – Air–Conditioning (HVAC) and Water Heating**:** Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning –Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

UNIT-V

Economic Aspects and Financial Analysis: Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems.

Computation of Economic Aspects

Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment –Numerical examples.

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd– 2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevierpublications. 2012
2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
4. Energy management hand book by W.C.Turner, John wiley and sons.
5. Energy management and conservation –k v

B.TECH VI SEMESTER		**OEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
	20ME6T07	**INDUSTRIAL ROBOTICS (OPEN ELECTIVE-II)**				

Pre-requisite: Kinematics and Mathematics

Course Objective:

1. The student will be exposed to the concepts of automation and fundamentals of robotics
2. The students will be exposed to the concepts of transformations and robot kinematics,
3. The students will understand the functioning of sensors and actuators
4. The students will be exposed to robot programming languages and Programming.
5. The student will be exposed to the applications of robotics in manufacturing.

Course Outcomes: At the end of the course, student will be able to

CO1	Understand various applications of robotics and classification of coordinate system and control systems.
CO2	Build the concepts of components of industrial robotics.
CO3	Apply kinematic analysis with D-H notation, forward and inverse kinematics and Solve dynamic analysis with Lagrange – Euler and Newton – Euler formulations.
CO4	Model trajectory planning for a manipulator by avoiding obstacles.
CO5	Understand different types of actuators and applications of robots in manufacturing.

SYLLABUS

UNIT-I:

Introduction: Automation and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT-II: MOTION ANALYSIS AND CONTROL:

Motion Analysis: Basic Rotation Matrices, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT-III:

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion straight line motion.

UNIT-IV:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools.

UNIT-V:

Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.

Text Book(s)

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson, 3rd edition.

References

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
4. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley

5. Introduction to Robotics by SK Saha, The McGrah Hill Company, 6th, 2012
6. Robotics and Control / Mittal R K &Nagrath I J / TMH

B.TECH VI SEMESTER		**OEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME6T08	**3D PRINTING (OPEN ELECTIVE-II)**					

Pre-requisite: Manufacturing Process

Course Objective:

The course aims at the importance of Additive Manufacturing, Classifications, models, specifications of various Additive Manufacturing Techniques. To learn the different tools, soft-wares required and the applications of Additive Manufacturing

Course Outcomes: At the end of the course, student will be able to

CO1:	Understand the working principle and process parameters of AM processes
CO2:	Explore the applications of AM processes in various fields
CO3:	Apply the suitable process and material for fabricating a given product
CO4:	Use the suitable post process based on product application
CO5:	Design and develop a product for AM Process

SYLLABUS

UNIT-I:

Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT-II:

Machines for Rapid Prototyping: Overview of Polymerization: Stereolithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT-III:

Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive Manufactured Tools, Indirect Rapid

UNIT-IV:

Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture of Metal Components

UNIT-V:

Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2015, 2nd Edition.
2. 3D Printing and Additive Manufacturing: Principles & Applications, Chua Chee Kai, Leong Kah Fai, World Scientific, 2015, 4th Edition.

References:

1. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venuvinod and Weiyin Ma, Springer, 2004.
2. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.
3. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006.

B.TECH VI SEMESTER **OEC**

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3	0	0	3

20EC6T07 **ELECTRONIC CIRCUITS AND NETWORKS (OPEN ELECTIVE-II)**

Course Objectives:

At the end of the course, student will be able to

1 To understand the Differentiator and Integrator circuits

2 To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.

3 To Introduce to Time-base Generators and Principles of Synchronization and Frequency division.

4 To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.

5 To understand and Design gates using various logic families.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand the basic concepts of Optoelectronic Devices

CO2: Design linear wave shaping circuits.

CO3: Design Non- linear wave shaping circuits.

CO4: Design Different Time Base Generators

CO5: understand the concepts of one port networks

SYLLABUS

UNIT-I: Optoelectronic Devices

Introduction, Photo sensors, Photoconductors, Photodiodes, Phototransistors, Light-Emitting Diodes, Liquid Crystal Displays, Cathode Ray Tube Displays, Emerging Display Technologies, Opto couplers.

UNIT-II: LINEAR WAVE SHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT-III: NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of

voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT-IV: VOLTAGE TIME BASE GENERATORS

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator.

UNIT-V: Synthesis of one port networks

Synthesis of one port networks
Synthesis of reactive one-ports by Foster's and Cauer methods (forms I and II) - Synthesis of LC, RC and RL driving-point functions.

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.

2. K. S. Suresh Kumar, ―Electric Circuit Analysis‖, Pearson Publications, 2013.

Reference Books:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20EC6T08 PRINCIPLES OF COMMUNICATIONS (OPEN ELECTIVE – II)

Course Objectives:

At the end of the course, student will be able to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Familiarize with the fundamentals of digital communication systems
4. Familiarize with various techniques for digital modulation and demodulation of signals
5. Distinguish the figure of merits of various analog modulation methods

Course Outcomes:

At the end of this course the student will able to:

CO1: Differentiate various Analog modulation schemes

CO2: Analyze demodulation schemes and their spectral characteristics

CO3: Analyze demodulation schemes and their spectral characteristics

CO4: Analyze demodulation schemes and their spectral characteristics

CO5: Analyze noise characteristics of various analog modulation methods

SYLLABUS

UNIT-I: Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver

UNIT-II: Angle Modulation, Frequency and Phase modulation, frequency deviation, Bandwidth, FM Modulators and Demodulators, Narrow band and wide band FM, FM Broadcasting.

UNIT-III: Pulse digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Generation and Demodulation, Frequency Division Multiplexing, Time Division Multiplexing

UNIT-IV: Digital Representation of Analog Signals, Pulse Code Modulation (PCM), Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Mathematical Representation of Noise.

UNIT-V: Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops.

Text Book:

1. Herbert Taub and Donald L. Schilling, ―Principles of Communication Systems., Tata McGraw Hill.
2. Rishabh Anand, Communication Systems, Khanna Publishers

Reference Books:

1. B.P.Lathi,―Modern Digital and Analog communication Systems, 3rd Edition, Oxford University Press.
2. Simon Haykin, ―Communication Systems, 4th Edition, Wiley India

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20EC6T09 **MICROCONTROLLERS & ITS APPLICATIONS (OPEN ELECTIVE-II)**

Course Objectives:

At the end of the course, student will be able to

1. To understand the basics of 8051 Microcontroller and its functionalities
2. To understand the 8051 family instruction set
3. To develop machine language programming in microprocessors.
4. Todesign and develop microcontroller based interfacing for real time applications using low level language like ALP.
5. To understand the basics of ARM architectures and its functionalities.

Course Outcomes:

At the end of this course the student will able to:

CO1: To be able to understand the overview of 8051 Micro controller in general.

CO2: To be able to understand the instruction set of 8051 microcontroller

CO3: To be able to understand the Assembly Language Programming in microcontrollers.

CO4: To be able to understand the microcontroller is interfacing with I/O devices, memory, and serial communication using ALP.

CO5: To be able to understand the overview of ARM Architecture in general.

SYLLABUS

UNIT-I: Introduction to 8051 Microcontrollers

Overview of 8051 microcontrollers, Architecture**,** I/O ports, Memory organization, Addressing modes, SFRs, Counters and timers, Synchronous serial-cum, Asynchronous serial communication, Interrupts and priorities.

UNIT-II: 8051 FAMILY MICROCONTROLLERS INSTRUCTION SET

Basic assembly language programming, Data transfer instructions, Data and bit- manipulation instructions, Arithmetic instructions, Instructions for logical operations on the test among the registers, Program flow control instructions, Interrupt control flow.

UNIT-III: 8051 REAL TIME CONTROL

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the serial communication Interrupts, programming Timers and Counters, serial port and its programming,

UNIT-IV: I/O and Memory Interface and Serial Communication and Bus Interface

I/O and Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer, USART, External Communication Interfaces-RS232,USB

UNIT-V: ARM Architecture:

ARM processor fundamentals, ARM Architecture –Register, exceptions and interrupts, interrupt vector table, ARM instruction set- Data processing, Branch, load and store instructions; Software instructions, Program status register instructions loading constants

TEXTBOOKS:

1. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System
Design, 2/e, Pearson Education, 2005.
2. Kenneth. J. Ayala, The 8051 Microcontroller, 3/e, Cengage Learning, 2004.

REFERENCE:

1. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems, 2/e, Pearson Education, 2007
2. ARM system Developers guide, Andrew N Sloss, Dominic Symes, Chris Wright, Elsevier,2012

B. TECH VI SEMESTER

OEC	L	T	P	C
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INTRODUCTION TO MACHINE LEARNING
20CS6T07 (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

INFORMATION SECURITY
20CS6T08 (OPEN ELECTIVE –II)

Course Objectives:

- Understand the concepts of classical encryption techniques and concepts of finite fields and number theory
- Understand Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Understand the Design issues and working principles of various authentication protocols, PKI standards
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications.

Course Outcomes:

CO1: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

CO2: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO3: Apply different digital signature algorithms to achieve authentication and create secure applications

CO4: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

CO5: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

SYLLABUS

UNIT - I: Classical Encryption Techniques:

The OSI Security Architecture, Security Attacks, Services & Mechanisms, Symmetric Cipher Model, Substitution Techniques: Caesar Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques: Rail fence, Row Transposition cipher, Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT - II:

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Block Cipher Modes of Operations.

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem

UNIT – III:

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security.

Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution

UNIT - IV:

User Authentication: Remote User Authentication Principles, Kerberos.

Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.

UNIT - V:

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS)

Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration

TEXT BOOKS:

1. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition. [Units 1,2,3,4,5]
2. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition. [Units 1,2,3,4,5]

REFERENCES:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

B. TECH VI SEMESTER

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OEC	3	0	0	3

AGILE TECHNOLOGIES
20CS6T09 (OPEN ELECTIVE –II)

COURSE OBJECTIVES:

1. To have an understanding of the Agile Manifesto and Principles
2. To Apply Agile based techniques in each of the development phases.

COURSE OUTCOMES:

CO1: Understand the Agile Manifesto and Principles.

CO2: Apply agile software development practices to create high-quality software.

CO3: Acquire Knowledge on software design, set of software technologies and APIs.

CO4: Examine and demonstrate knowledge of Agile development

CO5: Demonstrate the Agile Approach to estimate project variables, control and Risk Management

SYLLABUS

UNIT-I

Agile Software Development: Genesis of Agile, Introduction and Background, Traditional Model Vs Agile Model, Values of Agile, Agile Manifesto and Principles, Stakeholders, Challenges.

UNIT-II

Lean Approach: Waste Management, Kaizen and Kanban, Add process and products add Value, Roles related to life cycle, Differences between Agile and Traditional Plans, Differences at different life cycle phases, Key techniques, Principles, Understand as a means of assessing the initial status of the project, How agile helps to build quality.

UNIT-III

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, **Agile Requirements:** User story definition, Characteristics and contents of user stories, Acceptance tests and verifying stories, Product Velocity, Burn down chart, Sprint planning and retrospective, Daily Scrum, Scrum roles- Product Owner, Scrum Master, Scrum Team, Scrum Case Study, Tools for Agile Project Management.

UNIT-IV

Agile Software Design and Development: Agile Design practices, Role of design principles including Single Responsibility principle, Open Closed Principle, Liskov Substitution principle, Interface Segregation principles, Dependency Inversion principle in Agile Design, Refactoring- Need and significance, Refactoring techniques, Continuous Integration, Automated Build tools, Version Control.

UNIT-V

Agile Testing and Review: Agile Testing Techniques, Test Driven Development, User Acceptance Test, Agile Metrics and Measurements, The Agile Approach to estimate project variables, Agile control- The 7 control parameters, Agile Approach to Risk, Agile approach to Configuration Management, Atern Principles and Philosophy, Best practices to manage Scrum.

TEXT BOOKS:

1. Robort C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013(Units 1, 3, 5)

2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson(Units 3,4)

3. Mike Cohn, Succeeding with Agile: Software Development Using Scrum, Addison Wesley Series.(Units 3, 4)

REFERENCES:

1. David J. Anderson and Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer,.

3. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley.

4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and management, Butterworth-Heinemann.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

20IT6T07 FUNDAMENTALS OF MACHINE LEARNING (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
4. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

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20IT6T08 **DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE –II)**

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases

Course Outcomes:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT-I: Database System Applications:

A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT-II: Introduction to the Relational Model:

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III: SQL:

QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL.

UNIT-IV: Schema Refinement (Normalization):

Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.

UNIT-V: Transaction Management and Concurrency Control:

Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL” by Shashan k Tiwari, 2011, WROX Press.

REFERENCE:

1. Peter Rob & Carlos Coronel, “Data base Systems design, Implementation, and Management”, 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, “Data base System Concepts”, 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
4. C.J.Date, “Introduction to Database Systems”, 7th Edition, Pearson Education, 2002

B. TECH VI SEMESTER	OEC	L	T	P	C
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20HS6T02 QUANTITATIVE APTITUDE AND REASONING (OPEN ELECTIVE –II)

SYLLABUS

Unit-I: Divisibility and remainder rules of numbers, Unit digit , square root, cube root and simplification of numbers, HCF and LCM of numbers, Averages and Percentages, Alphabetical and miscellaneous series, Coding and decoding and Blood Relations

Unit-II: Profit & loss, Simple interest and Compound interest, Direction, Order and Ranking, Sitting arrangement and Puzzle

Unit-III: Ratio & proportions, Partnership, Alligation and mixtures and Ages.
Data sufficiency, Inequalities and Decision making.

Unit-IV: Time and work, Pipes & cisterns and Time and distance.
Syllogism, Statement and course of action and Statement and Assumption.

Unit-V: Boats and streams, Areas, Volume and surface areas.
Statement and argument, Cause and effect and Drawing inference.

Text Books:

1. “Objective Arithmetic” by R.S. Agarwal, S. Chand Publications.
2. Verbal and non-verbal Reasoning, R.S. Agarwal, S. Chand Publications

Reference Books:

1. Quantitative Aptitude by Dinesh Khattar, Pearson Education.
2. Quantitative Aptitude by Abhjit Guha.
3. Fast Track objective Arithmetic, Rajesh Verma, Arihant publications.

B. TECH VI SEMESTER **OEC**

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20MB6T01 ORGANIZATIONAL BEHAVIOUR (OPEN ELECTIVE –II)

Course Objectives

1 To understand the fundamentals of Organizational Behaviour.
2 For the understanding and balancing of Values and Emotions at work place.
3 To improve the student's Personality and Attitude.
4 To understand and improve the skill of perception and Group Behaviour.
5 Understanding and managing organizational culture, leadership and conflict.

Course Outcomes

Learning Organizational Behavior enables engineers:

CO1: To understand the psychology of workers and other members in the organization.

CO2: To be equipped with the right knowledge and skills regarding organizational processes, group behavior, organizational structure and culture.

CO3: To build up strategies for development at their work place.

CO4: To motivate and control employees.

CO5: To resolve organizational conflict effectively.

SYLLABUS

UNIT I

Fundamentals of OB: Definition, Scope and Importance of OB, Relationship between OB and the individual, Evolution of OB, Models of OB (Autocratic, Custodial, Supportive, Collegial & SOBC), Limitations of OB.

Unit II

Values, Attitudes and Emotions: Introduction, Values, Attitudes, Definition and Concept of Emotions, Emotional Intelligence - Fundamentals of Emotional Intelligence, The Emotional Competence Framework, Benefits of Emotional Intelligence, difference between EQ and IQ. Stress at workplace: Work Stressors – Prevention and Management of stress – Balancing work and Life, Workplace spirituality.

Unit III

Personality & Attitude: Definition Personality, importance of personality in Performance, The Myers-Briggs Type Indicator and The Big Five personality model, Johari Window, Transaction Analysis. Attitude – Definition, Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude.

Unit IV

Perception: Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). Motivation:

Definition & Concept of Motive & Motivation. Group and Team Dynamics: Meaning Group Dynamics, Types of Groups, Group Development, Team Effectiveness & Team Building.

Unit V

Organizational Culture: Types of Culture, Creating and Maintaining Organization Culture, Managing Cultural Diversity. Organizational Change: Types of Organizational change, Forces that acts as stimulants to change, overcome the Resistance to Change, Developing a Learning Organization. Leadership: Introduction, Managers V/s Leaders. Overview of Leadership- Traits and Types. Conflict Management: Sources of Conflict, Types of Conflict, Conflict Management Approaches.

Text Books

1. Pareek Udai: "Understanding Organizational Behavior", Oxford University Press, New Delhi, 2007.

1. K.Aswathappa: "Organizational Behavior-Text, Cases and Games", Himalaya Publishing House, New Delhi,2008.

2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "Organizational Behavior", Tata McGraw Hill Education, New Delhi, 2008.

References

1. Jerald Greenberg and Robert A Baron: "Behavior in Organizations", PHI Learning Pvt Ltd, New Delhi, 2009.

2. Robbins, Stephen P. Organizational behavior, 14/E. Pearson Education India, 2001.

B. TECH VI SEMESTER

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20MB6T02 PROJECT MANAGEMENT (OPEN ELECTIVE –II)

Course Objectives

The objective of this course is to enable the students to gain basic knowledge about the concept of project, project management, project life-cycle, project appraisal; to acquaint the students about various issues of project management.

SYLLABUS

Unit -I

Basics of Project Management –Concept– Project environment – Types of Projects – Project life cycle – Project proposals – Monitoring project progress – Project appraisal and Project selection – Causes of delay in Project commissioning– Remedies to avoid overruns. Identification of Investment opportunities – Sources of new project ideas, preliminary screening of projects – Components for project feasibility studies.

Unit- II

Market feasibility -Market survey – Categories of Market survey – steps involved in conducting market survey– Demand forecasting techniques, sales projections.

Unit- III

Technical and Legal feasibility: Production technology, materials and inputs, plant capacity, site selection, plant layout, Managerial Feasibility Project organization and responsibilities. Legalities – Basic legal provisions. Development of Programme Evaluation & Review Technique (PERT) –Construction of PERT (Project duration and valuation, slack and critical activities, critical path interpretation) – Critical Path Method (CPM)

Unit- IV

Financial feasibility – Capital Expenditure – Criteria and Investment strategies – Capital Investment Appraisal Techniques (Non DCF and DCF) – Risk analysis – Cost and financial feasibility – Cost of project and means of financing — Estimation of cash flows – Estimation of Capital costs and operating costs; Revenue estimation – Income – Determinants – Forecasting income –Operational feasibility - Breakeven point – Economics of working.

Unit -V

Project Implementation and Review: Forms of project organization – project planning – project control – human aspects of project management – prerequisites for successful project implementation – project review – performance evaluation – abandonment analysis.

Text Books

1. Prasanna Chandra, ―Projects, Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill Company Pvt. Ltd., New Delhi 1998.

2. Gido: Effective Project Management, 2e, Thomson, 2007.

References

1. Singh M.K, ―Project Evaluation and Management‖.

2. Vasanth Desai, Project Management, 4th edition, Himalaya Publications 2018.

3. Clifford F. Gray, Erik W. Larson, ―Project Management, the Managerial Emphasis, McGraw Hill, 2000.

B. TECH VI SEMESTER

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20AM6T07 BIG DATA ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: Data Base Management System

Course objectives:

In this course student will learn about

1. To understand the need of Big Data, challenges and different analytical architectures
2. Installation and understanding of Hadoop Architecture and its ecosystems
3. Processing of Big Data with Advanced architectures like Spark.
4. Describe graphs and streaming data in Spark.

Course Outcomes: At the end of the course, student will be able to

CO1: Discuss the challenges and their solutions in Big Data

CO2: Understand and work on Hadoop Framework and eco systems.

CO3: Explain and Analyze the Big Data using Map-reduce programming in Both Hadoop and Spark framework.

CO4: Demonstrate spark programming with different programming languages.

CO5: Demonstrate the graph algorithms and live streaming data in Spark.

SYLLABUS

Unit-I:

Introduction to big data: Data, Types of digital data, Evolution and Definition of big data, Challenges of big data, Characteristics and Need of big data.

Introduction to Hadoop: Introducing Hadoop, need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Hadoop Distributors.

HDFS (Hadoop Distributed File System): HDFS Daemons, Anatomy of file read, Anatomy of file write, working with HDFS commands.

Unit-II:

Introduction to MAPREDUCE Programming: Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Mapper, Reducer, Combiner, Partitioner, Searching, Sorting , Compression, Hadoop EcoSystem.

Unit-III:

Introduction to Pig: Key Features of pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, Relational Operators.

Introduction to HIVE: HIVE features, HIVE architecture, HIVE datatypes, HIVE File Formats, HIVE Query Language.

Unit-IV:

NoSQL: Introduction to NOSQL, Types of NoSQL Databases, and Advantages of NoSQL databases, CAP Theorem, BASE, SQL versus NoSql.

NoSQL databases: Introduction to MongoDB, Data types in MongoDB, MongoDB query language.

Unit-V:

Spark: Introduction to data analytics with Spark, Spark Stack, Programming with RDDS, Working with key/value pairs, Spark SQL, Schema RDDs,

Sparking Streaming: High level architecture of Spark Streaming, DStreams, Transformations on DStreams, Different Types of Transformations on DStreams.

Text Books:

[1].SeemaAcharya, SubhashiniChellappan, Big Data and Analytics, Wiley Publishers

[2].Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia, "Learning Spark: Lightning-Fast Big Data Analysis", O'Reilly Media, Inc.

Reference Books:

[1]. TomWhite, Hadoop,“TheDefinitiveGuide”,3rdEdition,O’ReillyPublications, 2012.

[2].David Loshin, "BigDataAnalytics: From Strategic Planning to Enterprise IntegrationwithTools,Techniques,NoSQL,andGraph”,MorganKaufmannPublishers, 2013

[3].Hadoopin PracticebyAlexHolmes, MANNING

[4].Hadoop in Action byChuckLam, MANNING

[5] Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , “Understanding Big Data Analytics for Enterprise ClassHadoopandStreamingData”, 1st Edition, TMH,2012.

[6] HienLuu, Beginning Apache Spark 2

E-resources and Other digital materials:

[1].Big Data Use cases for Beginners | Real Life Case Studies | Success Stories https://www.youtube.com/watch?v=HHR0-iJp2sM

[2]. Alexey Grishchenko, Hadoopvs MPP, https://0x0fff.com/hadoop-vs-mpp/

[3]. Random notes on bigdata- SlideShare: Available www.slideshare.net/yiranpang/random-notes-on-big-data-26439474

B. TECH VI SEMESTER

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20AD6T07 VISUAL ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: There is no prerequisite to learn this course.

Course Objective: *This* ***course*** explains apply the fundamentals of Tableau tool, Use all the basic functionality to visualize their data, Connect to various data sources, Build a variety of basic charts, Combine insights into a useable dashboard, Share and publish visualizations.

Course Outcomes: At the end of the course, student will be able to

CO1: Examine, navigate, and learn to use the various features of Tableau

CO2: Create and design visualizations and dashboards for your intended audience

CO3: apply predicative analytics to improve business decision making

CO4: Assess the quality of the data and perform exploratory analysis

CO5: Combine the data to and follow the best practices to present your story

SYLLABUS

UNIT-1:

Introduction: Tableau Application Suite, Installing and Activating Tableau Desktop, Data Preparation, Finding the Dataset, Understanding the Data, The Tableau Workspace, Saving, Opening, and Sharing Your Workbooks, Setting Up a Data Connector, Adding a Table to a Data Model, Data Extracts and Live Connections, Data Protection and Data Governance, Data Types, Data Collection with IFTTT and Google Sheets, Website Analysis with Google Analytics, Performance Optimization.

UNIT-2:

Data Visualizations and Aggregate Functions: Chart Types, Scatter Plots, Bar Charts, Legends, Filters, and Hierarchies, Line Charts, Straight Lines, Step Charts, Continuous Date Fields, Highlight Tables, Heat maps, Bullet Charts, Aggregate Functions, Calculated Fields, Aggregations in Calculated Fields, Text Operators, Splits, Date Fields, and Formats, Working with NULL Values, Parameters

UNIT-3:

Table Calculations and Maps: Different Types of Calculations, Quick Table Calculations, Customized Table Calculations, Bump Charts, Dual Axis Charts, Keywords and Syntax, Cohort Analysis, Regional Averages, Different Types of Maps, Map Layers, Maps with Pie Charts: Creating a Pie Chart Map, Dual Axis Map Embedding the Chart in Tooltips, Mapbox Maps, Mapbox in Tableau, Using the Background Map, Spatial Data.

UNIT-4:

Advanced Analytics and Interactive Dashboards: Overview of the Tableau Analytics Pane, Constant, Average, and Reference Lines, Trend Lines, Forecasts, Model Description, Cluster Analysis, Clustering in Tableau, Python, R, and MATLAB Integration, Connecting Tableau with TabPy, Security, The Dashboard Pane, Placing Charts on the Dashboard, Dashboard Actions, Filter Actions, Adding Web Content via URL Actions, Design Tips for Creating a Dashboard

UNIT-5:

Data Preparation with Tableau: Connecting to Data, Wildcard Unions, Inspecting the Data, Removing Unneeded Fields, Data Cleaning and Formatting, Cleaning Steps and Built-in Cleaning Features, Unions, Joins, Splits Grouping, Running the Flow and Outputting the Data, Saving Flows.

Text Book:

Alexander Loth, "**Visual Analytics with Tableau**", ISBN: 978-1-119-56020-3, Wiley 2019

Reference Books:

1. "**Visual Thinking for Design"** by Colin Ware
2. "**Storytelling With Data: A Data Visualization Guide for Business Professionals"** by Cole Nussbaumer Knaflic
3. "**Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics"** by Nathan Yau

B.TECH VII SEMESTER **OEC**

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20CE7T13 CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE-III)

Course Objectives:

- To introduce to the student the concept of project management including network drawing and monitoring
- To introduce various equipments like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
- to introduce the importance of safety in construction projects

Course Outcomes:

CO1: appreciate the importance of construction planning

CO2: understand the functioning of various earth moving equipment

CO3: the methods of production of aggregate products and concreting and usage of machinery required for the works.

CO4: apply the gained knowledge to project management and construction techniques

SYLLABUS

UNIT-I:

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts– critical Path Method – Applications

UNIT-II:

Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT-III:

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types

UNIT–IV:

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers –graders – scrapers– draglines - clamshell buckets

UNIT –V:

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers– selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality

control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder, Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

Reference Books:

1. Construction Project Management - An Integrated Approach, Peter Fewings, Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20CE7T14 GREEN BUILDINGS (OPEN ELECTIVE-III)

Course Objectives:

- To introduce the different concepts of green building techniques and how they may be synthesized to best fit a construction.
- To Know the importance of Green buildings
- To know and implement energy conservation and renewable resources
- To understand the knowledge of ECBC, LEED, GRIHA etc.

Course Outcomes:

CO1: Able to describe the importance and necessity of green building.

CO2: Able to suggest materials and technologies to improve energy efficiency of building.

CO3: Able to assess a building on the norms available for green building.

SYLLABUS

UNIT-I:

Introduction of Green Buildings, Salient features of green buildings, Advantages of Green Buildings- Sustainable site selection and planning of buildings to improve comfort, day lighting, ventilation, planning for drainage.

UNIT-II:

ENERGY EFFICIENT BUILDINGS Passive cooling and day lighting – Active solar and photovoltaic, building energy analysis methods, Lighting system design, Lighting economics and aesthetics, Impacts of lighting efficiency, Technological options for energy management.

UNIT-III:

ENERGY CONSERVATION Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings, waste to energy management in residential complexes or gated communities.

UNIT-IV:

RENEWABLE ENERGY RESOURCES Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar, windand hydro power appliances, success case studies of fully solar, wind and hydro power energies.

UNIT-V:

ENERGY REQUIREMENT AND GREEN BUILDING RATING SYSTEMS Energy

Conservation Building Code (ECBC) requirement for green buildings, Requirement for green rating systems - Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment (GRIHA), Building automation and building management systems.

Text Books:

1. 'Handbook on Green Practices published by Indian Society of Heating Refrigerating and Airconditioning Engineers', 2009
2. 'Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddyand K.S. Nanjunda Rao.
3. 'Green Building Handbook' by Tomwoolley and Samkimings, 2009

Reference Books:

1. 'Complete Guide to Green Buildings' by Trish riley.
2. 'Non-Conventional Energy Resources' by G. D. Rai, Khanna Publishers.
3. 'Standard for the design for High Performance Green Buildings' by Kent Peterson, 2009
4. Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE7T13 CONCEPT OF POWER SYSTEM ENGINEERING (OPEN ELECTIVE-III)

Course Objective: To develop problem solving skills and understanding of Power System concepts through the application of techniques and principles of electrical Power Generation methods.

Course Outcomes: At the end of the course, student will be able to

CO1: Various electrical Power System Components, Supply systems

CO2: Thermal Power Station working procedure, each module path directions

CO3: Hydro Power Station working procedure, classifications

CO4: Nuclear Power Station working procedure, Chain Reaction

CO5: Solar power generation & Wind Power Generation, Applications

SYLLABUS

UNIT-I: Power System Components

Single line Diagram of Power system, Different kinds of supply system, conventional and Non-conventional energy sources, Applications.

UNIT-II: Thermal Power Stations

Choice of site Selection, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super, heaters, Economizers, electrostatic precipitators

UNIT-III: Hydro & Nuclear Power Stations

Choice of site, arrangement of hydroelectric installations, Hydrology. Mass curve, flow duration curve, classification of Hydro Power Plants, Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components

UNIT-IV: Solar power generation & Wind Power Generation

Solar radiation spectrum. Radiation measurement. Applications of solar thermal systems Solar Photovoltaic (SPV) systems, Introduction to wind energy, basic principles of wind energy conversion.

UNIT-V: Transmission & Distribution

Transmission structure, classifications, types of conductors, primary & secondary distribution, Substation Equipments , layout.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagarand, A Chakrabarti, DhanpatRai& Co. Pvt. Ltd.

2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers
3. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006

B.TECH VII SEMESTER **OEC**

L	T	P	C
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20EE7T14 INSTRUMENTATION (OPEN ELECTIVE-III)

Course Objectives:

1 To study the basics of measuring system.
2 To study various Electrical transducers and to measure the various types of Non–electrical quantities
3 To study various types of digital voltmeters
4 To study the working principles of various types of oscilloscopes and their applications.
5 To study various types of signal analyzers

Course Outcomes:

CO1: Able to study the basics of measuring system.
CO2: Acquire proper knowledge to use various types of Transducers and able to monitor and measure various parameters such as strain, Fow, temperature and pressure
CO3: Acquire proper knowledge and working principle of various types of digital voltmeters.
CO4: Able to measure various parameters like phase and frequency of a signal with the help of CRO.
CO5: Acquire proper knowledge and able to handle various types of signal analyzers.

SYLLABUS

UNIT-I

Basics of Measuring System: Measuring Systems, Performance Characteristics – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors and Random Errors, Statistical analysis of random errors.

UNIT-II

Transducer Basics and Applications: Definition of transducers – Classification of transducers – Advantages of Electrical transducers –Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers. Measurement of Temperature, Pressure, Strain and Flow.

UNIT-III

Digital Voltmeters: Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type DVM, digital frequency meter – Digital phase angle meter.

UNIT-IV

Oscilloscope: Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns – Sampling oscilloscope, data logger, Transient recorder.

UNIT-V

Signal Analyzers: Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co

Reference Books:

1. Measurement and Instrumentation theory and application, Alan S.Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doeblin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson/Prentice Hall ofIndia
4. Modern Electronic Instrumentation and Measurement techniques – by A.D HelfrickandW.D.Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

B.TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME7T10 GREEN ENGINEERING SYSTEMS (OPEN ELECTIVE -III)

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: The course aims to highlight the significance of alternative sources of energy, green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

Course Outcomes: At the end of the course, student will be able to

CO1: Evaluate the impact of technology on environment

CO2: Compare biological ecology to industrial ecology

CO3: Design eco-friendly product

CO4: Create sustainable products, facilities, processes and infrastructure

CO5: Asses the life cycle of a product to evaluate its impact on energy and materials use. Determine the effects of air and water quality

SYLLABUS

UNIT-I:

INTRODUCTION: SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT-III:

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV: ENERGY EFFICIENT SYSTEMS:

(A) ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V: ENERGY EFFICIENT PROCESSES:

Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/ TMH
2. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3. Green Manufacturing Processes and Systems, Edited / J. Paulo Davim/Springer 2013

References:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international

2. Principles of Solar Engineering / D.YogiGoswami, Frank Krieth& John F Kreider / Taylor & Francis
3. Non-Conventional Energy / Ashok V Desai /New Age International (P) Ltd
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Non conventional Energy Source/ G.D Roy/Standard Publishers
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd
7. Fuel Cell Technology –Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T11 HYBRID ELECTRIC VEHICLES (OPEN ELECTIVE -III)

Pre-requisite: Internal-Combustion engines.

Course Objective:

The main objective of this course is to provide the knowledge on architecture of Hybrid Electric Vehicles, Fuel cells and their sub-systems. The focus is as well on explaining the requirements of hybrid electric vehicles and Fuel-cells for automobile applications. At the same time, various design considerations in fuel cell vehicles and electric vehicles will be explained.

Course Outcomes: At the end of the course, student will be able to

CO1:	Compare and contrast the working of Conventional and Electric Vehicles.
CO2:	Comprehend the use of Series and Hybrid Electric vehicle drive trains
CO3:	Apply the fundamentals of to develop the propulsion and storage systems for Hybrid Electric Vehicles.
CO4:	Perform a case study on Hybrid Electric vehicle drive trains for different parameters
CO5:	Describe the working principle of various types of fuel-cells.

SYLLABUS

UNIT-I:

ELECTRIC VEHICLES: Introduction, Electric Vehicle Principle- Components of Electric Vehicle Constituents of a conventional vehicle-Drive cycles and Drive Terrain, Operating principle of Fuel Cell, Differences between conventional battery and Electric battery, Transmission differences between conventional and Electric Vehicles, Differences between conventional lighting system and Electric vehicle lighting system.

UNIT-II:

HYBRID ELECTRIC VEHICLES: Introduction, A Brief history of Hybrid Electric vehicles (HEVs),Basics of Hybrid Electric Vehicles (HEVs), Architecture of HEVs-Series HEVs, Parallel HEVs, Series-Parallel HEVs.

HYBRID ELECTRIC VEHICLE DRIVE TRAINS: Parallel Hybrid Drive trains with Torque coupling, Parallel Hybrid Drive trains with both Speed coupling, Parallel Hybrid Drive trains with both speed Torque coupling.

UNIT-III:

ELECTRIC PROPULSION SYSTEMS: DC Motors- Operating principle and control of DC motors, Induction Motor Drives: Operating principle and Control Mechanisms, Brushless Motor Drives-Principle and Construction, Switched Reluctance Motor (SRM) Drives- Basic structure, Drive Convertor, Modes of Operation.

ENERGY STORAGE SYSTEMS: Electrochemical Batteries, Lead-Acid Batteries, Nickel Based Batteries, Lithium Based Batteries, Ultra Capacitors- Basic Principles and Performance, Ultrahigh-speed flywheels- Basic Principle and Power Capacity, Fly Wheel technologies.

UNIT-IV:

DESIGN OF SERIES HYBRID ELECTRIC VEHICLE DRIVES: Design of Series Hybrid Electric Vehicle Drive- Control Strategies, Sizing of Major Components and Case Study for designing for various parameters.

DESIGN OF PARALLEL HYBRID ELECTRIC VEHICLE DRIVES: Design of Parallel Hybrid Electric Vehicle Drive- Control Strategies of Drive Train and Design of Drive Train Parameters.

UNIT-V:

FUEL CELL ELECTRIC VEHICLES: Operating principles of fuel cells, Fuel and oxidant consumption, Fuel cell system characteristics, Fuel cell technologies- Proton Exchange membrane fuel cells, Alkaline Fuel cells, Phosphoric acid fuel cells, Molten carbonate fuel cells, Solid oxide fuel cells, Fuel supply- Hydrogen storage-Hydrogen production, Ammonia as hydrogen carrier, Non-Hydrogen fuel cells, Fuel Cell Hybrid Vehicle Drive Train.

Text Books:

1) MehrdadEhsani, YiminGao, Ali Emadi, 2nd edition, Modern Electric, Hybrid Electric and Fuel cell vehicles, CRC Press, Taylor and Francis Group, 2010.
2) Chris Mi, M.AbulMasrur and David WenzhongGao, 1st Edition, Hybrid Electric Vehicles, John Wiley & Sons, Ltd, 2011.

B. TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC7T10 DATA COMMUNICATIONS (OPEN ELECTIVE-III)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To focus on information sharing and networks.
2. To Introduce flow of data, categories of network, different topologies.
3. To focus on different coding schemes.
4. To brief the students regarding protocols and standards.
5. To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices, etc.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Know basic knowledge of data Communication
CO2: Know basic knowledge of Analog & Digital Signals
CO3: Understand the basic knowledge of Analog Transmission
CO4: know Different types of transmission media
CO5: Focus on DTE-DCE Interface

SYLLABUS

UNIT-I:

Introduction to data communication and networking: Reason to study data communication, Data Communication, Networks, Protocols and Standards, Standards Organizations. Line Configuration, Topology, Transmission Modes, Categories of Networks Internet works. Study of OSI and TCP/IP protocol suit: The Model, Functions of the layers, TCP/IP Protocol Suites

UNIT-II:

Study of Signals: Analog and Digital, Periodic and Aperiodic Signals, Analog Signals, Time and Frequency Domains, Composite Signals, Digital Signals. Study of Digital transmission: Digital to Digital Conversion, Analog to Digital Conversion.

UNIT-III:

Study of Analog transmission: Digital to Analog Conversion, Analog to Analog Conversion. Study of Multiplexing: Many to one/one to Many, Frequency division Multiplexing, Wage division Multiplexing, Time division Multiplexing, Multiplexing applications.

UNIT-IV:

Types of transmission media: Guided Media, Unguided Media, Transmission Impairments, Performance Wavelength, Shannon Capacity, Media Comparison, PSTN, Switching. Error Detection and Correction: Types of Errors, Detection, Parity Check, Vertical Redundancy Check, Longitudinal Redundancy Check, Cyclic Redundancy Check, Checksum, Error Correction.

UNIT-V:

Study of DTE-DCE in brief: Digital data transmission, DTE-DCE Interface, Modems, 56K Modems, Cable Modems. Introduction to networks and devices: Network classes, Repeaters, Hub, Bridges, Switches, Routers, Gateways Routers, Routing Algorithms, Distance Vector Routing, Link State Routing.

Text Books:

1. Data communication & Networking by Bahrouz Forouzan.
2. Computer Networks by Andrew S. Tanenbaum

Reference Books:

1. Data and Computer Communications by William Stallings
2. Kleinrock, Leonard. Queueing Systems, Vol 1: Theory. New York, NY: Wiley J., 1975. ISBN: 0471491101.

B. Tech VII Semester **OEC**

L	T	P	C
3	0	0	3

20EC7T11 MECHATRONICS (OPEN ELECTIVE III)

Course Objective: The main objective of this course is

- To introduce the integrative nature of Mechatronics.
- To describe the basic programming, different components and devices of mechatronics systems.

Course Outcomes:
At the end of this course the student will able to:

CO1: Basic concepts of mechatronics

CO2: To design mechatronics system with the help of Microprocessor

CO3: To design PLC and other electrical and Electronics Circuits

CO4: To understand the concept of solid state Devices

CO5: To know Dynamic models & controllers

SYLLABUS

UNIT-I:

Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors.

UNIT-II:

Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontrollers – Block diagram

UNIT-III:

Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC, Basic programming in PLC.

UNIT-IV:

Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning, operational amplifiers, noise reduction, filtering.

UNIT-V:

Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trend

TEXT BOOKS:

1. Bolton, ―Mechatronics‖, Printice Hall, 2000
2. Ramesh S Gaonkar, ―Microprocessor Architecture, Programming, and Applications with the 8085‖, 5th Edition, Prentice Hall, 2008.

REFERENCE BOOKS:

1. Mechatronics System Design / Devdas shetty/Richard/Thomson.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

BIOMEDICAL INSTRUMENTATION.

20EC7T12 (OPEN ELECTIVE III)

Course Objectives:

1. To introduce student to basic biomedical engineering technology
2. To understand the anatomy & physiology of major systems of the body in designing equipment for medical treatments.
3. To impart knowledge about the principle and working of different types of bio-medical electronic equipment/devices.

Course- Outcomes:

After going through this course the student will able

CO1.To understand Physiological System of the Body and Bioelectric Potentials.

CO2.To understand Electrodes, Transducer and Sensors used in Biomedical field.

CO3 To understand the problem and identify the necessity of equipment for diagnosis and therapy.

CO4 To understand the importance of electronics engineering in medical field.

CO5 To understand the importance of telemetry in patient care

SYLLABUS

UNIT-1: INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT-II: ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output**.**

UNIT-III: CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV: PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids, Laparoscope, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention,

UNIT-V: DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring**.**

Text Books:

1. Bio-Medical Instrumentation‖, Cromwell , Wiebell, Pfeiffer
2. Hand Book of Bio-Medical Instrumentation‖, Instrumentation‖, Kandahar. McGraw-Hill

References

1. Introduction to Bio-Medical Equipment Technology‖, 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. “Bio-Medical Electronics and Instrumentation”, Onkar N. Pandey, Rakesh Kumar, Katson Books.

B. TECH VII SEMESTER

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

20CS7T10 **ARTIFICIAL NEURAL NETWORKS.**
(OPEN ELECTIVE III)

Course Objectives:

- To deal with the historical developments of artificial intelligence leading to artificial neural networks (ANN).
- To introduce the basic concepts and models of ANN for solving real world problems.

Course Outcomes:

At the end of this course the student will be able to:

CO1- Understand biological neuron & artificial neuron and basic building blocks of ANN.

CO2-Understand different single layer/multiple layer Perceptron learning algorithms.

CO3- Understand and analyze Adaline and Madeline Networks and their applications

CO4- Learning algorithms based on basic gradient descent, backpropagation and their modifications.

CO5- Understand self-organization learning, ART, Radial basis Functions.

SYLLABUS

UNIT - I: Introduction to Artificial Neural Networks:

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT - II: Fundamental Models of Artificial Neural Networks:

Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS)Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.

Perceptron Networks: Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks

UNIT – III: Adaline and Madaline Networks:

Introduction, Adaline, Madaline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

UNIT - IV: Feedback Networks:

Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets.

Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT - V: Self Organizing Feature Map:

Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

Adaptive Resonance Theory: Introduction, ART Fundamentals, ART 1, ART2.

TEXT BOOKS:

1. Sivanandam, S Sumathi, S N Deepa; "Introduction to Neural Networks", 2nd ed.,TATA McGraw HILL : 2005.

REFERENCES:

1. "Simon Haykin, "Neural networks A comprehensive foundations", 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, "Artificial neural networks", 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, "Neural networks in Computer intelligence", 1st ed., TMH, 2003

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

CYBER SECURITY
20CS7T11 (OPEN ELECTIVE III)

Course Objective:

- Understand the importance of Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

Course Outcomes:

CO1: Understand and classify various forms of Cybercrimes

CO2: Interpret the reasons for Cyber offence

CO3: Detect and analyze vulnerabilities in Mobile and Wireless devices

CO4: Analyze tools used to perform cyber crimes

CO5: Understand cyber security Laws

SYLLABUS:

UNIT-I: Introduction, Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes

UNIT-II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT-III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT-IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-V: Cybercrimes and Cyber security:

The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

SOFTWARE TESTING METHODOLOGIES
20CS7T12 (OPEN ELECTIVE III)

Course Objectives:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To Understand different levels of Testing
- Apply Black Box and White Box Testing Techniques
- To learn how to plan a test project, design test cases and data, conduct testing operations, and generate a test report.
- To understand software test automation problems and solutions.

Course Outcomes:

CO1: Have an ability to apply software testing knowledge and engineering methods.

CO2: Ability to identify the needs of software test automation, and define a test tool to support test automation.

CO3: Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

CO4: Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

CO5: Apply techniques and skills to use modern software testing tools to support software testing projects.

SYLLABUS

UNIT-I: Software Testing:

Introduction, Evolution, Dichotomies, Goals & Typical Objectives of Testing, Model for testing, Software Testing Principles, **Software Testing Terminology and Methodology:** Software Testing Terminology, Errors, Defects, Failures, Root Causes and Effects, Software Testing Life Cycle, Software Testing Methodology.

UNIT-II: Verification and Validation:

Verification & Validation Activities, Categories of Test Techniques: Dynamic Testing,

Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing,

White-Box Testing: Need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT-III: Static Testing:

Inspections, Structured Walkthroughs, Technical reviews, Benefits of Static Testing, Static Vs Dynamic Testing.

Levels of Testing: Unit testing, Integration Testing,. Function testing, System testing and Acceptance testing.

Regression testing: Progressive Vs Regressive testing, Objectives of regression testing, Regression testing techniques

UNIT-IV: Test Management:

Test Organization, Test Planning, Test Design and Test case specifications, Structure of a Testing Group, Reasons for the growth of a Test suite, Test suite Minimization, Test suite prioritization, Types of test case prioritization, prioritization techniques, Measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models

Debugging: Debugging process, Debugging Techniques, Correcting Bugs, Debuggers

UNIT-V: Automation and Testing Tools:

Need for automation, Testing Tool Considerations, Test Tool Classification, Benefits and Risks of Test automation, Special Considerations for Test execution and Test Management Tools, Principles for tool selection, Testing tools- success factors, Guidelines for automated testing, overview of some commercial testing tools.

Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web **engineering**, testing of web based systems, Testing mobile systems.

TEXT BOOKS:

1. Software testing techniques - Baris Beizer, International Thomson computer press, second edition. (Unit 1)
2. Software Testing, Principles and Practices, Naresh Chauhan, Oxford Publishers(Unit 2,3,4,5)

REFERENCES:

Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

1. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
2. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

INTERNET OF THINGS
20IT7T10 (OPEN ELECTIVE III)

Course Objectives:

- Understand the architecture of Internet of Things and connected world.
- Explore on use of various hardware, communication and sensing technologies to build IoT applications
- Develop the real time IoT applications to make smart world.
- Understand challenges and future trends in IoT.

Course Outcomes:

CO1: Design and Deployment of IoT.

CO2: Design and comparing M2M with IoT.

CO3: Understand Platform design and modeling of IoT

CO4: Apply IoT in different devices using Python

CO5: Implement IoT and cloud platforms.

SYLLABUS

UNIT-I: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT Enabling Technologies, IoT levels and deployment, domains Specific IoTs.

UNIT-II: IoT and M2M :

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

UNIT-III: IoT Platforms Design Methodology:

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data Structures, control flow, functions, modules, packages, file handling. Raspberry PI with Python, other IoT devices.

UNIT-IV: IoT Protocols:

Messaging Protocols- MQ Telemetry Transport (MQTT), Constrained Application Protocol (CoAP) Transport Protocols-Light Fidelity (Li-Fi), Bluetooth Low Energy (BLE) IoT Protocols: Addressing and Identification: Internet Protocol Version 4 (IPV4), Internet Protocol Version 6(IPV6), Uniform Resource Identifier (URI)

UNIT-V: IoT Physical Servers And Cloud Offerings: Introduction to cloud storage models and communication APIs, WAMP –Auto Bahn for IoT, Xively cloud for IoT, case studies illustrating IoT design –home automation, smart cities, smart environment.

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things: A Hands-on-Approach”, VPT, 1st Edition, 2014. (Units1,2,3,5)
2. Matt Richardson, Shawn Wallace, “Getting Started with Raspberry Pi”, O’Reilly (SPD), 3rd Edition, 2014. (Unit 3)
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram “ Internet of Things” Wiley (Unit 4).

REFERENCE BOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons2014.

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

COMPUTER VISION
20IT7T11 (OPEN ELECTIVE III)

Course Objectives:

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand motion analysis.
- To study some applications of computer vision algorithms

Course Outcomes:

CO1: Implement fundamental image processing techniques required for computer vision.

CO2: Perform shape analysis.

CO3: Apply Hough Transform for line, circle, and ellipse detections.

CO4: Apply 3D vision techniques.

CO5: Develop applications using computer vision techniques

SYLLABUS

UNIT - I:

IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology –texture.

UNIT - II: SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT – III: HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT - IV: 3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

.**UNIT - V: APPLICATIONS**

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

TEXT BOOKS:

1.D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.

2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.
2. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
3. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
4. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

FUZZY SETS
20HS7T01 (OPEN ELECTIVE III)

COURSE OBJECTIVES:

1) Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
2) Explain different types operations performed on fuzzy sets.
3) Provide the knowledge of Arithmetic operations on fuzzy numbers.
4) Emphasis on different kinds of crisp and fuzzy relations
5) Enable students to know the validity of arguments by fuzzy logic.

COURSE OUTCOMES:

CO1: Understand basic knowledge of fuzzy sets and fuzzy logic.
CO2: Apply various kinds of operations on fuzzy sets.
CO3: Understand the concepts of fuzzy arithmetic to solve fuzzy equations.
CO4: Illustrate the properties of fuzzy sets to design modeling software system.
CO5: Apply fuzzy logic to solve the problems in neural networks.

SYLLABUS

UNIT-I

Fuzzy Sets(all theorems without proofs): Introduction, Crisp sets, Fuzzy sets: Basic types and basic concepts, additional properties of α-cuts, representations of Fuzzy sets, extension principle for Fuzzy sets.

UNIT-II

Operations on Fuzzy Sets(all theorems without proofs): Types of operations, Fuzzy complements, Fuzzy intersections: t-norms, Fuzzy unions: t-conorms, Combinations of operations, Aggregation operations.

UNIT-III

Fuzzy Arithmetic(all theorems without proofs): Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations.

UNIT-IV

Fuzzy Relations(all theorems without proofs): Crisp versus Fuzzy relations, Projection and cylindrical extensions, Binary Fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations, Fuzzy compatibility relations, Fuzzy ordering relations, Fuzzy morphisms.

UNIT-V

Fuzzy Logic(all theorems without proofs): Classical logic: an over view, multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic hedges, Inference from conditional Fuzzy propositions, Inference from conditional and qualified propositions, Inference from quantified propositions.

TEXT BOOKS:

1. George J. Klir& Bo Yuan, Fuzzy Sets & Fuzzy Logic, Pearson Education, PHI, 1995.
2. H. J. Zimmermann, Fuzzy Set Theory and its Applications, 4th edition, Springer.

REFERENCES:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd edition, Wiley, 2010.
2. John Yen & Reza Langari, Fuzzy Logic, Pearson.

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20MB7T01 DIGITAL MEDIA MANAGEMENT (OPEN ELECTIVE III)

Course Objective

Digital marketing channels that can helps the students to understand the increased business visibility and brand awareness. Moreover, having a professional presence on social media helps them to reach a broader target audience to secure more leads and convert them into loyal customers.

SYLLABUS

Unit – I

Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

Unit – II

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How different segments use Digital Media –

Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

Unit – III

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Writing the Marketing Plan and Implementing the Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget.

Unit – IV

Search Engine Marketing and Online Advertising: Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

Unit – V

Social Media Marketing: Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

TEXT BOOKS

1 Richard Gay, Alan Charles worth and Rita Essen, Online Marketing, Oxford University Press, 2016.

REFERENCES

1. Dave Chaffey, Fiona Ellis-Chadwick, Richard Mayer, Kevin Johnston. Internet Marketing Strategy, Implementation and Practice,3rd Ed .Prentice Hall.

2. Rob Stokes e-Marketing: The essential guide to marketing in a digital world. 5th Ed. Quirk e-Marketing (Pty) Ltd.

B. TECH VII SEMESTER

		L	T	P	C
	OEC	3	0	0	3

20MB7T02 ENTREPRENEURSHIP DEVELOPMENT (OPEN ELECTIVE III)

SYLLABUS

UNIT –I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.

2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International

3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20AD7T10 **DATA ANALYSIS AND VISUALIZATION WITH PYTHON (OPEN ELECTIVE III)**

Pre-requisite:

Course Objective: *This course* explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

Unit-1:

Preliminaries: What Kinds of Data?, Why Python for Data Analysis?, Python as Glue, Solving the "Two-Language" Problem, Why Not Python?, Essential Python Libraries, Installation and Setup.

Python Language Basics, IPython, and Jupyter Notebooks: The Python Interpreter, IPython Basics, Python Language Basics.

NumPy Basics: Arrays and Vectorized Computation:

The NumPy ndarray: A Multidimensional Array Object, Universal Functions: Fast Element-Wise Array Functions, Array-Oriented Programming with Arrays, File Input and Output with Arrays, Linear Algebra, Pseudorandom Number Generation.

Unit-2:

Introduction to pandas Data Structures: Series, DataFrame, Index Objects

Essential Functionality: Reindexing, Dropping Entries from an Axis, Indexing, Selection, and Filtering, Integer Indexes, Arithmetic and Data Alignment, Function Application and Mapping, Sorting and Ranking, Axis Indexes with Duplicate Labels, Summarizing and Computing Descriptive Statistics: Correlation and Covariance, Unique Values, Value Counts, and Membership.

Unit-3:

Data Loading, Storage, and File Formats Reading and Writing Data in Text Format: Reading Text Files in Pieces, Writing Data to Text Format, Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping

Binary Data Formats: Using HDF5 Format, Reading Microsoft Excel Files

Data Cleaning and Preparation:

Handling Missing Data: Filtering Out Missing Data, Filling In Missing Data

Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, Computing Indicator/Dummy Variables

Unit-4:

Data Wrangling: Join, Combine, and Reshape:

Hierarchical Indexing: Reordering and Sorting Levels, Summary Statistics by Level, Indexing with a DataFrame's columns.

Combining and Merging Datasets: Database-Style DataFrame Joins, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap.

Reshaping and Pivoting: Reshaping with Hierarchical Indexing, Pivoting "Long" to "Wide" Format, Pivoting "Wide" to "Long" Format.

Unit-5:

Plotting and Visualization

A Brief matplotlib API Primer: Figures and Subplots, Colors, Markers, and Line , Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, matplotlib Configuration.

Plotting with pandas and seaborn: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots, Facet Grids and Categorical Data, Other Python Visualization Tools.

Text Book:

"Python for Data Analysis" Data Wrangling With Pandas, Numpy, And Ipython Second Edition by Wes McKinney, Oreilly Publications.

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20AM7T10 NoSQL DATABASES (OPEN ELECTIVE III)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains define, compare and use the four types of NoSQL Databases, demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases, explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases, ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the type of NoSQL database to implement based on business requirements

CO2: Apply NoSQL data modeling from application specific queries

CO3: Understand NoSQL Storage Architecture

CO4: Use Atomic Aggregates and denormalization as data modeling techniques to optimize query processing

CO5: Apply indexing and ordering of data sets

SYLLABUS

Unit-1:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented

Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

Unit-2:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

Unit-3:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value

Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

Unit-4:

NoSQL Stores: Similarities between Sql and Mongodb Query Features, Accessing Data

From Column-Oriented Databases like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution in Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

Unit-5:

Indexing and Ordering Data Sets: Essential Concepts behind a Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Reference Books:

1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional,2012.

2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications,2013.

3) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN:978-0-470-94224-6

4) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE7T15 WASTE WATER TREATMENT
(OPEN ELECTIVE-IV)

Course Objectives: To study about waste water treatment

Course Outcomes: Able to provide waste management techniques

SYLLABUS

UNIT–I:

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

UNIT–II:

Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems, Industrial waste water discharges into streams. Lakes and oceans- consequent problems.

UNIT–III:

Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries, Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods. Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT-IV:

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT–V:

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

Text Books:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

Reference Books:

1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

B.TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20CE7T16 REPAIR AND REHABILITATION OF CONCRETE STRUCTURES
(OPEN ELECTIVE-IV)

Course Objectives:

- Familiarize Students with deterioration of concrete in structures
- Equip student with concepts of NDT and evaluation
- To evaluate the performance of the materials for repair
- To strategize different repair and rehabilitation of structures.

Course Outcomes:

CO1: Explain deterioration of concrete in structures

CO2: Carryout analysis using NDT and evaluate structures

CO3: Students must gain knowledge on quality of concrete

CO4: Examine how the Concrete repair industry equipped with variety of repair Material s and techniques .

SYLLABUS

UNIT–I:

Maintenance and Repair Strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT-II:

Causes of Damage To Structures Causes of Distress in Structures - Extrinsic and Intrinsic causes for damage of structures; Effect of Chemical and Marine Environment on structures.

UNIT-III:

Semi Destructive Tests for Damage Assessment Core Test, LOK test, CAPO test, Penetration Tests Non-Destructive Tests for Damage Assessment Rebound Hammer Test, Ultrasonic Pulse Velocity test, Resistivity Test, Carbonation Test, Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

UNIT-IV:

Materials for Repair: Criteria for durable concrete repair, selection of repair materials, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete, FRP sheets.

UNIT-V:

Techniques for Repair: Crack repair techniques – Crack Stitching, Mortar and dry pack, vacuum concrete, Shotcreting, Epoxy injection, Mortar repair for cracks Methods of Strengthening: Repairs to overcome low member strength – Jacketing, blanketing

Text Books:

1. 'Maintenance & Repair of Civil Structures' by B.L. Gupta & Amit Gupta.
2. 'Rehabilitation of Concrete Structures' by B. Vidivelli, Standard Publishers.
3. 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation' by V. K. Raina

Reference Books:

1. 'Concrete Structures- protection Repair and Rehabilitation' by R. Doodge Woodson, BH Publishers
2. ShettyM.S., "Concrete Technology – Theory and Practice", S. Chand and Company, 2008.
3. Dov Kominetzky. M. S., "Design and Construction Failures", Galgotia Publications Pvt.Ltd., 2001
4. Ravishankar.K., Krishnamoorthy. T. S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
5. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008,
6. Gambhir. M. L., "Concrete Technology", McGraw Hill, 2013

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE7T15 POWER QUALITY
(OPEN ELECTIVE-IV)

Course Objective:

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

Course Outcome:

At the end of this course the student should be able to

CO1: Differentiate between different types of power quality problems.

CO2: Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.

CO3: Analyze power quality terms and power quality standards.

CO4: Explain the principle of voltage regulation and power factor improvement methods.

CO5: Explain the power quality monitoring concepts and the usage of measuring instruments.

SYLLABUS

Unit-I

Introduction to Power Quality: Terms and definitions of transients, Long Duration Voltage Variations: Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching DC offset; waveform distortion; voltage fluctuation; power frequency variations.

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction-capacitor switching

transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics, measurement of harmonics, THD; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices" Kluwer Academic Publishers
3. Sankaran, " Power Quality" CRC Press.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis) Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

B.TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20EE7T16 ELECTRIC VEHICLES

(OPEN ELECTIVE-IV)

Course Objective:

- To study the different drive train configurations of electric vehicles
- To propose the various propulsion and energy storage systems for EHVs
- To know the sizing of propulsion motors and other systems involved in EH vehicles
- To carry out different design case studies of EHv and BEVs

Course Outcomes: At the end of the course, the student will be able to:

CO1: Assess the performance, societal and environmental impact of EHVs having known their past history

CO2: Implement various drive train topologies and control strategies in Electric and Hybrid vehicles

CO3: Recommend, Design/Size and Control different electric propulsion units and other components of EHVs and BEVs

CO4: Appropriately select the energy storage system and strategize its management in EHVs

CO5: Define Ancillary Service Management and explain different ancillary services.

SYLLABUS

UNIT-I INTRODUCTION TO ELECTRIC VEHICLES:

History of electric vehicles (EV) and hybrid electric vehicle (EHV), need and importance of EV and HEV, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Power/energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics.

UNIT-II HYBRID ELECTRIC DRIVE-TRAINS: Basic architecture and concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

UNIT-III ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, and Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV BATTERY ENERGY STORAGE SYSTEMS:

Battery Basics - Lead-Acid Battery -Cell Discharge Operation - Cell Charge Operation-Construction-Battery Parameters - Battery Capacity-Discharge Rate - State of Charge- State of Discharge- Depth of Discharge-Technical Characteristics - Practical Capacity -Battery Energy -Constant Current Discharge -Specific Energy - Battery Power -Specific Power -Batteries for EV applications.

UNIT-V MODELLING OF EV/HEV:

Modelling and analysis of EV/HEV drive train sizing of motor, and design of traction power electronics, various vehicle subsystems.

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2010.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,2009.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

REFERENCES:

1. Jefferson, C.M., Barnard and R.H., Hybrid Vehicle Propulsion, WIT Press, Boston, 2002
2. Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012
3. SerefSoylu “Electric Vehicles - The Benefits and Barriers”, InTech Publishers, Croatia, 2011
4. Jack Erjavec and Jeff Arias, “Alternative Fuel Technology – Electric, Hybrid and Fuel Cell Vehicles”, Cengage Learning Pvt. Ltd., New Delhi, 2007
5. Seth Leitman, “Build Your Own Electric Vehicle” McGraw hill, New York, USA, 2013

B.TECH VII SEMESTER **OEC**

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20ME7T12 **MICRO-ELECTRO- MECHANICAL SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Calculus and Differential Eq., Fundamentals of Physics (Mechanics, Optics, Electricity and magnetism), Fundamentals of Inorganic Chemistry.

Course Objective: The main objective of this course is to introduce the integrative nature of Micro Electro Mechanical systems. To describe the different components and devices of Micro Electro Mechanical systems.

Course Outcomes: At the end of the course, student will be able to

CO1:	Explain MEMS and Principles of sensing and actuation
CO2:	Explain Thermal Sensors and Actuators & Magnetic Sensors and Actuators
CO3:	Explain Micro-Opto-Electro Mechanical Systems
CO4:	Explain Radio Frequency (RF) MEMS & Micro Fluidic Systems
CO5:	Explain Chemical And Bio Medical Micro Systems

SYLLABUS

UNIT-I:

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT-II:

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, magnetic MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT-III: MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS:

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT-IV:

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

UNIT-V: CHEMICAL AND BIO MEDICAL MICRO SYSTEMS:

Sensing mechanism & principle, membrane transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (Enose), mass sensitive chemosensors, fluroscence detection, calorimetric spectroscopy.

Text Books:

1. MEMS, NitaigourPremchandMahalik, TMH Publishing co.

References:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. Bio-MEMS (Micro systems), Gerald Urban, Springer.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.

B.TECH VII SEMESTER	OEC	L	T	P	C
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20ME7T13 **SOLAR ENERGY SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: To impart knowledge on non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

Course Outcomes: At the end of the course, student will be able to

CO1: Significance of renewable energy and describe the principles of solar radiation. Analyze various solar collectors.

CO2: Know the various storage methods and application of solar energy.

CO3: Understand the concept of converting wind energy into electrical energy using both horizontal and vertical axis wind machines.

CO4: Know biomass disasters, functional operation of geothermal systems. Generalize the operation of ocean, tidal and wave energy systems.

CO5: understand the operating principle of direct energy conversion systems .and to recognize the need and ability to engage in lifelong learning for further developments in this field.

SYLLABUS

UNIT-I: FUNDAMENTALS OF SOLAR RADIATION:

Energy conservation principle, Energy scenario (world and India), Solar angles, Solar time, Solar radiation: Outside earth's atmosphere, Earth surface, measurements of solar radiation: Pyrometer, Sunshine recorder, Pyro heliometer.

UNIT-II: ENERGY STORAGE SYSTEMS:

Energy –Environment-Economy Necessity of energy storage, Specifications of energy storage devices, energy storage Methods-Mechanical Energy Storage-Thermal Energy Storage-Sensible Heat Storage-Solid media storage.

UNIT-III: SOLAR COLLECTORS:

Classifications, comparison of concentrating and non-concentrating types – Liquid flat plate collectors, Evacuated tube collectors. Modified flat plate collectors: Compound parabolic concentrator(CPC), Cylindrical parabolic Concentrator, Fixed mirror solar concentrator, Paraboloid Dish Collector.

UNIT-IV: SOLAR THERMAL DEVICES:

Solar water heater, Solar space heating and cooling systems, Solar industrial heating systems, Solar refrigeration and air conditioning systems, Solar Desalination – Solar cooker: domestic, community – Solar pond – Solar drying.

UNIT-V: SOLAR PHOTOVOLTAIC SYSTEMS:

Solar cell fundamentals, Energy band model of semiconductors, Working Principle of photovoltaic cell, solar cell classification, solar cell technologies, solar PV systems-classification. Solar cell –module-array Construction.

Text Books:

1. Goswami D.Y., Kreider, J. F. and Francis., "Principles of Solar Engineering', Taylor and Francis, 2000.
2. Chetan Singh Solanki, "Solar Photovoltatics – Fundamentals, Technologies and Applications", PHI Learning Private limited, 2011.
3. Sukhatme S.P., Nayak.J.P, 'Solar Energy – Principle of Thermal Storage and collection", Tata McGraw Hill, 2008.
4. Solar Energy International, "Photovoltaic – Design and Installation Manual" – New Society Publishers, 2006.
5. Roger Messenger and Jerry Vnetre, "Photovoltaic Systems Engineering", CRC Press, 2010.

Reference Books:

1. B.H.Khan "Non – conventional Energy Resources" Tata McGraw Hill education Pvt. Ltd.
2. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons .

B. TECH VII SEMESTER

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INTRODUCTION TO EMBEDDED SYSTEMS
20EC7T13 (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1 The basic concepts of an embedded system are introduced.

2 The various elements of embedded hardware and their design principles are explained

3 Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed

4 Embedded system implementation and testing tools are introduced and discussed.

Technology capabilities and limitations of the hardware, software components

5 Design Methodologies

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the basic concepts of an embedded system and able to know an embedded system design Approach to perform a specific function.

CO2: The various embedded firmware design approaches on embedded environment.

CO3: Identify the unique characteristics of real-time systems

CO4: Design, implement and test an embedded system.

CO5: Define the unique design problems and challenges of real-time systems

SYLLABUS

UNIT-I: Introduction to Embedded systems

What is an embedded system Vs. General Computing system, history, classification, major application areas, and purpose of embedded systems, Core of embedded system, Characteristics and Quality Attributes of Embedded systems

UNIT-II: Embedded Hardware Design

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real-time clock, Application specific and Domain specific embedded systems-Examples

UNIT-III:

Embedded Firmware design approaches, Embedded Firmware Development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA,Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV:

Factors to be considered in selecting a controller, 8051 Architecture, RTOS and Scheduling Operating basics, types, RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Types of multitasking, Non preemptive Scheduling, Preemptive Scheduling.

UNIT-V: Design and Development

Embedded system development Environment – IDE, Simulators, Emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry

Text books:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.

2. Embedded Systems, Rajkamal, TMH, 2009.

References:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE

2. Embedded Systems: A Contemporary Design Tool Paperback by James K. Peckol

B. Tech VII Semester

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OEC	3	0	0	3

20EC7T14 INTERNET OF THINGS (OPEN ELECTIVE –IV)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To introduce the terminology, technology and its applications
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language which is used in many IoT devices
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To introduce the implementation of web-based services on IoT devices

COURSE OUTCOMES:

At the end of this course the student will able to:

At the end of the course, student will be able to

CO1: Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.

CO2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on Bwireless, energy, power, and sensing modules

CO3: Market forecast for IoT devices with a focus on sensors

CO4: Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

SYLLABUS

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Sensors, Actuators,
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II: IoT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT-III: IoT Physical Devices and Endpoints

Introduction to Arduino and Raspberry Pi- Installation,
Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT-IV: Controlling Hardware-

Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors

Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

UNIT-V: IoT Physical Servers and Cloud Offerings–

Introduction to Cloud Storage models and
communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

B. TECH VII SEMESTER	OEC	L	T	P	C
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20EC7T15 ANALOG AND DIGITAL IC APPLICATIONS (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1. To understand the analysis & design of different types of active filters using op-amps
2. To learn the internal structure, operation and applications of different analog ICs
3. In this course, students can study Integrated circuits for all digital operational designs like adder, subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM.
4. Design and to develop the internal circuits for different digital operations and simulate them using hardware languages using integrated circuits.
5. Understand the concepts of Latches and Flip-Flops and Design of Counters using Digital ICs, modeling of sequential logic integrated circuits using VHDL

Course Outcomes:

At the end of the course, student will be able to

CO1: Design circuits using operational Amplifier for various applications

CO2: Understand the concept of A/D & D/A Converters

CO3: Analyze and design amplifiers and active filters using Op-amp.

CO4: Understand the concepts of Combinational logic circuits in digital system

CO5: Understand the concepts of sequential logic circuits in digital system

SYLLABUS

UNIT-I: OPERATIONAL AMPLIFIER

The Ideal Operational Amplifier; Operational Amplifier Internal Circuit. Op-Amp parameters & Measurement, DC Characteristics, input & output off set voltages & currents, slew rate, CMRR, PSRR, drift, AC Characteristics and Compensation Techniques.

UNIT-II: OPERATIONAL AMPLIFIER APPLICATIONS

Basic Op-Amp Applications; Inverting and Non-inverting amplifier,. Integrator and differentiator, Difference amplifier, Instrumentation Amplifier; AC Amplifier; V to I and I to V Converters. Op-Amp Circuits using Diodes, Sample and Hold Circuit, Comparator, Regenerative Comparator (Schmitt Trigger).

D-A AND A-D CONVERTERS Introduction; Series Op-Amp Regulator; Basic DAC Techniques Weighted Resistor DAC,R-2R DAC ; AD Converters, Flash ADC and Successive approximation Converter.

UNIT-III: FILTERS USING OP-AMP & 555 TIMERS

Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Description of Functional Diagram of 555 Timer; Monostable Operation; Astable Operation and its Applications and PLL, Applications PLL. VCO and its applications.

UNIT-IV: Digital Design Using HDL

Design flow, program structure, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Objects and Classes, Subprograms, Comparison of VHDL and Verilog HDL.

UNIT-V: Combinational And sequential Logic Design

Combinational Logic Design: Adders & Sub tractors, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Barrel Shifter, Simple Floating-Point Encoder, Dual Priority Encoder.

Sequential Logic Design: Flip-Flops, Counters, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Register. Linear feedback shift register and applications.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGrawHill,4th Edition,2005
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.

REFERENCES:

1. "Fundamentals of Digital logic design with VHDL". Stephen Brown & Zvonko Vranesic, Tata McGraw Hill, 2nd edition.2004
2. Designing with TTL Integrated Circuits: Robert L. / John R. Morris & Miller.

B. TECH VII SEMESTER **OEC**

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20CS7T13 DATA ANALYTICS (OPEN ELECTIVE –IV)

Course Objectives:

1. To understand Data Analytics lifecycle and Business Challenges.
2. To understand Analytical Techniques
3. To understand various tools and technologies to handle big data

Course Outcomes:

CO1: Understand big data and data analytics life cycle.
CO2: Explore various supervised learning methods.
CO3: Explore various unsupervised learning methods.
CO4: Understand and apply ARIMA model on time series data.
CO5: Learn various technology and tools in big data analytics.

SYLLABUS

UNIT-I

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the new big data Ecosystem, Examples of Big Data Analytics. Data Analytics Life Cycle: Data Analytics life cycle Overview, Discovery, Data Preparation, Model,Planning, Model Building, Communicate Results, Operationalize, Case Study.

UNIT-II

Supervised Learning: Decision Trees – Overview of Decision Trees, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree. Naive Bayes: Baye's Theorem, Naïve Baye's Classifier, Diagnostics of Classifiers.
Regression –Linear Regression, Logistic Regression.

UNIT-III

Unsupervised Learning: Association Rule Mining–Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules. Cluster Analysis – Overview of Clustering, k-means

UNIT IV

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model
Text Analysis: Text Analysis Steps, Example, Collecting Raw Data, Representing Text, TFIDF, Categorizing Documents by Topics, Determining Sentiments, Gaining Insights.

UNIT-V

Technology and Tools: MapReduce and Hadoop- Analytics for Unstructured Data, The Hadoop Ecosystem In-DataBase Analytics: SQL Essentials, In-Database Text Analysis, Advanced SQL.

TEXT BOOKS:

1. David Dietrich, Barry Hiller, "Data Science and Big Data Analytics", EMC education services, Wiley publications, 2012.

REFERENCE BOOKS:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with
advanced analytics, John Wiley & sons, 2012.

2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O"
Reilly, 2011.

3. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

B. Tech VII Semester	OEC	L	T	P	C
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20CS7T14 BLOCK CHAIN TECHNOLOGY (OPEN ELECTIVE –IV)

Course Objectives

By the end of the course, students will be able to

- Understand how major block chain systems work.
- To securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

Course Outcomes

CO 1: Understand the design principles of Bitcoin and Ethereum.

CO 2: Understand and apply Nakamoto consensus.

CO 3: Analyze the differences between proof-of-work and proof-of-stake consensus.

CO 4: Understand cryptocurrency

CO 5: Understand cryptocurrency Regulations

SYLLABUS

Unit I: Basics:

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Unit II: Blockchain:

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Unit III: Distributed Consensus:

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV: Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Unit V: Cryptocurrency Regulation:

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.

Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Text Book

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

B. TECH VII SEMESTER **OEC**

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20CS7T15 SOFTWARE PROJECT MANAGEMENT (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

CO1: Apply the process to be followed in the software development life-cycle models.

CO2: Apply the concepts of project management & planning.

CO3: Implement the project plans through managing people, communications and change

CO4: Conduct activities necessary to successfully complete and close the Software projects

CO5: Implement communication, modeling, and construction & deployment practices in software development.

SYLLABUS

UNIT I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

TEXT BOOKS:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

REFERENCES:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH VII SEMESTER	OEC	L	T	P	C
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20IT7T13 CLOUD COMPUTING (OPEN ELECTIVE –IV)

Course Objectives:

- Explain the technology and principles involved in building a cloud environment
- To implement Virtualization
- Understand various types of cloud and its services
- Contrast various programming models used in cloud computing

Course Outcomes:

CO1: Describe the principles of parallel and distributed computing and evaluation of cloud computing from existing technologies

CO2: Illustrate Virtualization for Data-Center Automation.

CO3: Explain and characterize different cloud deployment models and service models

CO4: Program data intensive parallel applications in cloud.

CO5: Understand commercial cloud computing technologies such as AWS, AZURE and AppEngine

SYLLABUS

UNIT-I: Introduction:

Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Microsoft Aneka.

UNIT-II: Virtualization:

Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen, VMware, Microsoft Hyper – V.

UNIT-III: Cloud Computing Architecture:

Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy.

UNIT-IV: Data Intensive Computing: Map-Reduce Programming:

What is Data-Intensive Computing? Characteristics, Challenges, Historical Perspective. Technologies for Data Intensive Computing: Storage Systems, Programming Platforms.

Cloud Applications: Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.

UNIT-V: Cloud Platform in Industry and Cloud Applications:

Cloud Platforms in Industry: Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

TEXTBOOKS:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud Computing McGraw Hill Education.

REFERENCES:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.
3. Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan Kaufmann, 2013.

B. TECH VII SEMESTER **OEC**

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20IT7T14 BUSINESS INTELLIGENCE (OPEN ELECTIVE –IV)

Course Objectives:

- Introduce the concepts and components of Business Intelligence (BI)
- Evaluate the technologies that make up BI (data warehousing, OLAP)
- Identify the technological architecture that makes up BI systems

Course Outcomes:

CO1: Understand concepts and components of Business Intelligence.

CO2: Explain the complete life cycle of BI development.

CO3: Illustrate technology and processes associated with Business Intelligence framework.

CO4: Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

CO5: Ability to design expert system using AI tools.

SYLLABUS

UNIT-I:

Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence

Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

UNIT-II:

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics. **Getting started with business intelligence:** Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

UNIT-III:

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete BI professional, Popular BI tools.

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart,OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

UNIT-IV:

Business Intelligence Applications:

Marketing models: Relational marketing, Sales force management,

Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.

Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices

UNIT-V:

Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management

Artificial Intelligence and Expert Systems:

Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems

TEXT BOOKS:

1. Fundamental of Business Intelligence" Grossmann W, Rinderle-Ma Springer, 2015
2. "Fundamentals of Business Analytics" – By R N Prasad and SeemaAcharya, Publishers: Wiley India.

REFERENCE BOOKS:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : TheCompleteProject Lifecycle for Decision Support Applications, Addison WesleyInformation Technology
2. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann.

B. Tech VII Semester	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20HS7T02 POLYMER CHEMISTRY (OPEN ELECTIVE –IV)

PREREQUISITES: Chemistry I and Chemistry II of AICTE syllabus

Course Outcomes

CO1: After studying this course, the learners are expected to: Relate polymer properties to their structure and conformation

CO2: Analyse different mechanisms of polymer formation and use this information in the synthesis of different polymers.

CO3: Distinguish between enthalpic and entropic contributions to polymerisation/crystallization.

CO4: Distinguish between absolute and relative methods for molecular weight determination.

CO5: Determine the flow properties of polymer melts and solutions.

CO6: Interpret experimental data and determine parameters such as polymerization ratesand copolymer composition.

CO7: Estimate the solubility of a given polymer in various solvents and blends.

CO8: Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.

CO9: Assess the effect of synthetic polymers on the environment.

SYLLABUS

Unit 1. Definitions, origin, nomenclature, classification and types of macromolecules; molecular weight (MW) and its distribution; Determination of molecular weight – methods for measuring number average, weight average, viscosity average MW; gel permeation chromatography; spectroscopic techniques to determine chemical composition and molecular microstructure, thermal transitions; melting temperature and glass transition temperature. Colligative properties, osmotic pressure, light scattering, refractive index, viscosity, small angle X-ray scattering (6)

Unit 2tep-Growth Polymerization: Reactivity of functional groups; kinetics; molecular weight in open and closed system cyclization vs. linear polymerization, cross-linking and gel point; process condition; step-copolymerization, examples of step polymers (3)

Unit 3. Free radical Polymerization: Nature of chain polymerization and its comparison with step polymerization; radical vs. ionic polymerizations; structural arrangements of monomer units; kinetics of chain polymerization; molecular weight and its distribution; chaintransfer, inhibition, retardation, auto-acceleration; energetic characteristics; techniques of radical polymerization – bulk, solution, emulsion, suspension polymerization; examples of polymers made by radical chain polymerization (4). Ionic Polymerization: Propagation and termination of cationic polymerization, anionic and ring opening polymerization, active polycarbanions (2)

Unit 4. Copolymerization: types of copolymers, copolymer compositions, reactivity ratio; radical and ionic co-polymerizations; Block and Graft copolymer synthesis, examples (2). Thermodynamics of polymer solutions; Flory-Huggins theory, theta conditions; solubility parameters; fractionation of macromolecules, osmotic pressure, lower criticalsolution temperature (3)

Unit 5. Naturally occurring polymers, biodegradability, biosynthesis, polymers frombio/renewable resources (2)

Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography, Electron beam, X-ray and ion sensitive resists, Conducting polymers, types, properties and applications, electroluminescence, molecular basis of electrical conductivity, Photonic applications and non-linear optics, optical information storage (3)

Text Books:

1. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur
2. Polymer chemistry and Physics of Modern Materials, 2nd edn, J. M. G. Cowie, Stanley Thornes, UK, 1998
3. Contemporary Polymer Chemistry, 3rd edn. H. R. Allcock, F. W. Lampe and J. E.Mark, Pearson
4. Polymers: Chemistry and Physics of Modern Materials, J.M.G. Cowie, CRC Press
5. Introduction to Physical Polymer Science, L. H. Sperling, Wiley
6. Introduction to Soft matter, I. W. Hamley, John Wiley and Sons, 2007
7. Polymer Chemistry, 2nd edn, P. C. Hiemenz and T. P. Lodge, CRC Press (2007)

B. TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20MB7T03 TOTAL ENGINEERING QUALITY MANAGEMENT (OPEN ELECTIVE –IV)

Course Objective

To understand the Engineering and Management aspects of Planning, Designing, Controlling and Improving Quality in Manufactured products.

Course Outcome

1. To understand the fundamentals of quality
2. To understand the role of TQM tools and techniques in elimination of wastages and reduction of defects
3. To develop quality as a passion and habit
4. To Facilitate the understanding of Quality Management principles and process.
5. The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

SYLLABUS

UNIT I

Quality Gurus And TQM Kitemarks: Definition, Need & Evolution of TQM – Contributions of Quality Guru's – Edward Deming – Joseph Juran – Philip Crosby – Genichi Taguchi – Walter Shewart – Criteria for Deming's Prize.

UNIT II

Product Design & Analysis : Dimensions of product and service quality, Basic Design Concepts and TQM – Design Assurance – Design Validation –Failure Mode Effect Analysis – Fault Tree Analysis – Design for Robustness – Value Analysis.

UNIT III

Process Improvement & Modern Production Management Tools

Control Charts – Process Capability, -Bench Marking, Six Sigma Approach – Total Productive Maintenance – Just-In-Time – Lean Manufacturing Paradigms.

UNIT IV

Quality Improvement Tools & Continuous Improvement

Traditional Q-7Tools, New Q-7 Tools, Quality Function Deployment (QFD), Kaizen 5S, Poka-Yoke, Failure Mode and Effects Analysis(FMEA) – Stages, Types, Taguchi Quality Loss Function(QFD) – Total Productive Maintenance (TPM).

UNIT V

Quality Management Systems ISO 9000, ISO 9001: 2008, QS 9000, ISO 14000, TS16949:2002 and EMS14001 certifications of quality systems- Elements, Documentation, Quality Auditing — Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.

TEXT BOOKS

1. Total Engineering Quality Management, Sunil Sharma, 1st Edition, MacMillan India Limited.
2. Total Quality Management, Poornima M. Charantimath, 2nd Edition, Pearson Education.
3. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint 2006.

REFERENCES

1. "Quality and Performance Excellence", James R Evans, Edition, 7th Edition, Cengage Learning.
2. "Quality Management", Howard S Gitlow, Alan J Oppenheim, Rosa Oppenheim, David M Levine,3rd Edition , Tata McGraw Hill Limited.
3. "Fundamentals of Quality Control & Improvement", Amitava Mitra, 3rd Edition, Wiley Publications, 2012.
4. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.

B. TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20MB7T04 STRESS MANAGEMENT (OPEN ELECTIVE –IV)

OBJECTIVES

This course examines different sources from where individuals experience a stress response. Through diligent individual and group study, students will be able to learn to apply stress management principles in order to achieve high levels of performance and understand the role of relationships to the management of stress and health.

Course Outcomes

1. Understand the physiological systems that are affected by stressors and the long-term effects and illnesses that can result from stressors.
2. Understand the specific applications of stress as it relates to the workplace and different target groups.
3. Create effective stress management plans for individual clients and for workplace environments. Enhancing significance of training and development, performance evaluation

SYLLABUS

UNIT I: UNDERSTANDING STRESS

Meaning – Symptoms – Work Related Stress – Individual Stress – Reducing Stress - Sources of stress –Consequence of stress-Burnout-symptoms of Burnout- Stress vs Burnout-Model of stress-strategies for coping stress (individual and organizational strategies)

UNIT II: TIME MANAGEMENT

Techniques – Importance of Planning the day –developing concentration – Prioritizing, Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say "No."

UNIT III:CAREER PLATEAU

Career plateau – Identifying Career plateaus – Structural and Content - Plateauing – Making a fresh start – Importance of Sabbaticals – Counseling out – Executive leasing – Sustaining a marketable Career.

UNIT IV:CRISIS MANAGEMENT

Implications – People issues – Structure issues – Environmental issues –Learning to keep calm - Preventing interruptions – Controlling crisis – Pushing new ideas – Empowerment – Work place Humour, Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit.

UNIT V: SELF DEVELOPMENT

Improving personality – Leading with Integrity – Enhancing Creativity – Effective Decision Making – Sensible Communication – The Listening Game – Managing Self – Mediation for peace – Yoga for Life

TEXT BOOKS

1. Bhatia R.L., The Executive Track: An Action Plan for Self Development Wheeler Publishing, New Delhi
2. Charavathy. S.K, "Human Values for Manager", McGraw Hill/Henely Management Series

REFERENCES

1. Jeffr Davison, Managing Stress, Prentice Hall of India, New Delhi
2. Jerrold S Greenberg, Comprehensive Stress Management, Jain Books, 2009

B. TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20AD7T11 NATURAL LANGUAGE PROCESSING (OPEN ELECTIVE –IV)

Pre-requisite: Nil

Course Educational Objective: The Objective of the course is to make learn the basic elements of C programming, control structures, derived data types, Modular programming, user defined structures, basics of files and its I/O operations.

Course Outcomes: At the end of this course, the student will be able to

CO1: Familiar with the basic components of NLP.

CO2: Applying N-gram models to predict a sequence of text.

CO3: Build a basic language understanding system using preliminary concepts of NLTK library.

CO4: Exposure on advanced techniques for understanding patterns in text

CO5: Understand the semantics of linguistic components in a natural dialogue

Syllabus

UNIT – I:

Introduction

Knowledge in Speech and Language Processing; Ambiguity; Models and Algorithms; Language, Thought and Understanding; History Regular Expressions Regular Expression; Words; Corpora; Text Normalization; Minimum Edit Distance

UNIT – II

N-gram Language Models

N-Grams; Evaluating Language Models, Generalization and Zeros, Smoothing: Laplace Smoothing; Add-k Smoothing; Backoff and Interpolation; Kneser-Ney Smoothing

UNIT – III

Natural language processing tools in Python (NLTK Package)

Part-I: Introduction to NLTK; Tokenizing; Filtering Stop words; Stemming; Tagging parts of speech; Lemmatizing; Chunking; Chinking

Part-II: Using Named Entity Recognition (NER); Getting Text to Analyze; Using a Concordance; Making a Dispersion Plot;

UNIT – IV

Information Extraction:

Relation Extraction Algorithms; Using Patterns to extract relations; Relation extraction via supervised learning; Semi supervised relation extraction via

bootstrapping; Distant Supervision for Relation Extraction; Evaluation of Relation Extraction; Extracting Times; Extracting Events and their Times; Template Filling

UNIT – V

Word Senses and WordNet

• Defining Word Senses; How many senses do words have?

• Relations between senses

WordNet: Sense relations in WordNet; Word Sense Disambiguation; Alternate WSD algorithms and Tasks

Text Books:

1. Daniel Jurafsky, James H. Martin ,"Speech and Language Processing" , Third Edition, PHI, 2020.
2. https://realpython.com/nltk-nlp-python/#getting-text-to-analyze

Reference Books:

1. Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, 2011
2. Applied Text Analysis with Python: Enabling Language-Aware Data Products with Machine Learning, Benjamin Bengfort, Rebecca Bilbro, 2018
3. Speech and Language Processing, 2nd Edition, Daniel Jurafsky, James H. Martin, 2009

B. TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20AM7T11 DEEP LEARNING (OPEN ELECTIVE –IV)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains understanding basics of deep neural networks, CNN architectures of deep neural networks, concepts of Artificial Neural Networks, basics of Data science in Deep learning, applications of deep learning in AI and Data Science

Course Outcomes: At the end of the course, student will be able to

CO1: Explain the basics in deep neural networks

CO2: Apply Convolution Neural Network for image processing

CO3: Explain the basics of Artificial Intelligence using deep learning

CO4: Apply deep learning algorithms for data science

CO5: Apply deep learning algorithms for variety applications

SYLLABUS

Unit-1:

DEEP NETWORKS BASICS

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization – Machine Learning Basics: Capacity – Over fitting and under fitting – Hyper parameters and validation sets -- Estimators -- Bias and variance -- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization -- Optimization .

Unit-2:

CONVOLUTIONAL NEURAL NETWORKS

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.

Unit-3:

DEEP LEARNING ALGORITHMS FOR AI

Artificial Neural Networks – Linear Associative Networks – Perceptrons -The Back propagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Auto encoders - Deep Backprop Networks- Auto encoders

Unit-4:

DATA SCIENCE AND DEEP LEARNING

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

Unit-5:

APPLICATIONS OF DEEP LEARNING

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion -NLP tasks - dimensionality estimation - time series forecasting - building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016

2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019

3. Vance, William, Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science (Hardcover - 2020), Joiningthedotstv Limited

4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022

5. Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018.

B.TECH MINORS

MN	L	T	P	C
	3	1	0	4

20ITMN01 COMPUTER ORGANIZATION
(Minor Engineering Course)

Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It provides an in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

Course Outcomes: By the end of the course the student will be able to

CO1: Demonstrate an understanding of the design of the functional units of a digital computer system. Relate Postulates of Boolean algebra and minimize combinational functions

CO2: Design and analyze combinational and sequential circuits.

CO3: Implementation of computer arithmetic operations and to know the basic computer instruction formats.

CO4: Obtain how micro programmed control is used to interact with units of components of CPU.

CO5: Understanding of organization and architecture of input output and memory.

SYLLABUS

UNIT-I:

Digital Components and Data Representation:

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation, other Binary codes, Error Detection Codes

Digital Components: Digital Components, logic gates, Boolean Algebra, Map Simplification.

UNIT-II:

Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Decoders, Multiplexers.

S**equential Circuits**: Flip-Flops-SR Flip flop, D Flip flop, JK Flip flop, T Flip flop, Edge Triggered File flop.

Sequential Circuits: flip flop input equations, state table, state diagram, Design example and procedure Registers, Shift Registers, Binary Counters

UNIT-III:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating–Point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT-IV:

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control

UNIT-V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

TEXT BOOKS:

1. Computer System Architecture, 3rded., M.MorrisMano,PHI

REFERENCE:

1. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006
2. Computer Organization, 5thed., Hamacher, Vranesic and Zaky, TMH,2002
3. Computer Organization & Architecture: Designing for Performance, 7th ed., William Stallings, PHI,

B.TECH MINORS

MN	L	T	P	C
	3	1	0	4

20ITMN02 OPERATING SYSTEMS
(Minor Engineering Course)

Course Objective:

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS.
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
- To know the components and management aspects of concurrency management

Course Outcomes: Upon successful completion of the course, the student will be able to:

CO1: Understand the functionalities of an operating system and Evaluate different CPU scheduling algorithms

CO2: Apply synchronization to cooperating processes and handle the deadlocks.

CO3: Learn various management techniques for efficient utilization of system memory

CO4: Understand and analyze theory and implementation of files and Evaluate different disk scheduling algorithms

CO5: Analyze the functionalities in various operating systems

SYLLABUS

Unit-I: Introduction to Operating System Concept:

Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types. Process Management – Process concept, the process, Process State Diagram, Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Inter process Communication, Scheduling- Basic Concepts, Scheduling Criteria, and Scheduling Algorithms.

Unit-II: Concurrency:

Process Synchronization, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples.

Unit-III:

Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock

Unit-IV: Memory Management:

Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation Virtual Memory Management: Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

Unit-V:

File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection. File System implementation- File system structure, allocation methods, free-space management Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers.

TEXT BOOKS:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.

REFERENCES:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education‖, 1996.

B.TECH MINORS

MN	L	T	P	C
	3	1	0	4

20ITMN03 DATABASE MANAGEMENT SYSTEMS
(Minor Engineering Course)

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases.

Course Outcomes: Upon successful completion of the course, the student will be able to

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models.

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT - I:

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT - II:

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT – III:

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL

UNIT - IV:

Schema Refinement (Normalization): Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.

UNIT - V:

Transaction Management and Concurrency Control: Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency Control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, TATA McGraw Hill
2. "Professional NOSQL” by Shashan k Tiwari, 2011, WROX Press

REFERENCES:

1. Peter Rob & Carlos Coronel, “Data base Systems design, Implementation, and Management”, 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, “Data base System Concepts”, 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
4. C.J.Date, “Introduction to Database Systems”, 7th Edition, Pearson Education, 2002.

B.TECH MINORS

MN	L	T	P	C
	3	1	0	4

20ITMN04 INTERNET OF THINGS
(Minor Engineering Course)

Course Objectives:

- Understand the architecture of Internet of Things and connected world
- Explore on use of various hardware, communication and sensing technologies to build IoT applications.
- Develop the real time IoT applications to make smart world.
- Understand challenges and future trends in IoT

Course Outcomes:

CO1: Design and Deployment of IoT.

CO2: Design and comparing M2M with IoT.

CO3: Understand Platform design and modeling of IoT.

CO4: Apply IoT in different devices using Python.

CO5: Implement IoT and cloud platforms.

SYLLABUS

UNIT - I: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT Enabling Technologies, IoT levels and deployment, domains Specific IoTs.

UNIT - II: IoT and M2M:

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG

UNIT – III: IoT Platforms Design Methodology:

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data Structures, control flow, functions, modules, packages, file handling.Raspberry PI with Python, other IoT devices.

UNIT – IV: IoT Protocols:

Messaging Protocols- MQ Telemetry Transport (MQTT), Constrained Application Protocol (CoAP) Transport Protocols-Light Fidelity(Li-Fi), Bluetooth Low Energy(BLE) IoT Protocols: Addressing and Identification: Internet Protocol Version 4(IPV4), Internet Protocol Version 6(IPV6), Uniform Resource Identifier (URI)

UNIT - V: IoT Physical Servers and Cloud Offerings:

Introduction to cloud storage models and communication APIs, WAMP –AutoBahn for IoT, Xively cloud for IoT, case studies illustrating IoT design –home automation, smart cities, smart environment

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-on-Approach", VPT, 1st Edition, 2014. (Units1,2,3,5)
2. Matt Richardson, Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 3rdEdition, 2014. (Unit 3)
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram " Internet of Things" Wiley (Unit 4)

REFERENCES:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw HillHigher Education.
2. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", John Wiley andSons2014.

B.TECH MINORS

MN	L	T	P	C
	3	1	0	4

20ITMN05 E-COMMERCE
(Minor Engineering Course)

Course Objectives:

- Discuss the benefits and trade-offs of various e-commerce clicks and bricks alternatives
- Identify the essential processes of an e-commerce system
- Identify several factors and web store requirements needed to succeed in e-commerce
- Understand the main technologies behind e-commerce systems and how these technologies interact

Define various electronic payment types and associated security risks and the ways to
- protect against them

Course Outcomes:

CO1: Identify and analyze stake holder needs.
CO2: Understand electronic payment systems.
CO3: Acquire Knowledge on Intra organizational commerce.
CO4: Design and prepare marketing strategies for corporate digital Library.
CO5: Design and prepare accurate e-commerce related presentations of multimedia information taking into account technical and aesthetic considerations.

SYLLABUS

UNIT-I:

Electronic Commerce-Frame work, the anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce –Mercantile Process models.

UNIT–II:

Electronic payment systems– Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter-Organizational Commerce – EDI, EDI Implementation, Value-added networks.

UNIT–III:

Intra Organizational Commerce – Work Flow, Automation Customization and internal Commerce, Supply chain Management

UNIT–IV: Classification:

Corporate Digital Library – Document Library, digital Document types, corporate Data Warehouses.
Advertising and Marketing – Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT–V:

Consumer Search and Resource Discovery – Information search and Retrieval, Commerce Catalogues, Information Filtering Multimedia – key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing

TEXT BOOKS:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.(Units 1,2,3,4,5).

REFERENCES:

1. Electronic Commerce – Gary P.Schneider – Thomson.
2. The E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.
3. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon,
   Elizabeth Chang, John Wiley.

B.TECH MINORS

MN	L	T	P	C
	3	1	0	4

20ITMN06 WEB TECHNOLOGIES

(Minor Engineering Course)

Course Objectives:

- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web.
- The course will introduce web-based media-rich programming tools for creating interactive web pages.

Course Outcomes:

CO1: Analyze a web page and identify its elements and attributes.
CO2: Create web pages using HTML and Cascading Styles sheets.
CO3: Build dynamic web pages and client-side scripts using AJAX.
CO4: Build web applications using PHP.
CO5: Develop interactive web pages that include databases.

SYLLABUS

UNIT - I:

Web Basics and Overview: Introduction to Internet, World Wide Web, Web Browsers, URL, MIME, HTTP, Web Programmers Tool box.

HTML Common tags: List, Tables, images, forms, frames, HTML5, Cascading Style Sheets (CSS) & its Types, Style Specification Formats, Selector Forms, CSS3 modules.

UNIT - II: Java Script:

Introduction to Java Script, Declaring variables, Event handlers (onclick, onsubmit, etc.,) and Form Validation. Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Pattern Matching using Regular Expressions, DHTML: Positioning Moving and Changing Elements.

UNIT – III: XML:

XML Syntax, Namespace in XML, Document type Definition, XML schemas, XSLT,DOM and SAX Approaches. AJAX A New Approach: Introduction to AJAX.

UNIT - IV: PHP Programming:

Introducing PHP: Creating PHP script, Running PHP script, working with variables and constants: Using variables Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions. Working with forms and Databases.

UNIT - V: MySQL:

Introduction to MySQL, Data types, Queries, Applying Filters, Usage of Grouping and Sort, SET Operators, CRUD operations, Joins, Integration of MySQL with PHP.

TEXT BOOKS:

1. Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson. (Unit 1,2,3)
2. Web Technologies, Uttam K Roy, Oxford publications (Units 1,2 3)
3. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill. (Unit 4)
4. MySQL The Complete Reference - VikramVaswani McGraw Hill. (Unit 5)

REFERENCES:

1. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.

M. Tech Computer Science and Engineering
COURSE STRUCTURE
I Semester

S.No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20511T01	PC	Mathematical Foundations of Computer Science	3	0	0	3
2	20511T02	PC	Advanced Data Structures & Algorithms	3	0	0	3
3	20511T03/ 20511T04/ 20511T05	PE	**Program Elective-1** 1. Big Data Analytics 2. Digital Image Processing 3. Advanced Operating Systems	3	0	0	3
4	20511T06/ 20511T07/ 20511T08	PE	**Program Elective-2** 1. Advanced Computer Networks 2. Internet of Things 3. Object Oriented Software Engineering	3	0	0	3
5	20511T09	CC	Research Methodology and IPR	2	0	0	2
6	20511L10	PC	Advanced Data Structures & Algorithms Lab	0	0	4	2
7	20511L11	PC	Advanced Computing Lab	0	0	4	2
8	20511M12	MC	Audit Course 1*	2	0	0	0
Total Credits							**18**

II Semester

S.No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20512T01	PC	Machine Learning	3	0	0	3
2	20512T02	PC	MEAN Stack Technologies	3	0	0	3
3	20512T03/ 20512T04/ 20512T05	PE	**Program Elective-3** 1. Advanced Databases and Mining 2. Adhoc & Sensor Networks 3. Soft Computing	3	0	0	3
4	20512T06/ 20512T07/ 20512T08	PE	**Program Elective-4** 1. Cloud Computing 2. Principles of Computer Security 3. High Performance Computing	3	0	0	3
5	20512L09	PC	Machine Learning with Python Lab	0	0	4	2
6	20512L10	PC	MEAN Stack Technologies Lab	0	0	4	2
7	20512P11	PROJ	Mini Project with Seminar	-	-	-	2
8	20512M12	MC	Audit Course 2*	2	0	0	0
Total Credits							**18**

III SEMESTER

S.No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20513T01/ 20513T02	PE	**Program Elective-5** 1. Deep Learning 2. Social Network Analysis 3. MOOC-1(NPTEL/SWAYAM) 12 Week program related to the program which is not listed in the course structure	3	0	0	3
4	20513T03/ 20513T04	OE	**Open Elective** 1. Human Resource Management 2. Digital Marketing 3. MOOC-2 (NPTEL/SWAYM) 12 Week program related to the program which is not listed in the course structure	3	0	0	3
5	20513P05	PROJ	Dissertation-1/ Industrial Project	-	-	-	10
Total Credits							**16**

#Students going for Industrial Project/Thesis will complete these courses through MOOCs

IV SEMESTER

S.No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20514P01	PROJ	Dissertation-II	-	-	-	16
Total Credits							**16**

M.Tech I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20511T01 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Course Objectives: This course is aimed at enabling the students to

- To understand the mathematical fundamentals that is prerequisites for variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems bioinformatics, Machine learning.
- To develop the understanding of the mathematical and logical basis to many modern techniques in computer science technology like machine learning, programming language design, and concurrency.
- To study various sampling and classification problems.

Course Outcomes:

- To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
- Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters.
- To learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests.
- Design various ciphers using number theory.
- Apply graph theory for real time problems like network routing problem.

SYLLABUS

UNIT I: Basic Probability and Random Variables: Random Experiments, Sample Spaces Events, the Concept of Probability the Axioms of Probability, Some Important Theorems on Probability Assignment of Probabilities, Conditional Probability Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables

UNIT II: Sampling and Estimation Theory: Population and Sample, Statistical Inference
Sampling With and Without Replacement Random Samples, Random Numbers Population Parameters Sample Statistics Sampling Distributions, Frequency Distributions, Relative Frequency Distributions, Computation of Mean, Variance, and Moments for Grouped Data. Unbiased Estimates and Efficient Estimates Point Estimates and Interval Estimates. Reliability Confidence Interval Estimates of Population Parameters, Maximum Likelihood Estimates

UNIT III: Tests of Hypothesis and Significance: Statistical Decisions Statistical Hypotheses. Null Hypotheses Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests Involving the Normal Distribution One-Tailed and Two-Tailed Tests P Value Special Tests of Significance for Large Samples Special Tests of Significance for Small Samples Relationship between Estimation Theory and Hypothesis Testing Operating Characteristic Curves. Power of a Test Quality Control Charts Fitting Theoretical Distributions to Sample Frequency Distributions, The Chi-Square Test for Goodness of Fit Contingency Tables Yates' Correction for Continuity Coefficient of Contingency.

UNIT IV: Algebraic Structures and Number Theory: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

UNIT V: Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Reference Books:

1. Foundation Mathematics for Computer Science, John Vince, Springer.

2. Probability & Statistics, 3rd Edition, Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers
3. Probability and Statistics with Reliability, K. Trivedi, Wiley.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, H. Rosen, Tata McGraw Hill.
5. Probability and Computing: Randomized Algorithms and Probabilistic Analysis, M. Mitzenmacher and E. Upfal.
6. Applied Combinatorics, Alan Tucker, Wiley.

M.Tech I Semester

L	T	P	C
3	0	0	3

20511T02 ADVANCED DATA STRUCTURES & ALGORITHMS

Course Objectives: From the course the student will learn

- Single Linked, Double Linked Lists, Stacks, Queues, Searching and Sorting techniques, Trees, Binary trees, representation, traversal, Graphs- storage, traversal.
- Dictionaries, ADT for List, Stack, Queue, Hash table representation, Hash functions, Priority queues, Priority queues using heaps, Search trees.
- AVL trees, operations of AVL trees, Red- Black trees, Splay trees, comparison of search trees.

Course Outcomes:

- Ability to write and analyze algorithms for algorithm correctness and efficiency
- Master a variety of advanced abstract data type (ADT) and data structures and their Implementation
- Demonstrate various searching, sorting and hash techniques and be able to apply and solve problems of real life
- Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees
- Ability to compare various search trees and find solutions for IT related problems

SYLLABUS

UNIT I: Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists- Algorithms. **Stacks and Queues**: Algorithm Implementation using Linked Lists.

UNIT II: Searching-Linear and Binary, Search Methods, **Sorting**-Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort. **Trees**- Binary trees, Properties, Representation and Traversals (DFT, BFT), Expression Trees (Infix, prefix, postfix). **Graphs**-Basic Concepts, Storage structures and Traversals.

UNIT III: Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, **Open Addressing**-Linear Probing, Double Hashing.

UNIT IV: Priority queues- Definition, ADT, Realizing a Priority Queue Using Heaps, Definition, Insertion, Deletion .**Search Trees**- Binary Search Trees, Definition, ADT, Implementation, **Operations**- Searching, Insertion, Deletion.

UNIT V: Search Trees- AVL Trees, Definition, Height of AVL Tree, Operations-, Insertion, Deletion and Searching, Introduction to Red-Black and Splay Trees, B-Trees, Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees

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References::

1. Data Structures: A Pseudo Code Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon and Cengage
2. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press
3. Data Structures and Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.
4. Data Structures and Algorithms, 3/e, Adam Drozdek, Cengage
5. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E.V.Prasad and S Chand & Co, 2009

M.Tech I Semester	Program Elective-1	L	T	P	C
		3	0	0	3

20511T03 BIG DATA ANALYTICS

Course Objectives: This course is aimed at enabling the students to

- To provide an overview of an exciting growing field of big data analytics.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSQL, Map Reduce, HIVE, Cassandra, Spark.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To optimize business decisions and create competitive advantage with Big Data analytics

Course Outcomes:

- Illustrate on big data and its use cases from selected business domains.
- Interpret and summarize on No SQL, Cassandra
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore on Big Data applications Using Hive.
- Make use of Apache Spark, RDDs etc. to work with datasets.
- Assess real time processing with Spark Streaming.

SYLLABUS

UNIT I: What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

UNIT II: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, Working with Cassandra ,Table creation, loading and reading data.

UNIT III: Data formats, analyzing data with Hadoop, scaling out, Architecture of

Hadoop distributed file system (HDFS), fault tolerance ,with data replication, High availability, Data locality , Map Reduce Architecture, Process flow, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization. Introduction to Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing, Indexing, Join strategies.

UNIT IV: Apache spark- Advantages over Hadoop, lazy evaluation, In memory processing, DAG, Spark context, Spark Session, RDD, Transformations- Narrow and Wide, Actions, Data frames ,RDD to Data frames, Catalyst optimizer, Data Frame Transformations, Working with Dates and Timestamps, Working with Nulls in Data, Working with Complex Types, Working with JSON, Grouping, Window Functions, Joins, Data Sources, Broadcast Variables, Accumulators, Deploying Spark- On-Premises Cluster Deployments, Cluster Managers- Standalone Mode, Spark on YARN , Spark Logs, The Spark UI- Spark UI History Server, Debugging and Spark First Aid

UNIT V: Spark-Performance Tuning, Stream Processing Fundamentals, Event-Time and State full Processing - Event Time, State full Processing, Windows on Event Time-Tumbling Windows, Handling Late Data with Watermarks, Dropping Duplicates in a Stream, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output.

References:

1. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, and Ambiga Dhiraj
2. SPARK: The Definitive Guide, Bill Chambers & Matei Zaharia, O'Reilley, 2018 Edition
3. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World Polyglot Persistence", Addison-Wesley Professional, 2012
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012
6. "Hadoop Operations", O'Reilley, Eric Sammer, 2012
7. "Programming Hive", O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen, 2012
8. "HBase: The Definitive Guide", O'Reilley, Lars George, 2011
9. "Cassandra: The Definitive Guide", O'Reilley, Eben Hewitt, 2010
10. "Programming Pig", O'Reilley, Alan Gates, 2011

M.Tech I Semester	Program Elective-1	L	T	P	C
		3	0	0	3

20511T04 DIGITAL IMAGE PROCESSING

Course Objectives:

- Describe and explain basic principles of digital image processing.
- Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
- Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
- Assess the performance of image processing algorithms and systems.

Course Outcomes:

- Demonstrate the components of image processing
- Explain various filtration techniques.
- Apply image compression techniques.
- Discuss the concepts of wavelet transforms.
- Analyze the concept of morphological image processing.

SYLLABUS

UNIT I: Introduction: Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. **Image Enhancement Techniques**: Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image subtraction, image averaging.

UNIT II: Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters, Homomorphism is filtering. **Image Restoration & Reconstruction**: Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering, Minimum mean square Error filtering, constrained least square filtering, Geometric

mean filter, Image reconstruction from projections. Color Fundamentals, Color Models, Color Transformations.

UNIT III: Image Compression: Redundancies- Coding, Interpixel, Psycho visual; Fidelity, Source and Channel Encoding, Elements of Information Theory; Loss Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization, Entropy coding, LZW coding; Image Compression Standards-JPEG, JPEG 2000, MPEG; Video compression.

UNIT IV: Wavelet Based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding.

UNIT V: Image Segmentation: Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds; Introduction to morphological operations; binary morphology- erosion, dilation, opening and closing operations, applications; basic gray-scale morphology operations; Feature extraction; Classification; Object recognition. **Digital Image Watermarking**: Introduction, need of Digital Image Watermarking, applications of watermarking in copyright protection and Image quality analysis.

References:

1. Digital Image Processing. 2nd ed. Gonzalez, R.C. and Woods, R.E. India: Person Education, (2009)
2. Digital Image Processing. John Wiley, Pratt, W. K, (2001)
3. Digital Image Processing, Jayaraman, S., Veerakumar, T. and Esakkiranjan, S. (2009),Tata McGraw- Hill

M.Tech I Semester	Program Elective-1	L	T	P	C
		3	0	0	3

20511T05 ADVANCED OPERATING SYSTEMS

Course Objectives: This course is aimed at enabling the students to

- To provide comprehensive and up-to-date coverage of the major developments in distributed Operating System, Multi-processor Operating System and Database Operating System and to cover important theoretical foundations including Process Synchronization, Concurrency, Event ordering, Mutual Exclusion, Deadlock, Agreement Protocol, Security, Recovery and fault tolerance.

Course Outcomes:

- Illustrate on the fundamental concepts of distributed operating systems, its architecture and distributed mutual exclusion.
- Analyze on deadlock detection algorithms and agreement protocols.
- Make use of algorithms for implementing DSM and its scheduling.
- Apply protection and security in distributed operating systems.
- Elaborate on concurrency control mechanisms in distributed database systems

SYLLABUS.

UNIT-1: Architectures of Distributed Systems, System Architecture types, issues in distributed operating systems, communication networks, communication primitives. Theoretical Foundations, inherent limitations of a distributed system, lamp ports logical clocks, vector clocks, casual ordering of messages, global state, cuts of a distributed computation, termination detection. Distributed Mutual Exclusion, introduction, the classification of mutual exclusion and associated algorithms, a comparative performance analysis.

UNIT-2: Distributed Deadlock Detection, Introduction, deadlock handling strategies in distributed systems, issues in deadlock detection and resolution, control organizations for distributed deadlock detection, centralized and distributed deadlock detection algorithms, hierarchical deadlock detection algorithms. Agreement protocols, introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, and applications of agreement algorithms. Distributed resource management: introduction-architecture, mechanism for building distributed file systems design issues, log structured file systems.

UNIT- 3: Distributed shared memory, Architecture, algorithms for implementing DSM, memory coherence and protocols, design issues. Distributed Scheduling, introduction, issues in load distributing, components of a load distributing algorithm, stability, load distributing algorithm, performance comparison, selecting a suitable load sharing algorithm, requirements for load distributing, task migration and associated issues. Failure Recovery and Fault tolerance: introduction, basic concepts, classification of failures, backward and forward error recovery, backward error recovery, recovery in concurrent systems, consistent set of check points, synchronous and asynchronous check pointing and recovery, check pointing for distributed database systems, recovery in replicated distributed databases.

UNIT- 4: Protection and security, preliminaries, the access matrix model and its implementations.-safety in matrix model, advanced models of protection. Data security, cryptography: Model of cryptography, conventional cryptography modern cryptography, private key cryptography, data encryption standard public key cryptography, multiple encryptions, authentication in distributed systems.

UNIT-5: Multiprocessor operating systems, basic multiprocessor system architectures, inter connection networks for multiprocessor systems, caching hypercube architecture. Multiprocessor Operating System, structures of multiprocessor operating system, operating system design issues, threads, process synchronization and scheduling. Database Operating systems: Introduction, requirements of a database, operating system Concurrency control :Theoretical aspects, introduction, database systems, a concurrency control model of database systems, the problem of concurrency control, serializability theory, distributed database systems, concurrency control algorithms, introduction, basic synchronization primitives, lock based algorithms, timestamp based algorithms, optimistic algorithms, concurrency control algorithms, data replication.

References:

1. "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", Mukesh Singhal, Niranjan and G.Shivaratri, TMH, 2001
2. "Modern operating system", Andrew S.Tanenbaum, PHI, 2003
3. "Distributed operating system-Concepts and design", Pradeep K.Sinha, PHI, 2003
4. "Distributed operating system", Pearson education, AndrewS.Tanenbaum, 2003

M.Tech I Semester	Program Elective-2	L	T	P	C
		3	0	0	3

20511T06 ADVANCED COMPUTER NETWORKS

Course Objectives: This course is aimed at enabling the students to

- Attain basic understanding of Computer networks starting with OSI Reference Model, Protocols at different layers with special emphasis on IP, TCP & UDP and Routing algorithms.
- Some of the major topics which are included in this course are CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routing and Addressing.
- Provide the mathematical background of routing protocols.
- Aim of this course is to develop some familiarity with current research problems and research methods in advance computer networks.

Course Outcomes:

- Illustrate reference models with layers, protocols and interfaces.
- Describe the routing algorithms, Sub netting and Addressing of IP V4and IPV6.
- Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation.
- Describe the concepts Wireless LANS, WIMAX, IEEE 802.11, Cellular telephony and Satellite networks
- Describe the emerging trends in networks-MANETS and WSN

Unit-I:**Network layer:** Network Layer design issues: store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual –circuit and datagram subnets, Routing Algorithms-shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, **congestion control algorithms:**Approaches to congestion control, Traffic aware routing, Admission control,

Traffic throttling, choke Packets, Load shedding, Random early detection, Quality of Service, Application requirements, Traffic shaping, Leaky and Token buckets

Unit-II: Internetworking and IP protocols: How networks differ, How net works can be connected, internetworking, tunneling, The network layer in the internet,IPV4 Protocol, IP addresses, Subnets, CIDR, classful and Special addressing, network address translation (NAT),IPV6 Address structure address space, IPV6 Advantages, packet format, extension Headers, Transition from IPV4 to IPV6 , Internet Control Protocols-IMCP, ARP, DHCP

Unit-III: Transport Layer Protocols: Introduction, Services, Port numbers,
User Datagram Protocol: User datagram, UDP services, UDP Applications, Transmission control Protocol: TCP services, TCP features, Segment, A TCP connection, State transition diagram, Windows in TCP, Flow control and error control, TCP Congestion control, TCP Timers, **SCTP:** SCTP services SCTP features, packet format, An SCTP association, flow control, error control.

Unit- IV: Wireless LANS: Introduction, Architectural comparison, Access control, The IEEE 802.11 Project: Architecture, MAC sub layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Bluetooth Layers **Other Wireless Networks:** WIMAX: Services, IEEE project 802.16, Layers in project 802.16, Cellular Telephony: Operations, First Generation (1G), Second Generation (2G), Third Generation (3G), Fourth Generation (4G), Satellite Networks: Operation, GEO Satellites, MEO satellites, LEO satellites.

Unit–V: Emerging trends in Computer networks:
Mobile computing: Motivation for mobile computing, Protocol stack issues in mobile computing environment, mobility issues in mobile computing, security issues in mobile networks, MOBILE Ad Hoc Networks: Applications of Ad Hoc Networks, Challenges and Issues in MANETS, MAC Layer Issues Routing Protocols in MANET, Transport Layer Issues, Ad hoc Network Security. **Wireless Sensor Networks:** WSN functioning, Operating system support in sensor devices, WSN characteristics, sensor network operation, Sensor Architecture: Cluster management, Wireless Mesh Networks: WMN design, Issues in WMNs, Computational Grids, Grid Features, Issues in Grid construction design, Grid design features,P2P Networks: Characteristics of P2P Networks, Classification of P2P systems, Gnutella, BitTorrent, Session Initiation Protocol(SIP) , Characteristics and addressing, Components of SIP, SIP establishment, SIP security.

References:

1. Data communications and networking 4th edition Behrouz A Fourzan,TMH
2. Computer networks4th edition Andrew S Tanenbaum, Pearson
3. Computer networks, Mayank Dave, CENGAGE
4. Computer networks, A system Approach, 5th ed, Larry L Peterson and Bruce S Davie, Elsevier

M.Tech I Semester	Program Elective-2	L	T	P	C
		3	0	0	3

20511T07 INTERNET OF THINGS

Course Objectives:

- To Understand Smart Objects and IoT Architectures.
- To Learn about various IoT- related protocols
- To build simple IoT Systems using Arduino and Rasberry Pi
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular application

Course Outcomes:

- Summarize on the term 'internet of things' in different contexts.
- Analyze various protocols for IoT.
- Design a PoC of an IoT system using Rasperry Pi/Arduino
- Apply data analytics and use cloud offerings related to IoT.
- Analyze applications of IoT in real time scenario

UNIT I: FUNDAMENTALS OF IoT: Evolution of Internet of Things, Enabling Technologies, IoT Architectures,oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II: IoT PROTOCOLS: IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

UNIT III: DESIGN AND DEVELOPMENT: Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python

Programming.

UNIT IV: DATA ANALYTICS AND SUPPORTING SERVICES: Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning – No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django, AWS for IoT, System Management with NETCONF-YANG.

UNIT V: CASE STUDIES/INDUSTRIAL APPLICATIONS: Cisco IoT system, IBM Watson IoT platform, Manufacturing, Converged Plant wide Ethernet Model (CPwE), Power Utility Industry, Grid Blocks Reference Model, Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

References:

1.IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017

2. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015

3. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012

4. "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Ho¨ ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.

5. Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer, 2011.

M.Tech I Semester	Program Elective-2	L	T	P	C
		3	0	0	3

20511T08 OBJECT ORIENTED SOFTWARE ENGINEERING

Course Objectives:

- To elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project.
- To understand the what software life cycle is, how software projects are planned and managed, types of resources involved in software development projects, risks are identified and assessed, predictions and assessments are made.
- To identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements

Course Outcomes:

- Apply the Object Oriented Software-Development Process to design software
- Analyze and Specify software requirements through a SRS documents.
- Design and Plan software solutions to problems using an object-oriented strategy.
- Model the object oriented software systems using Unified Modeling Language (UML)
- Estimate the cost of constructing object oriented software.

SYLLABUS

UNIT I: Introduction to Software Engineering: Software, Software Crisis, Software Engineering definition, Evolution of Software Engineering Methodologies, Software Engineering Challenges. Software Processes: Software Process, Process Classification, Phased development life cycle, Software Development Process Models, Process, use, applicability and Advantages/limitations.

UNIT II: Object oriented Paradigm, Object oriented Concepts, Classes, Objects, Attributes, Methods and services, Messages, Encapsulation, Inheritance, Polymorphism, Identifying the elements of object model, management of object oriented Software projects, Object Oriented Analysis, Domain Analysis, Generic Components of OOA model,OOA Process, Object Relationship model, Object Behavior

Model.

UNIT III: Object Oriented Design: Design for Object- Oriented systems, The Generic components of the OO design model, The System design process, The Object design process, Design Patterns, Object Oriented Programming.

UNIT IV: Object Oriented testing: Broadening the view of Testing, Testing of OOA and OOD models, Object-Oriented testing strategies, Test case design for OO software, testing methods applicable at the class level, Interclass test case design.

UNIT V: Technical Metrics for Object Oriented Systems: The Intent of Object Oriented metrics, The distinguishing Characteristics, Metrics for the OO Design model, Class-Oriented metrics, Operation- Oriented Metrics, Metrics foe Object Oriented testing, Metrics for Object Oriented projects. CASE Tools.

References:

1. Object oriented and Classical Software Engineering, 7/e, Stephen R. Schach, TMH.
2. Object oriented and Classical Software Engineering, Timothy Lethbridge, Robert Laganiere, TMH
3. Software Engineering by Roger S Pressman, Tata McGraw Hill Edition.
4. Component based software engineering: 7th International symposium, ivicaCrnkovic, Springer, CBSE 2004

M.Tech I Semester

L	T	P	C
2	0	0	2

20511T09 RESEARCH METHODOLOGY AND IPR

UNIT 1:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT 2:

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT 3:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT 4:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT 5:

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCES:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.
6. Niebel, "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
1. (8) Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
8. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

M.tech I Semester

L	T	P	C
0	0	4	2

20511L10 ADVANCED DATA STRUCTURES & ALGORITHMS LAB

Course Objectives:

From the course the student will learn

- Knowing about oops concepts for a specific problem.
- Various advanced data structures concepts like arrays, stacks, queues, linked lists, graphs and trees.

Course Outcomes:

- Identify classes, objects, members of a class and relationships among them needed for a specific problem.
- Examine algorithms performance using Prior analysis and asymptotic notations.
- Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
- Apply and analyze functions of Dictionary

Experiment 1:

Write a java program to perform various operations on single linked list

Experiment 2:

Write a java program for the following

a) Reverse a linked list

b) Sort the data in a linked list

c) Remove duplicates

d) Merge two linked lists

Experiment 3:

Write a java program to perform various operations on doubly linked list.

Experiment 4:

Write a java program to perform various operations on circular linked list.

Experiment 5:

Write a java program for performing various operations on stack using linked list.

Experiment 6:

Write a java program for performing various operations on queue using linked list.

Experiment 7:

Write a java program for the following using stack

a) Infix to postfix conversion.

b) Expression evaluation.

c) Obtain the binary number for a given decimal number.

Experiment 8:

Write a java program to implement various operations on Binary Search Tree Using Recursive and Non-Recursive methods.

Experiment 9:

Write a java program to implement the following for a graph.

a) BFS b) DFS

Experiment 10:

Write a java program to implement Merge & Heap Sort of given elements.

Experiment 11:

Write a java program to implement Quick Sort of given elements.

Experiment 12:

Write a java program to implement various operations on AVL trees.

Experiment 13:

Write a java program to perform the following operations:

a) Insertion into a B-tree b) Searching in a B-tree

Experiment 14:

Write a java program to implementation of recursive and non-recursive functions to Binary tree Traversals

Experiment 15:

Write a java program to implement all the functions of Dictionary (ADT) using Hashing.

M.Tech I Semester	L	T	P	C
	0	0	4	2

20511L11 Advanced Computing Lab

Course Objectives:

From the course the student will learn

- The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

Course Outcomes:

- The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.
- Development and use of s IoT technology in Societal and Industrial Applications.
- Skills to undertake high quality academic and industrial research in Sensors and IoT.
- To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Experiment 1: Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.

Experiment 2: Study and Install IDE of Arduino and different types of Arduino.

Experiment 3: Study and Implement Zigbee Protocol using Arduino / RaspberryPi.

Experiment 4: Write a map reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

Experiment 5: Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.

Write a single Spark application that

- Transposes the original Amazon food dataset, obtaining a PairRDD of the type<user_id>→ <list of the product_ ids reviewed by user_id>
- Counts the frequencies of all the pairs of products reviewed together.

- Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Experiment 6:

Write a program to Implement Bankers algorithm for Dead Lock Avoidance.

Experiment 7:

Write a program to Producer-consumer problem Using semaphores.

Experiment 8:

Write a program for an image enhancement using pixel operation.

Experiment 9:

Write a Program to enhance image using image arithmetic and logical operations.

Experiment 10:

Write a program of bit stuffing used by Data Link Layer.

Experiment 11:

Write a program to configure a Network using Distance Vector Routing protocol.

Experiment 12:

Write a program to perform the function oriented diagram: DFD and Structured chart.

Experiment 13:

Write a program to perform the system analysis: Requirement analysis, SRS.

Experiment 14:

Write a program to draw the structural view diagram: Class diagram, object diagram.

Experiment 15:

Write C programs for implementing the Demorgan’s law.

M.Tech II Semester

L	T	P	C
3	0	0	3

20512T01 MACHINE LEARNING

Course Objectives:

Machine Learning course will

- Develop an appreciation for what is involved in learning from data.
- Demonstrate a wide variety of learning algorithms.
- Demonstrate how to apply a variety of learning algorithms to data.
- Demonstrate how to perform evaluation of learning algorithms and model selection.

Course Outcomes:

- Domain Knowledge for Productive use of Machine Learning and Diversity of Data.
- Demonstrate on Supervised and Computational Learning
- Analyze on Statistics in learning techniques and Logistic Regression
- Illustrate on Support Vector Machines and Perceptron Algorithm
- Design a Multilayer Perceptron Networks and classification of decision tree

SYLLABUS

Unit I: Introduction: Towards Intelligent Machines Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

Unit II: Supervised Learning: Rationale and Basics: Learning from Observations, Bias and Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.

Unit III: Statistical Learning: Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.

Unit IV: Support Vector Machines (SVM): Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly seperable data, Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, and Regression by Support vector Machines.

Learning with Neural Networks: Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error correction delta rule.

Unit V: Multilayer Perceptron Networks and error back propagation algorithm, Radial Basis Functions Networks. **Decision Tree Learning**: Introduction, Example of classification decision tree, measures of impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning the tree, strengths and weakness of decision tree approach.

References:

1. Applied Machine Learning,1st edition, M.Gopal, McGraw Hill Education,2018
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC) 1st Edition-2014
3. Machine Learning Methods in the Environmental Sciences, Neural Networks, William WHsieh, Cambridge Univ Press. *1* edition (August 31, 2009)
4. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley &SonsInc., 2nd Edition-2001.
5. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.
6. Machine Learning by Peter Flach , Cambridge-1st Edition 2012

M.Tech II Semester

L	T	P	C
3	0	0	3

20512T02 MEAN Stack Technologies

Course Objectives:

From the course the student will learn

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.
- Writing optimized front end code HTML and JavaScript.
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
- Design and implementation of Robust and Scalable Front End Applications.

Course Outcomes:

- After the completion of the course, student will be able to
- Identify the Basic Concepts of Web & Markup Languages.
- Develop web Applications using Scripting Languages & Frameworks.
- Make use of Express JS and Node JS frameworks
- Illustrate the uses of web services concepts like restful, react js.

SYLLABUS

UNIT I: Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. **Html5** concepts, **CSS3**, Anatomy of a web page. **XML:** Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT II: JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. **Angular Java Script** Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS

UNIT III: Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. **Express.js:** Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

UNIT IV: RESTful Web Services: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. **React Js:** Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories

UNIT V: Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

References:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. Pro Mean Stack Development, ELadElrom, Apress
4. Restful Web Services Cookbook, Subbu Allamraju, O'Reilly
5. JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
6. Web Hosting for Dummies, Peter Pollock, John Wiley Brand

M.Tech II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20512T03 Advanced Databases and Mining

Course Objectives:

- This Subject deals with dealing data in the real world, maintaining data without any redundancy, several techniques involved in DBMS to recover the problems caused due to redundancy, storing data for quick insertion, manipulation and deletion operations in order to retrieve data from the database.
- This subject provides an introduction to multidisciplinary field of data mining, the general data features, techniques for data preprocessing, general implementation of data warehouses and OLAP, the relationship between data warehousing and other generalization methods
- The concepts of data clustering includes a different methods of clustering such as k-means, k- mediods, db scan algorithm, role of data mining in web mining.

Course Outcomes:

- Analyze on normalization techniques.
- Elaborate on concurrency control techniques and query optimization.
- Summarize the concepts of data mining, data warehousing and data preprocessing strategies.
- Apply data mining algorithms.
- Assess various classification & cluster techniques.

SYLLABUS

UNIT I: Introduction: Concepts and Definitions, Relational models, Data Modeling and Query Languages, Database Objects. **Normalization Techniques:** Functional Dependency, 1NF, 2NF, 3NF, BCNF; Multi valued Dependency; Loss-less Join and Dependency Preservation.

UNIT II: Transaction Processing: Consistency, Atomicity, Isolation and Durability, Serializable Schedule, Recoverable Schedule, Concurrency Control, Time-stamp based protocols, Isolation Levels, Online Analytical Processing,

Database performance Tuning and Query optimization: Query Tree, Cost of Query, Join, Selection and Projection Implementation Algorithms and Optimization Database Security: Access Control, MAC, RBAC, Authorization, SQL Injection Attacks.

UNIT III: Data Mining: stages and techniques, knowledge representation methods, data mining approaches (OLAP, DBMS, Statistics and ML). **Data warehousing:** data warehouse and DBMS, multidimensional data model, OLAP operations. **Data processing:** cleaning, transformation, reduction, filters and discretization with weka.

UNIT IV: Knowledge representation: background knowledge, representing input data and output knowledge, visualization techniques and experiments with weka. **Data mining algorithms:** association rules, mining weather data, generating item sets and rules efficiently, correlation analysis.

UNIT V: Classification & Clustering: 1R algorithm, decision trees, covering rules, task prediction, statistical classification, Bayesian network, instance based methods, linear models, Cluster/2, Cobweb, k- means, Hierarchical methods. **Mining real data:** preprocessing data from a real medical domain, data mining techniques to create a comprehensive and accurate model of data. **Advanced topics:** text mining, text classification, web mining, data mining software.

References:

1. Fundamentals of Database Systems, RamezElmasri, Shamkant B. Navathe, Addison-Wesley,6th edition-
2. Data Mining: Concepts and Techniques, J. Han and M. Kamber, Morgan Kaufmann C.J. Date, Database Systems, Pearson, 3rd edition-
3. Principles of Distributed Database Systems, Prentice Hall, P. Valduriez, M. TamerOzsu 3rd edition- 2000
4. Database systems: Design, implementation and Management, C.M. Coronel, S. Morris, P. Rob, Boston: Cengage Learning,9th edition-2011

M.Tech II Semester	Program Elective-3	L	T	P	C
		3	0	0	3

20512T04 Adhoc & Sensor Networks

Course Objectives:

- Architect sensor networks for various application setups.
- Devise appropriate data dissemination protocols and model links cost.
- Understandings of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.
- Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes:

After the completion of the course, student will be able to

- Explain the Fundamental Concepts and applications of ad hoc and wireless sensor networks
- Discuss the MAC protocol issues of ad hoc networks
- Enumerate the concept of routing protocols for ad hoc wireless networks with respect to TCP design issues
- Analyze & Specify the concepts of network architecture and MAC layer protocol for WSN
- Discuss the WSN routing issues by considering QoS measurements

SYLLABUS

UNIT I: Introduction : Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio propagation Mechanisms ,Characteristics of the Wireless channel mobile ad hoc networks (MANETs), **Wireless Sensor Networks (WSNs):** concepts and architectures, Applications of Ad Hoc and Sensor Networks, Design Challenges in Ad hoc and Sensor Networks.

UNIT II: MAC Protocols For Ad Hoc Wireless Networks: Issues in designing a MAC Protocol, Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention based protocols with Scheduling Mechanisms, Multi channel

MAC - IEEE 802.11.

UNIT III: Routing Protocols And Transport Layer In Ad Hoc Wireless Networks: Routing Protocol: Issues in designing a routing protocol for Ad hoc networks, Classification, proactive routing, reactive routing (on-demand), hybrid routing, Transport Layer protocol for Ad hoc networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer solutions-TCP over Ad hoc wireless, Network Security, Security in Ad Hoc Wireless Networks, Network Security Requirements.

UNIT IV: Wireless Sensor Networks (WSNS) And Mac Protocols: Single node architecture - hardware and software components of a sensor node, **WSN Network architecture:** typical network architectures, data relaying and aggregation strategies, **MAC layer protocols:** self-organizing, Hybrid TDMA/FDMA and CSMA based MAC - IEEE 802.15.4.

UNIT V: WSN Routing, Localization & Qos: Issues in WSN routing, OLSR, Localization, Indoor and Sensor Network Localization, absolute and relative localization, triangulation, QOS in WSN, Energy Efficient Design, Synchronization.

References:

1. "Ad Hoc Wireless Networks: Architectures and Protocols ", C. Siva Ram Murthy, and B. S. Manoj, Pearson Education, 2008
2. “Wireless Adhoc and Sensor Networks”, Labiod. H, Wiley, 2008
3. “Wireless ad -hoc and sensor Networks: theory and applications”, Li, X, Cambridge University Press, 2008.
4. “Ad Hoc & Sensor Networks: Theory and Applications”, 2nd edition, Carlos De Morais Cordeiro, Dharma Prakash Agrawal ,World Scientific Publishing Company, 2011
5. "Wireless Sensor Networks", Feng Zhao and Leonides Guibas,Elsevier Publication.
6. “Protocols and Architectures for Wireless Sensor Networks”, Holger Karl and Andreas Willig,Wiley, 2005 (soft copy available)
7. “Wireless Sensor Networks Technology, Protocols, and Applications”, Kazem Sohraby, Daniel Minoli, & TaiebZnati, John Wiley, 2007. (soft copy available)

M.Tech II Semester	Program Elective-3	L	T	P	C
		3	0	0	3

20512T05 Soft Computing

Course Objectives:

- To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
- To implement soft computing based solutions for real-world problems.
- To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
- To provide student a hand-on experience on MATLAB to implement various strategies.

Course Outcomes:

After the completion of the course, student will be able to

- Elaborate fuzzy logic and reasoning to handle uncertainty in engineering problems.
- Make use of genetic algorithms to combinatorial optimization problems.
- Distinguish artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning.
- Formulate and apply the principles of self-adopting and self organizing neuro fuzzy inference systems.
- Evaluate and compare solutions by various soft computing approaches for a given problem

SYLLABUS

UNIT I: Fuzzy Set Theory: Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic function and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.

UNIT II: Optimization: Derivative based Optimization, Descent Methods, and The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing, and Random Search, Downhill Simplex Search.

UNIT III: Artificial Intelligence: Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainty Basic knowledge Representation Issues Knowledge acquisition, Heuristic Search: Techniques for Heuristic search Heuristic Classification State Space Search: Strategies Implementation of Graph Search based on Recursion Patent-directed Search Production System and Learning.

UNIT IV: Neuro Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems, Architecture Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks Neuro Fuzzy Spectrum.

UNIT V: Applications Of Computational Intelligence: Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Coloripe Prediction.

References:

1. "Neuro-Fuzzy and Soft Computing", J.S.R.Jang, C.T.Sun and E.Mizutani, PHI, 2004, Pearson Education 2004
2. Artificial Intelligence by Saroj Koushik, Cengage Learning
3. "Artificial Intelligence and Intelligent Systems", N.P.Padhy, Oxford University Press, 2006
4. Artificial Intelligence, Second Edition, Elaine Rich & Kevin Knight, Tata McGraw Hill Publishing Comp., New Delhi, , 2006
5. "Fuzzy Logic with Engineering Applications", Timothy J.Ross, McGraw- Hill, 1997

M.Tech II Semester	Program Elective-3	L	T	P	C
		3	0	0	3

20512T06 Cloud Computing

Course Objectives:

- To implement Virtualization
- To implement Task Scheduling algorithms.
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- Broadly educate to know the impact of engineering on legal and societal issues involved.

Course Outcomes: At the end of the course, student will be able to

- Interpret the key dimensions of the challenge of Cloud Computing.
- Examine the economics, financial, and technological implications for selecting cloud computing for own organization.
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
- Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas.
- To Illustrate Virtualization for Data-Center Automation.

SYLLABUS

UNIT I: Introduction: Network centric computing, Network centric content, peer-to – peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. **Parallel and Distributed Systems:** Introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, model concurrency with Petri Nets.

UNIT II: Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing, **Cloud Computing:** Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, The Map Reduce Program model, HPC on cloud, biological research.

UNIT III: Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades, **Cloud Resource Management and Scheduling**: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling.

UNIT IV: Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), **Cloud Security:** Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.

UNIT V: Cloud Application Development: Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Installing Simple Notification Service on Ubuntu 10.04, Installing Hadoop on Eclipse, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book 1), **Google:** Google App Engine, Google Web Toolkit (Text Book 2), **Microsoft:** Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2).

References:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi, TMH

M.Tech II Semester	Program Elective-4	L	T	P	C
		3	0	0	3

20512T07 Principles of Computer Security

Course Objectives:

In the course the student will learn

- This course provides an overview of modern cryptographic theories and techniques, mainly focusing on their application into real systems.
- Topics include Database and Cloud Security, Malicious Software, Denial-of-Service Attacks, Software Security, Operating System Security, Wireless Network Security and mobile device security.

Course Outcomes:

After the completion of the course, student will be able to

- Describe the key security requirements of confidentiality, integrity, and availability, types of security threats and attacks and summarize the functional requirements for computer security.
- Explain the basic operation of symmetric block encryption algorithms, use of secure hash functions for message authentication, digital signature mechanism.
- Discuss the issues involved and the approaches for user authentication and explain how access control fits into the broader context that includes authentication, authorization, and audit.
- Explain the basic concept of a denial-of-service attack, nature of flooding attacks, distributed denial- of-service attacks and describe how computer security vulnerabilities are a result of poor programming practices.
- List the steps used to secure the base operating system, specific aspects of securing Unix/Linux systems, Windows systems, and security in virtualized systems and describe the security threats and countermeasures for wireless networks.

SYLLABUS

Unit I: Introduction: Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, Fundamental Security Design Principles, Attack

Surfaces and Attack Trees, Computer Security Strategy. **Cryptographic Tools:** Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers.

Unit II: User Authentication: Electronic User Authentication Principles, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication. **Access Control:** Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, UNIX File Access Control, Role-Based Access Control, Attribute-Based Access Control, Identity, Credential, and Access Management, Trust Frameworks.

Unit III: Database and Cloud Security: The Need For Database Security, Database Management Systems, Relational Databases, Sql Injection Attacks, Database Access Control, Database Encryption, Cloud Computing, Cloud Security Risks And Countermeasures, Data Protection In The Cloud, Cloud Security As A Service. **Malicious Software:** Types of Malicious Software (Malware), Advanced Persistent Threat, Propagation, Infected Content, Viruses, Propagation, Vulnerability Exploit, Worms, Propagation, Social Engineering, Spam E-Mail, Trojans, Payload, System Corruption, Payload, Attack Agent, Zombie, Bots, Payload, Information Theft, Key loggers, Phishing, Spyware, Payload, Stealthing, Backdoors, Root kits, Countermeasures.

Unit IV: Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial- of-Service Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack. **Software Security:** Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs.

Unit V: Operating System Security: Introduction To Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security. **Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.

References:

1. Computer Security: Principles and Practices, 3e, William Stallings, Lawrie Brown, Pearson
2. Network Security Essentials, Principles and Practices, William Stallings, Pearson

M.Tech II Semester	**Program Elective-4**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20512T08 High Performance Computing

Course Objectives:

The objective of the subject is to

- Introduce the basic concepts related to HPC architecture and parallel computing.
- To discuss various computational techniques for studying soft matter systems.
- To apply these concepts to examine complex bimolecular/materials systems that generally require large-scale HPC platform with hybrid CPU-GPU architectures.

Course Outcomes:

- Design, formulate, solve and implement high performance versions of standard single threaded algorithms.
- Demonstrate the architectural features in the GPU and MIC hardware accelerators.
- Design programs to extract maximum performance in a multicore, shared memory execution environment processor.
- Analyze Symmetric and Distributed architectures.
- Develop and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.

SYLLABUS

UNIT I: Graphics Processing Units: Introduction to Heterogeneous Parallel Computing, GPU architecture, Thread hierarchy, GPU Memory Hierarchy.

UNIT II: GPU Programming: Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations, Image Processing algorithms – Image Blur, Gray scaling. Histogramming, Convolution, Scan, Reduction techniques.

UNIT III: Many Integrated Cores: Introduction to Many Integrated Cores. MIC, Xeon Phi architecture, Thread hierarchy, Memory Hierarchy, Memory Bandwidth and performance considerations.

UNIT IV: Shared Memory Parallel Programming: Symmetric and Distributed architectures, OpenMP Introduction, Thread creation, Parallel regions. Work sharing, Synchronization.

UNIT V: Message Passing Interface: MPI Introduction, Collective communication, Data grouping for communication.

References

1. Programming Massively Parallel Processors A Hands-on Approach, 3e, Wen-Mei W Hwu, David B Kirk and Morgan Kaufmann-2019
2. Intel Xeon Phi Coprocessor Architecture and Tools, Rezaur Rahman, Apress Open, 1st edition-2013
3. Using OpenMP, Barbara Chapman, Gabriele Jost, Rudd Vander Pas, MIT Press, 2008
4. “A Parallel Algorithm Synthesis Procedure for High-Performance Computer Architectures” by Dunn Ian N, 2003

M. Tech II Semester

L	T	P	C
0	0	4	2

20512L09 Machine Learning with Python Lab

Course Objectives:

This course will enable students to

- To learn and understand different Data sets in implementing the machine learning algorithms.
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes:

- Implement procedures for the machine learning algorithms
- Design Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real world problems

Experiment-1:

Exercises to solve the real-world problems using the following machine learning methods:

a) Linear Regression

b) Logistic Regression.

Experiment-2:

Write a program to Implement Support Vector Machines.

Experiment-3:

Exploratory Data Analysis for Classification using Pandas and Matplotlib.

Experiment-4:

Implement a program for Bias, Variance, and Cross Validation.

Experiment-5:

Write a program to simulate a perception network for pattern classification and function approximation.

Experiment-6:

Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-7:

Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:

Write a program to implement the naïve Bayesian classifier for Iris data set. Compute the accuracy of the classifier, considering few test data sets.

Experiment-9:

Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-10:

Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k- Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-11:

Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

M.Tech II Semester	L	T	P	C
	0	0	4	2

20512L10 MEAN Stack Technologies Lab

Course Objectives:

From the course the student will

- Learn the core concepts of both the frontend and backend programming course.
- Get familiar with the latest web development technologies.
- Learn all about SQL and Mongo databases.
- Learn complete web development process.

Course Outcomes: At the end of the course, student will be able to

- Identify the Basic Concepts of Web & Markup Languages.
- Develop web Applications using Scripting Languages & Frameworks.
- Creating & Running Applications using JSP libraries.
- Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng- form.
- Working with the Files in React JS and Constructing Elements with Data.

Experiment-1:

Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com. The website should consist of the following pages. Home page

- Registration and user Login
- User profile page
- Books catalog
- Shopping cart
- Payment by credit card Order Conformation

Experiment-2:

Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.

Experiment-3:

Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:

a) Input: Click on Display Date button using on click ( ) function Output: Display date in the textbox

b) Input: A number n obtained using prompt Output: Factorial of n number using alert

c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert

d) Input: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert

Experiment-4:

Create a simple visual bean with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click.

Experiment-5:

Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.

Experiment-6:

Develop and demonstrate PHP Script for the following problems:

a) Write a PHP Script to find out the Sum of the Individual Digits.

b) Write a PHP Script to check whether the given number is Palindrome or not

Experiment-7:

Implement the following in CSS

a) Implementation of 'get' and 'post' methods.

b) Implementation in colors, boarder padding.

c) Implementation button frames tables, navigation bars.

Experiment-8:

Implement the web applications with Database using

a) PHP,

b) Servlets and

c) JSP.

Experiment-9:

Write a program to design a simple calculator using

a) JavaScript

b) PHP

c) Servlet and

d) JSP.

Experiment-10:

Create registration and login forms with validations using Jscript query.

Experiment-11:

Jscript to retrieve student information from student database using database connectivity.

Experiment-12:

Implement the following in React JS

a) Using React Js creating constructs data elements.

b) Using React Js implementations DoM.

Experiment-13:

Implement the following in Angular JS

a) Angular Js data binding.

b) Angular JS directives and Events.

c) Using angular Js fetching data from MySQL.

Experiment-14:

Develop and demonstrate Invoking data using Jscript from Mongo DB.

Experiment-15:

Create an Online fee payment form using JSCript and MangoDB.

M.Tech III Semester	**Program Elective-5**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20513T01 Deep Learning

Course Objectives:

At the end of the course, the students will be expected to:

- Learn deep learning methods for working with sequential data,
- Learn deep recurrent and memory networks,
- Learn deep Turing machines,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

Course Outcomes:

After the completion of the course, student will be able to

- Demonstrate the basic concepts fundamental learning techniques and layers.
- Discuss the Neural Network training, various random models**.**
- Explain different types of deep learning network models.
- Classify the Probabilistic Neural Networks.
- Implement tools on Deep Learning techniques.

UNIT I: Introduction: Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. **Feed forward neural network:** Artificial Neural Network, activation function, multi-layer neural network.

UNIT II: Training Neural Network: Risk minimization, loss function, back propagation, regularization, model selection, and optimization.

Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

UNIT III: Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, and Deep

Belief Network.

UNIT IV: Probabilistic Neural Network: Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Auto encoders.

UNIT V: Applications: Object recognition, sparse coding, computer vision, natural language processing. **Introduction to Deep Learning Tools:** Caffe, Theano, Torch.

References:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016..
2. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.
3. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.

Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.

1. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

M.Tech III Semester	L	T	P	C
	3	0	0	3

20513T02 Social Network Analysis

Course Objectives:

- The learning objective of the course Social Network Analysis is to provide students with essential knowledge of network analysis applicable to real world data, with examples from today's most popular social networks.

Course Outcomes:

- After the completion of the course, student will be able to
- Demonstrate social network analysis and measures.
- Analyze random graph models and navigate social networks data
- Apply the network topology and Visualization tools.
- Compare the application driven virtual communities from social network Structure.

UNIT I: Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT II: Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT III: Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT IV: Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The ErdosRenyi Model, Clustering Models.

UNIT V: Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.

Reference Books:

1. S. Wasserman and K. Faust. Social Network Analysis: Methods and Applications (Cambridge, Cambridge University Press, 1994)

2. D. Easley and J. Kleinberg, Networks, Crowds and Markets: Reasoning about a highly connected world-2010
3. Social Network Analysis: Methods and Applications (Structural Analysis in the Social Sciences) by Stanley Wasserman, Katherine Faust, 1994.

M.Tech III Semester	**Open Elective**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20513T03 Human Resource Management

Course Objectives:

- Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes.
- Administer and contribute to the design and evaluation of the performance management program.
- Develop, implement, and evaluate employee orientation, training, and development programs.
- Facilitate and support effective employee and labour relations in both non-union and union environments.

Course Outcomes (COs): At the end of the course, student will be able to

- Explain the importance of human resources and their effective management in organizations
- Demonstrate a basic understanding of different tools used in forecasting and planning, human resource need.
- Describe the meanings of terminology and tools used in managing employees effectively
- Make use of Record governmental regulations affecting employees and employers
- Analyze the key issues related to administering the human elements such as motivation, compensation, appraisal, career planning, diversity, ethics, and training

SYLLABUS

UNIT I:

HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- - HR policies, Strategies to increase firm performance - Role and position of HR department – aligning HR strategy with organizational strategy - HRM at global perspective -challenges – cross- cultural problems – emerging trends in HRM.

UNIT II:

Investment perspectives of HRM: HR Planning – Demand and Supply forecasting - Recruitment and Selection- Sources of recruitment - Tests and Interview Techniques - Training and Development – Methods and techniques – Training evaluation - retention - Job Analysis – job description and specifications -

Management development - HRD concepts.

UNIT III:

Wage and Salary Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Job design and Evaluation- Incentive Payment Systems. Welfare management: Nature and concepts – statutory and non-statutory welfare measures – incentive mechanisms.

UNIT IV:

Performance Evaluation: Importance – Methods – Traditional and Modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation, Concepts and Principles- Influencing Factors- Current Trends in Compensation- Methods of Payments - compensation mechanisms at international level.

UNIT V:

Managing Industrial Relations: Trade Unions - Employee Participation Schemes-Collective Bargaining–Grievances and disputes resolution mechanisms – Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress.

References:

1) K Aswathappa: “Human Resource and Personnel Management”, Tata McGraw Hill, New Delhi, 2013
2) N.Sambasiva Rao and Dr. Nirmal Kumar: “Human Resource Management and Industrial Relations”, Himalaya Publishing House, Mumbai
3) Mathis, Jackson,Tripathy:“Human Resource Management:Asouth-Asin Perspective”, Cengage Learning, New Delhi, 2013
4) Subba Rao P: “Personnel and Human Resource Management-Text and Cases”, Himalaya Publications, Mumbai, 2013.
5) Madhurima Lall, Sakina Qasim Zasidi: “Human Resource Management”, Excel Books, New Delhi, 2010

M.Tech III Semester	Open Elective	L	T	P	C
		3	0	0	3

20513T04 Digital Marketing

Course Objectives:

Digital marketing aims at being SMART (Specific, Measurable, Achievable, Relevant and Time Related) so that people can withstand against competitors.

Course Outcomes (COs): At the end of the course, student will be able to

- Explain about web pages with basic HTML5, DHTML tags using CSS and XML, the overview of W3C DOM.
- Discuss the key elements of a digital Java Scripts.
- Apply search engine optimization techniques to a website.
- Illustrate how the effectiveness of a digital marketing campaign can be measured
- Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs

SYLLABUS

UNIT I:

HTML: Introduction, HTML5, Audio Elements, Video Elements, Organizing Elements. **Scripting Documents:** Dynamic Document content, Document properties, Legacy DOM, Document Collections, Overview of the W3C DOM, Traversing a Document, Finding Elements in a Document, Modifying a Document, Adding Content to a Document Example

UNIT II:

Cascading Style Sheets and Dynamic HTML: Overview of CSS, CSS for DHTML Scripting inline Styles, Scripting computed styles, Scripting CSS Classes, Scripting Style Sheets, **Java Script and XML:** Obtaining XML Documents, Manipulating XML with the DOM API, Transforming XML with XSLT querying XML with X path, Serializing XML, Example, XML and Web services.

UNIT III:

Search Engine Optimization (SEO): Searching Engine Marketing, Search Engine Optimization, Measuring SEO Success, Mapping with SEO Journey, **Search Advertising:** Online Advertising Payment Models, Search Advertising (Desktop & Mobile Devices), Planning & Executing a search Advertising Camping, Strategic Implications of Advertising on the search Network.

UNIT IV:

Search Media Marketing: What is Social Media? Social Media Marketing, Social Media Marketing Strategy, Adopting Social Media in Organizations: Internal Learning, Paid-Owned-Earned Media, Social CRM, **Mobile Marketing:**
Mobile Internet in India, What is Mobile Marketing? Email Marketing Strategy, Forms of Mobile Marketing, Mobile Advertising, M-Commerce.

UNIT V:

E-Mail Marketing: E-Mail Marketing in India, What is E-Mail Marketing? E-Mail Marketing Strategy, Executing E-Mail Marketing, **Internet Marketing:**
Internet Marketing Strategy, Content Marketing, Content Marketing in India.

References:

1. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Ian Dodson, Wiley, 2016
2. Programming the World Wide Web, Robet W Sebesta, Pearson, 8th edition, 2015
3. Fundamentals of Digital Marketing, Second Edition, Pearson Paperback, 2019
4. Internet Marketing- A Practical approach in the India Context by Moutusy Maity, Oxford
5. Java Script: The Definite Guide David Flanagan, O' Reilly Publisher

M.Tech III Semester

L	T	P	C
3	0	0	3

20513P05 (DISSERTATION)

DISSERTATION PHASE – I

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – I and II at M. Tech. (Electronics):

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.

- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.
- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.
- During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.
- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work.

Course Outcomes:

At the end of this course, students will be able to

1. Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.

2. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
3. Ability to present the findings of their technical solution in a written report.
4. Presenting the work in International/ National conference or reputed journals.

M.Tech IV Semester

L	T	P	C
3	0	0	3

20514P01 (DISSERTATION) DISSERTATION PHASE – II

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establidirect link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various

domain The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Course objectives:

Students will be able to:

Understand that how to improve your writing skills and level of readability Learn about what to write in each section

Understand the skills needed when writing a Title Ensure the good quality of paper at very first- time submission

Syllabus		
Units	**CONTENTS**	**Hours**
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	Skills needed when writing the Methods, skills needed when writing the Results, skills needed when writing the Discussion, skills needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork , English for Writing Research Papers, Springer New York ordrecht Heidelberg London, 2011

AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives:

Students will be able to:

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Syllabus		
Units	**CONTENTS**	**Hours**
1	**Introduction** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	**Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man- made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	**Disaster Prone Areas In India** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4

4	**Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5	**Risk Assessment** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co- Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival. **Disaster Mitigation** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4

Suggested Readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content	Hours
1	Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences	4
2	Order, Introduction of roots, Technical information about Sanskrit Literature	4
3	Technical concepts of Engineering - Electrical,	4
4	Technical concepts of Engineering - Mechanical.	4
5	Technical concepts of Engineering – Architecture, Mathematics	4

Suggested reading

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

AUDIT 1 and 2: VALUE EDUCATION

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

SYLLABUS

Unit	Content	Hours
1	Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements	4
2	Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism.Love for nature ,Discipline	4
3	Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking.	4
4	Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature	4
5	Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively	4

Suggested reading

1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Course outcomes

Students will be able to 1.Knowledge of self-development

2.Learn the importance of Human values 3.Developing the overall personality

AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus		
Units	**Content**	**Hours**
1	**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working)	4
2	**Philosophy of the Indian Constitution:** Preamble Salient Features	4
3	**Contours of Constitutional Rights & Duties:** Fundamental Rights Right to Equality Right to Freedom, Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights, Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties.	4
4	**Organs of Governance:** Parliament Composition, Qualifications and Disqualifications Powers and Functions, Executive President Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions	4

5	**Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CE of Municipal Corporation. Panchayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy **Election Commission:** Election Commission: Role and Functioning.Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.	6

Suggested reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

AUDIT 1 and 2: PEDAGOGY STUDIES

Course Objectives:

Students will be able to:

- Review existing evidence on the review topic to inform programm design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Syllabus		
Units	**Content**	**Hours**
1	**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.	4
2	Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.	4
3	Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?	4
4	Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.	6
5	Professional development: alignment with classroom practices and follow-up support Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and	6

	large class sizes Research design Contexts Pedagogy Teacher education Curriculum and assessment Dissemination and research impact.	

Suggested reading:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Course Outcomes:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

Syllabus

Unit	Content	Hours
1	Definitions of Eight parts of yog. (Ashtanga)	5
2	Yam and Niyam. Do`s and Don't's in life. Ahinsa, satya, astheya, bramhacharya and aparigraha	5
3	Yam and Niyam. Do`s and Don't's in life. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	5
4	Asan and Pranayam Various yog poses and their benefits for mind & body	5
5	Regularization of breathing techniques and its effects-Types of pranayam	4

Suggested reading

2. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami YogabhyasiMandal, Nagpur
3. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Course Outcomes

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students

Unit	Content	Hours
1	Neetisatakam-Holistic development of personality Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)	4
2	Neetisatakam-Holistic development of personality Verses- 52,53,59 (dont's) Verses- 71,73,75,78 (do's)	4
3	Approach to day to day work and duties. Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,	4
4	Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.	4
5	Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18	4

6	Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63	4

SYLLABUS

Suggested reading

1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

COURSE STRUCTURE-MIC20
M. Tech (Machine Design)
M. Tech I Semester

S.No	Course Code	Course Title	Hours Per Week L	T	P	Total Contact Hours	Credits
1	20311T01	Advanced Stress Analysis	3	---	---	3	3
2	20311T02	Advanced Vibrations and Acoustics	3	---	---	3	3
3	20311T03	1.Advanced Machine Design	3	---	---	3	3
	20311T04	2.Design for Manufacturing and Assembly					
	20311T05	3.Mathematical Methods in Engineering					
4	20311T06	1.Advanced Engineering Materials	3	---	---	3	3
	20311T07	2.Mechanics of Composite Materials					
	20311T08	3.Analysis and Synthesis of Mechanisms					
5	20311L11	Machine dynamics lab	---	---	4	4	2
6	20311L12	Numerical Simulation lab	---	---	4	4	2
7	20311T09	Research Methodology and IPR	2	---	---	2	2
8	20311T10	Audit Course - 1	2	---	---	2	0
		TOTAL	16	---	8	24	18

M. Tech II Semester

S.No	Course Code	Course Title	Hours Per Week L	T	P	Total Contact Hours	Credits
1	20312T01	Finite Element Method	3	---	---	3	3
2	20312T02	Computer Aided Design	3	---	---	3	3
3	20312T03	1. Tribology in Design	3	---	---	3	3
	20312T04	2. Robotics					
	20312T05	3. Fracture Mechanics					
4	20312T06	1. Multi-body Dynamics	3	---	---	3	3
	20312T07	2. Condition Based Monitoring					
	20312T08	3. Optimization Techniques in Design					
5	20312L11	Computer Aided Design lab	---	---	4	4	2
6	20312L12	Simulation lab	---	---	4	4	2
7	20312T09	Audit -2	2	---	---	2	0
8	20312P10	Mini-Project with Seminar	---	---	4	4	2
		TOTAL	14	---	12	26	18

M. Tech III Semester

S.No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1	20313T01	1. Advanced Finite Element Method	3	---	---	3	3
	20313T02	2. Advanced Metallurgy					
2	20313T03	1. Business Analytics	3	---	---	3	3
	20313T04	2. Industrial Safety					
	20313T05	3. Operations Research					
	20313T06	4. Cost Management of Engineering Projects					
	20313T07	5. Composite Materials					
	20313T08	6. Waste to Energy					
3	20313P08	Dissertation Phase – I	---	---	20	20	10
		TOTAL	6	---	20	26	16

M.Tech IV Semester

S. No	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
			L	T	P		
1	20314P01	Dissertation Phase – II	---	--	32	32	32
		TOTAL	---	--	32	32	16

Audit course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

M.Tech I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Advanced Stress Analysis (20311T01)

Course Outcomes:
At the end of the course:
1. Students will understand the tonsorial approach of continuum mechanics and comprehend modern research material.
2. Student will learn basic field equations such as equilibrium equations, compatibility and constitutive relationship.
3. Students will be able to apply basic field equations to torsion, bending and two dimensional elasticity problems, and energy methods.
4. Students will be able to solve problems in unsymmetrical bending and shear center,
5. Contact stresses and pressurized cylinders and rotating discs.

Syllabus Contents

Unit 1: Theory of Elasticity
Analysis of stress, Analysis of stain, Elasticity problems in two dimension and three dimensions, Mohr's circle for three dimensional stresses. Stress tensor, Air's stress function in rectangular and polar coordinates.
Energy Methods-Energy method for analysis of stress, strain and deflection **T**he three theorem's -theorem of virtual work, theorem of least work, Castiglioni's theorem, Rayleigh Ritz method, Galekin's method, Elastic behavior of anisotropic materials like fiber reinforced composites.

Unit 2. Theory of Torsion
Torsion of prismatic bars of solid section and thin walled section. Analogies for torsion, membrane analogy, fluid flow analogy and electrical analogy.
Torsion of conical shaft, bar of variable diameter, thin walled members of open cross section in which some sections are prevented from warping, Torsion of noncircular shaft.

Unit 3. Unsymmetrical Bending and Shear Centre
Concept of shear center in symmetrical and unsymmetrical bending, stress and deflections in beams subjected to unsymmetrical bending.
shear center for thin wall beam cross section, open section with one axis of symmetry, general open section, and closed section. .

Unit 4. Pressurized Cylinders and Rotating Disks
Governing equations, stress in thick walled cylinder under internal and external pressure, shrink fit compound cylinders. Stresses in rotating flat solid disk, flat disk with central hole, disk with variable thickness, disk of uniform strength, Plastic action in thick walled cylinders and rotating disc.

Unit 5.
Contact stresses: Geometry of contact surfaces, method of computing contact stresses and deflection of bodies in point contact, stress for two bodies in line contact with load normal to contact area and load normal and tangent to contact area.Introduction to Analysis of low speed impact.

TEXT BOOKS:

1. Sadd, Martin H., Elasticity: Theory, applications and Numeric, Academic Press 05 (Text Book)
2. Boresi, A.P. and K. P. Chong, Elasticity in Engineering Mechanics, Second Edition,John Wiley & Sons, 00.

REFERENCES:

1. Budynas, R. G. Advance strength and Applied Stress Analysis, Second Edition, WCB/ McGraw Hill 1999
2. Dally, J. W. and W.F. Riley, Experimental Stress Analysis, McGraw Hill International,Third Edition, 1991
3. Theory of Elasticity – Timoshenko and Goodier, Mc Graw Hill
4. Advanced Strength of Materials, Vol. 1,2 – Timoshenko, CBS
5. Advanced Strength of Materials – Den Harteg

M.Tech I Semester	L	T	P	C
	3	0	0	3

Advanced Vibrations and Acoustics (20311T02)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes:
At the end of the course:

1. The student will be able to predict response of a SDOF system, damped or undamped, subjected to simple arbitrary base or force excitations. They will be able to obtain Shock Response Spectrum of SDOF systems for such excitations and understand use of the SRS.
2. The students will be able to write differential equations of motion for MDOF systems, and through the technique of decoupling and orthogonal properties of natural modes, should be able to obtain the Eigen-values and mode shapes of natural vibrations and response to harmonic and arbitrary excitations.
3. The students will be able to obtain the Eigen-values and mode shapes of natural vibrations of beams and response to harmonic excitations using orthogonal properties of natural modes.
4. Student will be able to obtain natural frequencies and mode shapes of MDOF and continuous systems using computational methods such as Rayleigh-Ritz method, Holzer method, Dunckerley's method, and Stodola's method.
5. Student will know various terminologies used in acoustics and acoustic wave transmission, derive plane and spherical wave equations, and obtain sound pressure level at a given distance from a simple sound source of known strength.

Students should understand the basics of psychoacoustics, equal loudness contours, dBA scale,loudness, pitch and timbre.

Syllabus Contents:

Unit 1:
Transient Vibrations, Response of a single degree of freedom system to step and any arbitrary excitation.Convolution (Duhamel's) integral, impulse response function

Unit 2:
Multi degree of freedom systems, Free, damped and forced vibrations of two degree of freedom systems, Eigen values and Eigen vectors, normal modes and their properties, mode summation method.Use of Lagrange's equations to derive the equations of motion,

Unit 3:
Continuous Systems, Natural Vibrations of beams – Differential equation of motion,

solution by the method of separation of variables, frequency parameter, natural frequencies and mode shapes, forced vibration of simply supported beam subjected to concentrated harmonic force at a point, Mode summation method.Discretized models of continuous systems and their solutions using Rayleigh – Ritz method.

Unit 4:

Vibration Control, Methods of vibration control, principle of superposition, Numerical and computer methods in vibrations:Rayleigh, Rayleigh-Ritz and Dunkerley's methods, matrix iteration method for Eigen-value calculations, Holzer's method.

Unit 5:

Plane acoustic waves, Sound speed, characteristic acoustic impedance of elastic media, sound intensity, dB scale, Transmission Phenomena, transmission from one fluid medium to another,normal incidence, reflection at the surface of a solid, standing wave patterns, Symmetric Spherical waves, near and far fields, simple models of sound sources, sound power,determination of sound power and intensity levels at a point due to a simple source.Psychoacoustics, Speech, mechanism of hearing, thresholds of the ear – sound intensity and frequency, loudness, equal loudness levels, loudness, pitch and timbre, beats, masking by pure tones, masking by noise.

TEXT BOOKS:

1.Thomson W.T., "Theory of Vibrations with applications", George Allen and Unwh Ltd.London, 1981.

2.S.S. Rao, Addison, "Mechanical Vibrations", Wesley Publishing Co., 1990.

References:

1.Leonard Meirovitch, "Fundamentals of vibrations", McGraw Hill International Edition.
2.S. Timoshenko, "Vibration problems in Engineering", Wiley, 1974.
3.Lawrence E. Kinsler and Austin R.Frey, "Fundamentals of acoustics", Wiley Eastern Ltd.,1987.
4.Michael Rettinger, "Acoustic Design and Noise Control", Vol. I & II. , Chemical Publishing Co., New York, 1977.

M.Tech I Semester	L	T	P	C
	3	0	0	3

Advanced Machine Design (20311T03)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes:
At the end of the course:
1. Students will realize that creativity, manufacturability, assembly, maintainability, emotions, reliability are also important aspects of design other than
2. Finding dimensions and stresses in the highly competitive, dynamic and customer centered market.
3. Students will demonstrate the ability to identify needs of the customer and convert them in to technical specifications of a product.
4. Students will be able to generate different ideas after identifying the need and determining the specifications and constraints of a product for a particular purpose.
5. Students will understand the principals used while designing for manufacture, assembly, emotions and maintenance.
6. Students will know various methods of rapid prototyping the products to test and modify the designs.
7. Students will be able to design the components considering strength based reliability.

Syllabus Contents:
Unit 1: Development processes and organizations, Product Planning.

Unit2: Need Identification and problem definition, product specification, concept generation and selection. Evaluation, creativity methods, Concept testing.

Unit 3: Design for manufacture, assembly, maintenance, Casting, forging.

Unit4: Design for Reliability, strength based reliability. Parallel and series systems, robust design.

Unit 5: Industrial design: Design for Emotion and experience, Introduction to retrofit and Eco design, Human behavior in design, Rapid Prototyping.

TEXT BOOKS:
1. George E Dieter, “Engineering Design”, McGraw Hill Company, 00.

2. Prashant Kumar, “Product Design, Creativity, Concepts and Usability”, Eastern Economy Edition, PHI New Delhi. 12.

REFERENCES:
1. Woodson T.T., “Introduction to Engineering Design”, McGraw Hill Book Company, 1966.
2. John J.C. “Design Methods”, Wiley Inter science, 1970.

3. Averill M. Law and W. David Kelton "Simulation, modelling and analysis", McGraw Hill Book Company, 1991.
4. Pahl, G.and W.Beitz, *Engineering Design–A Systematic Approach* – Springer, 2nd Ed.,1996.
5. Product Design and development Karl T. Ulrich, Steven Eppinger

M.Tech I Semester	L	T	P	C
	3	0	0	3

Design for Manufacturing and Assembly (20311T04)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes:
At the end of the course, the student should be able to
1. Understand the product development cycle
2. Know the manufacturing issues that must be considered in the mechanical engineering design process
3. Know the principles of assembly to minimize the assembly time
4. Know the effect of manufacturing process and assembly operations on the cost of product (not included by others)
5. Be familiar with tools and methods to facilitate development of manufactural mechanical Designs.

Syllabus Contents:
Unit 1: Introduction Need Identification and Problem Definition, Concept Generation and Evaluation.Embodiment Design, Selection of Materials and Shapes.

Unit 2: Properties of Engineering Materials, Selection of Materials – I, Selection of Materials – II,Case Studies – I, Selection of Shapes.Co-selection of Materials and Shapes, Case Studies – II.

Unit 3: Selection of Manufacturing Processes, Review of Manufacturing Processes, Design for Casting, Design for Bulk Deformation Processes, Design for Sheet Metal Forming Processes.Design for Machining, Design for Powder Metallurgy, Design for Polymer Processing, Co- selection of Materials and Processes, Case-Studies – III.

Unit 4: Design for Assembly, Review of Assembly Processes, Design for Welding – I, Design for Welding – II, Design for Brazing and Soldering. Design for Adhesive Bonding, Design for Joining of Polymers, Design for Heat Treatment, Case-Studies – IV

Unit 5: Design for Reliability, Failure Mode and Effect Analysis and Quality, Design for Quality. Design for Reliability, Approach to Robust Design, Design for Optimization,

TEXT BOOKS:
1. M F Ashby and K Johnson, Materials and Design - the art and science of material
selection in product design, Butterworth-Heinemann, 03.
2. G Dieter, Engineering Design - a materials and processing approach, McGraw Hill, NY, 00.

References:

1. M F Ashby, Material Selection in Mechanical Design, Butterworth-Heinemann, 1999.
2. T H Courtney, Mechanical Behavior of Materials, McGraw Hill, NY, 00.
3. K G Swift and J D Booker, Process selection: from design to manufacture,

London:
Arnold,1997.
4. S S Rao, Engineering Optimization: theory and practice, John Wiley, NY, 1996.
5. G Boothroyd, P Dewhurst and W Knight, Product design for manufacture and assembly,
John Wiley, NY: Marcel Dekkar, 1994.
6. J G Bralla, Handbook for Product Design for Manufacture, McGraw Hill, NY, 1998.
7. Houldcroft, Which Process – an introduction to welding and related processes and guide to
their selection, Cambridge, Abington Pub., 1990.

M.Tech I Semester	L	T	P	C
	3	0	0	3

Mathematical Methods in Engineering(20311T05)

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. apply statistical techniques to analyze multivariate functions.
2. identify and solve engineering problems by applying the knowledge of ordinary and partial differential equations.
3. Identify nature of a given wave equation and solve by applying D'Alembert solution and/or method of solution of method of separation of variables.

Course Contents:

Unit 1 : Introduction to Probability Theory

Probability Theory and Sampling Distributions. Basic probability theory along with examples. Standard discrete and continuous distributions like Binomial, Poisson, Normal, Exponential etc. Central Limit Theorem and its significance. Some sampling distributions like 2, t, F.

Unit 2 : Testing of Statistical Hypothesis

Testing a statistical hypothesis, tests on single sample and two samples concerning means and variances.ANOVA: One – way, Two – way with/without interactions.

Unit 3 : Ordinary Differential Equations:

Ordinary linear differential equations solvable by direct solution methods. solvable nonlinear ,ODE's;

Unit 4: Partial Differential Equations and Concepts in Solution to Boundary Value Problems:

First and second order partial differential equations. Canonical forms.

Unit 5: Major Equation Types Encountered in Engineering and Physical Sciences

Solution methods for wave equation, D'Alembert solution, potential equation.Properties of harmonic functions, maximum principle, solution by variable separation method.

Text Books:

1. Ronald E, Walpole, Sharon L. Myers, Keying Ye, *Probability and Statistics for Engineers and Scientists* (8^{th} Edition), Pearson Prentice Hall, 07 (for Units I & II)
2. J. B. Doshi, *Differential Equations for Scientists and Engineers*, Narosa, New Delhi, 10 (for Units III & IV)

Reference Books:

1. Douglas C. Montgomery, *Design and Analysis of Experiments* (7^{th} Edition), Wiley Student Edition, 09.
2. S. P. Gupta, *Statistical Methods*, S. Chand & Sons, 37^{th} revised edition, 08
3. William W. Hines, Douglas C. Montgomery, David M. Goldsman,

Probability and Statistics for Engineering, (4^{th} Edition), Willey Student edition, 06.

4. Advanced Engineering Mathematics (9^{th} Edition), Erwin Kreyszig, Wiley India (13)

M.Tech I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Advanced Engineering Materials (20311T06)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes:
At the end of the course the student will

1. Demonstrate an understanding of mechanics, physical and chemical properties of materials including metals, ceramics, polymers and composites
2. Understand existence of imperfections and their effects on mechanical properties of materials and cause of failure
3. Demonstrate understanding of phase diagrams and their use in predicting phase transformation and microstructure
4. Understand and predict various types of failures using concept of fracture mechanics, creep and effect of impact
5. Know Electrical, Thermal, Optical and Magnetic Properties of metals, ceramics, polymers and composites
6. Understand the economic considerations in usage and recycling of materials in human
use.

Syllabus Contents:

Unit 1. Introduction, Atomic Structure, Interatomic Bonding and Structure of Crystalline solids: Historical perspective of Materials Science. Why study properties of materials? Classification of materials. Advanced Materials, Future materials and modern materials, Atomic structure. Atomic bonding in solids, Crystal structures, Crystalline and noncrystalline materials. Miller indices. Anisotropic elasticity. Elastic behavior of composites. Structure and properties of polymers. Structure and properties of ceramics.

Unit 2:
Phase Diagrams, Imperfections in Solids and Diffusions
Introduction to Phase Diagrams Equilibrium phase diagrams- The iron-carbon system. Phase transformations. Transformation rate effects and TTT diagrams. Microstructure and property changes in iron- carbon system Point defects. Theoretical yield point.Line defects and dislocations. Interfacial defects. Bulk or volume defects. Atomic vibrations; Diffusion mechanisms. Steady and non-steady state diffusion. Factors that influence diffusion Non-equilibrium transformation and microstructure.

Unit 3:
Mechanical Behaviour of Metals and Diffusion Mechanisms: Elastic deformation. Plastic deformation. Interpretation of tensile stress-strain curves Yielding under multiaxial stress. Yield criteria and macroscopic aspects of plastic deformation. Property variability and design factors, Dislocation and plastic deformation. Mechanisms of strengthening in metals. Recovery, recrystallization and grain growth. Strengthening by second phase particles. Optimum distribution

of particles. Lattice resistance to dislocation motion.Mechanical Strengthening Mechanisms- Particle strengthening by precipitation. Precipitation reactions. Kinetics of nucleation and growth. **Failure:** Fracture. Ductile and brittle fracture. Fracture mechanics. Impact fracture. Ductile brittle transition. Fatigue. Crack initiation and propagation. Crack propagation rate. Creep. Generalized creep behavior. Stress and temperature effects.

Unit 4:
Applications and Processing of Metals and Alloys, Polymers, Ceramics, and composites:
Types of metals and alloys. Fabrication of metals. Thermal processing of metals. Heat treatment. Precipitation hardening. Types and applications of ceramics. Fabrication and processing of ceramics, Mechanical behaviour of polymers.Mechanisms of deformation and strengthening of polymers. Crystallization, melting and glass transition. Polymer types. Polymer synthesis and processing, Particle reinforced composites. Fibre reinforced composites. Structural composites.

Unit 5.
Electrical, Thermal, Optical and Magnetic Properties and economic Considerations: Electrical conduction. Semi conductivity. Super conductivity. Electrical conduction in ionic ceramics and in polymers. Dielectric behaviour. Ferroelectricity. Piezoelectricity Heat capacity. Thermal expansion. Thermal conductivity. Thermal stresses Diamagnetism and Para magnetism. Ferromagnetism. Anti-ferromagnetism and ferrimagnetism.Influence of temperature on magnetic behaviour. Domains and Hysteresis,Basic concepts. Optical properties of metals. Optical properties of non-metals. Application of optical phenomena. Economic, Environmental and Social Issues of Material Usage - Economic considerations. Environmental and societal considerations. Recycling issues. Life cycle analysis and its use in design

TEXT BOOKS:
1.Materials Science and Engineering, William D. Callister, Jr, John Wiley & sons, 07
2.Modern Physical Metallurgy and Material Engineering, Science, Process, application, Smallman R.E., Bishop R J, Butterworth Heinemann, Sixth Ed., 1999.

REFERENCES:
1. Nano material by A.K. Bandyopadyay, New age Publishers.
2. Material science and Technology- Cahan.
3. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press.
4. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.

M.Tech I Semester	L	T	P	C
	3	0	0	3

Mechanics of Composite Materials (20311T07)

Course Outcomes:
The student should be able to
1. Student will be able to understand the basic concepts and difference between composite
materials with conventional materials.
2. Students will be able to understand role of constituent materials in defining the average
properties and response of composite materials on macroscopic level.
3. Students will be able to apply knowledge for finding failure envelopes and stress-strain
Plots of laminates.
4. Students will be able to develop a clear understanding to utilize subject knowledge using
computer programs to solve problems at structural level.

Syllabus Contents:

Unit 1.
Introduction
Definition and characteristics, Overview of advantage and limitations of composite materials, Significance and objectives of composite materials, Science and technology, current status and future prospectus, Basic Concepts and Characteristics- Structural performance of conventional material, Geometric and physical definition, Material response, Classification of composite materials, Scale of analysis; Micromechanics, Basic lamina properties, Constituent materials and properties, Properties of typical composite materials

Unit 2.
Elastic Behavior of Unidirectional Lamina
Stress-strain relations, Relation between mathematical and engineering constants.Transformation of stress, strain and elastic parameters.

Unit 3.Strength of Unidirectional Lamina
Micromechanics of failure; failure mechanisms, Macro-mechanical strength parameters, Macro- mechanical failure theories.Applicability of various failure theories.

Unit 4.
Elastic Behavior of Laminate
Basic assumptions, Strain-displacement relations, Stress-strain relation of layer within a laminate, Force and moment resultant.General load–deformation relations, Analysis of different types of laminates

Unit 5.
Stress and Failure Analysis of Laminates
Types of failures, Stress analysis and safety factors for first ply failure of symmetric laminates, Micromechanics of progressive failure.Progressive and ultimate laminate

failure,
Design methodology for structural composite materials.

TEXT BOOKS:

1. Isaac M. Daniels, Ori Ishai, “Engineering Mechaincs of Composite Materials”, Oxford
University Press, 1994.
2. Bhagwan D. Agarwal, Lawrence J. Broutman, “Analysis and Performance of fiber composites”, John Wiley and Sons, Inc. 1990.

REFERENCES:

1. Mathews, F. L. and Rawlings, R. D., “Composite Materials: Engineering and Science”, CRC Press, Boca Raton, 03.
2. Madhujit Mukhopadhyay, “Mechanics of Composite Materials and Structures”, University Press, 04.
3. Mazumdar S. K., “Composaite Manufacturing – Materials, Product and Processing Engineering”, CRC Press, Boca Raton, 02.
4. Robert M. Jones, “Mechanics of Composite Materials”, Taylor and Francis, Inc., 1999.

M.Tech I Semester	L	T	P	C
	3	0	0	3

Analysis and Synthesis of Mechanisms (20311T08)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes:
At the end of the course:
1. To develop analytical equations describing the relative position, velocity and acceleration of all moving links.
2. To select, configure, and synthesize mechanical components into complete systems.
3. Use kinematic geometry to formulate and solve constraint equations to design linkages for specified tasks.
4. Formulate and solve four position synthesis problems for planar and spherical four-bar linkages by graphical and analytical methods.
5. Analyze and animate the movement of planar and spherical four-bar linkages.
6. Students will be able to apply modern computer-based techniques in the selection, analysis, and synthesis of components and their integration into complete mechanical systems.
7. Finally Students will demonstrate ability to think creatively, participate in design challenges, and present logical solutions.

Syllabus Contents:

Unit 1
Basic Concepts; Definitions and assumptions; planar and spatial mechanisms; kinematic pairs;degree of freedom; equivalent mechanisms; Kinematic Analysis of Planar Mechanisms. Review of graphical and analytical methods of velocity and acceleration analysis of kinematically simple mechanisms.Velocity-acceleration, analysis of complex mechanisms by the normal acceleration and auxiliary-point methods.

Unit 2
Curvature Theory: Fixed and moving centrodes, inflection circle, Euler-Savary equation, Bobillier constructions.Cubic of stationary curvature, Ball's point, Applications in dwell mechanisms.

Unit 3
Kinematic Synthesis of planar mechanisms, accuracy (precision) points, Chebesychev spacing, types of errors, Graphical synthesis for function generation and rigid body guidance with two, three and four accuracy points using pole method, centre and circle point curves, Analytical synthesis of four-bar and slider-crank mechanisms.

Unit 4
Freudenstein's equation, synthesis for four and five accuracy points, compatibility condition, synthesis of four-bar for prescribed angular velocities and accelerations using complex numbers, three accuracy point synthesis using complex numbers.Coupler Curves : Equation of coupler curve, Robert-Chebychev theorem, double points and symmetry.

Unit 5

Kinematic Analysis of Spatial Mechanisms, Denavit-Hartenberg parameters.Matrix method of analysis of spatial mechanisms.

TEXT BOOKS:

1.R.S. Hartenberg and J. Denavit, “Kinematic Synthesis of Linkages”, McGraw-Hill, New York, 1980.
2.Robert L.Nortan ,"Design of Machinery',Tata McGraw Hill Edition.

REFERENCES:

1.Hamilton H.Mabie,"Mechanisms and Dynamics of Machinery",John Wiley and sons New York
2.S.B.Tuttle,"Mechanisms for Engineering Design" John Wiley and sons New York
3.A. Ghosh and A.K. Mallik, “Theory of Machines and Mechanisms”, Affiliated East-West Press, New Delhi, 1988.
4.A.G. Erdman and G.N. Sandor, “Mechanism Design – Analysis and Synthesis”, (Vol. 1 and 2), Prentice Hall India, 1988.
5. A.S. Hall, “Kinematics and Linkage Design”, Prentice Hall of India.
6.J.E. Shigley and J.J. Uicker, “Theory of Machines and Mechanisms”, 2nd Edition, McGraw-Hill, 1995.

M.Tech I Semester	**L**	**T**	**P**	**C**
	0	**0**	**4**	**2**

Lab –I (18311L11) and Lab-II (20311L12)

Course Outcomes:
At the end of the course:
1. Students will be able to use various experimental techniques relevant to the subject.
2. Students will acquire hands on experience on the various test-rigs, Experimental set up.
3. Students will be able to function as a team member
4. Students will develop communication skills.
5. Students will be able to write technical reports.
6. Students will be able to use different software's.

Syllabus Contents:
The lab practice consists of experiments, tutorials and assignments decided by the course supervisors of the program core courses and program specific elective courses.

Lab-1: Machine dynamics lab

EXPERIMENTS:
1. Determination of damped natural frequency of vibration of the vibrating system with different viscous oils
2. Determination of steady state amplitude of a forced vibratory system
3. Static balancing using steel balls & Determination of the magnitude and orientation of the balancing mass in dynamic balancing
4. Field balancing of the thin rotors using vibration pickups.
5. Determination of the magnitude of gyroscopic couple, angular velocity of precession, and representation of vectors.
6. Determination of natural frequency of given structure using FFT analyzer
7. Diagnosis of a machine using FFT analyzer.
8. .Direct kinematic analysis of a robot
9. Inverse kinematic analysis of a robot
10 An experiment on friction, wear, pin-on-disc
11. An experiment on stress intensity factors / fatigue, fracture
12. Modal analysis of beams and plates

Lab-2: Numerical Simulation lab

Introduction to MATLAB and practice, Practice session on handling basic arithmetic etc, Writing codes with control loops, functions and scripts, Developing codes for visualization and plotting, Solving problems involving linear and nonlinear equations, Solving problems involving curve fitting and interpretations, Solving problems involving ordinaryal equation and partial differential equations, Solving case studies and working on projects

M.Tech I Semester	L	T	P	C
	2	0	0	2

Research Methodology and IPR (20311T09)

Teaching Scheme
Lectures: 1hrs/week
Course Outcomes:

At the end of this course, students will be able to

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Syllabus Contents:

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2: Effective literature studies approaches, analysis Plagiarism, Research ethics,

Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction".

REFERENCES:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall , "Industrial Design", McGraw Hill, 1992
4. Niebel , "Product Design", McGraw Hill, 1974.
5. Asimov , "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
7. T. Ramappa, "Intellec tual Property Rights Under WTO", S. Chand, 2008

M.Tech II Semester	L	T	P	C
	3	0	0	3

Finite Element Method(20312T01)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes:

At the end of the course,
For one and two dimensional, linear, static and dynamic problems in Structural Mechanics and Heat Transfer, the student will be able to demonstrate the learning outcomes as mentioned below:

1.The student will be able to classify a given problem on the basis of its dimensionality as 1-D, 2-D, or 3-D, time-dependence as Static or Dynamic, Linear or Non-linear.
2.The students will be able to develop system level matrix equations from a given mathematical model of a problem following the Galerkin weighted residual method or principle of stationary potential.
3. The student will be able to state three sources of errors in implementing FEM and suggest remedies to minimize the same for a given problem, viz. Modeling errors, Approximation errors, and numerical errors.
4. The student will be able to obtain consistent and lumped mass matrices for axial vibration of bars and transverse vibration of beams and obtain fundamental frequency of natural vibration using the methods mentioned in the curricula.
5.The students will be able use MATLAB for implementation of FEM to obtain elongations at nodes of a bar subjected to traction and concentrated loads and prescribed boundary conditions
6.The students will be able to use commercial software like ANSYS or ABAQUS for implementation of FEM to obtain stress concentration due to a small hole in a rectangular plate subjected to traction on edges and concentrated loads at points on the edges and prescribed boundary conditions.

Syllabus Contents:

Unit 1: Introduction, Classification of problems – Dimensionality, time dependence, Boundary Value problems, Initial value problems, Linear/Non-linear, etc,Differential equation as the starting point for FEM, steps in finite element method,discretization, types of elements used, Shape functions, Linear Elements, Local and Global coordinates, Coordinate transformation and Gauss-Legendre scheme of numerical integration, Nodal degrees of freedom,

Unit 2: Finite element formulation, variational, weighted residual and Virtual work methods.

Unit 3: 1-D and 2-D problems from Structural Mechanics – Bar, Beam, Plane stress and plane strain problems.Axisymmetric problems – Axi-symmetric forces and geometry.

Unit 4: computer implementation, higher order elements,Iso-parametric formulation,

Unit 5: Eigen-value problems, Natural vibration of bars and beams,Methods to find eigen-values and eigen-vectors.

TEXT BOOKS:

1.Chandrupatla and Belegundu "Introduction to Finite Elements in Engineering",Prentice Hall of India Pvt. Ltd. New Delhi, Ed.4, 11.
2. Logan Deryl L., "A First Course in Finite Element Method", Thomson Brook/Cole,5th Ed.12.

REFERENCES:

1. Cook R.D. "Concepts and applications of finite element analysis" Wiley, New York, 4thEd. 02.
2. Reddy J N, "Finite element Method", Tata McGraw Hill publishing Co Ltd, New Delhi, 3rdEd., 05
3. Bathe K.J., Cliffs, N.J. "Finite Element Procedures in Engineering Analysis", PHI Learning, Eastern Economy Editions, 09.

M.Tech II Semester	L	T	P	C
	3	0	0	3

Computer Aided Design (20312T02)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes:

At the end of the course:

1. Have a conceptual understanding of the principles of CAD systems, the implementation of these principles, and its connections to CAM and CAE systems.
2. Understand 2D, 3D transformations and projection transformations
3. Get knowledge of various approaches of geometric modeling
4. Understand mathematical representation of 2D and 3D entities
5. Understand basic fundamentals of FEM

Syllabus Contents:

Unit 1: CAD Hardware and Software, Types of systems and system considerations, input and output devices, hardware integration and networking, hardware trends, Software modules,Computer Communications, Principle of networking, classification networks, network wring, methods, transmission media and interfaces, network operating systems,

Unit 2: Computer Graphics Introduction, transformation of geometric models: translation, scaling, reflection, rotation, homogeneous representation.Concatenated transformations; mappings of geometric models, translational mapping rotational mapping, general mapping, mappings as changes of coordinate system; inverse transformations and mapping.

Unit 3 : Projections of geometric models, orthographic projections, Geometric Modeling, curve representation.Parametric representation of analytic curves, parametric representation of synthetic curves, curve manipulations. Surface representation.

Unit 4 : Fundamentals of solid modeling, boundary representation (B-rep), Constructive Solid Geometry (CSF), sweep representation.Analytic Solid Modeling (ASM), other representations; solid manipulations, solid modeling based applications: mass properties calculations, mechanical tolerancing, etc.

Unit 5: Finite Element Modeling and Analysis, Finite Element Analysis, finite element modeling, mesh generation mesh requirements, semiautomatic methods, fully automatic methods, design and engineering applications.System Simulation, Need of simulation, areas of applications, when simulation is appropriate tool / not appropriate, concept of a system, components of a system, discrete and continuous systems, model of a system, types of models, types of simulation approaches.

TEXT BOOKS:

1. Ibrahbim Zeid, “CAD / CAM Theory and Practice”.
2. Jim Browne, “Computer Aided Engineering and Design”.

REFERENCES:

1 P. Radhakrishnan / V. Raju / S. Subramanyam, “CAD / CAM / CIM”.
2. P.N. Rao, “CAD / CAM principles and applications”, Tata Mcraw-Hill, 02.
3. Rogers / Adams, “Mathematical Elements for Computer Graphics”.
4. Rooney and Steadman, “Principles of Computer Aided Design”, Aug. 1993.
5. Jerry Banks / John Carson / Barry Nelson / David Nicol, “Discrete-Event System Simulation”

M.Tech II Semester	L	T	P	C
	3	0	0	3

Tribology in Design (20312T03)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes:

At the end of the course:

1. The students will be able to apply theories of friction and wear to various practical situations by analysing the physics of the process.
2. They will understand the various surface measurement techniques and effect of surface texture on Tribological behavior of a surface.
3. They will be able to select materials and lubricants to suggest a tribological solution to a particular situation.
4. The students will be able to design a hydrodynamic bearing using various bearing charts.
5. The students will be able to understand the recent developments in the field and understand modern research material.

Syllabus Contents:

Unit 1: Friction, theories of friction, Friction control, Surface texture and measurement, genesis of friction, instabilities and stick-slip motion.Wear, types of wear, theories of wear, wear prevention.

Unit 2: Tribological properties of bearing materials and Lubricants.

Unit 3: Lubrication, Reynolds's equation and its limitations, idealized bearings, infinitely long plane pivoted and fixed show sliders, infinitely long and infinitely short (narrow) journal bearings.Lightly loaded infinitely long journal bearing (Petroff's solution), Finite Bearings, Design of hydrodynamic journal bearings.

Unit 4: Hydrostatic, squeeze film Circular and rectangular flat plates,Variable and alternating loads, piston pin lubrications, application to journal bearings.

Unit 5: Elasto-hydrodynamic lubrication – pressure viscosity term in Reynolds's equation, Hertz' theory, Ertel-Grubin equation.Lubrication of spheres, gear teeth and rolling element bearings, Air lubricated bearings, Tilting pad bearings.

TEXT BOOKS:

1. Cameron, "Basic Lubrication Theory", Ellis Horwood Ltd, 1981.
2. Principles in Tribology, Edited by J. Halling, 1975.

REFERENCES:

1. Fundamentals of Fluid Film Lubrication – B. J. Hamrock, McGrawHill International,1994
2. D.D. Fuller, "Theory and Practice of Lubrication for Engineers", John Wiley and Sons,1984.
3. "Fundamentals of Friction and wear of Materials" American Society of Metals.
4. Introduction to Tribology of Bearings –B. C. Majumdar, A. H. Wheeler &co.pvt. ltd1985.
5. T.A. Stolarski, "Tribology in Machine Design".

M.Tech II Semester	L	T	P	C
	3	0	0	3

Robotics (20312T04)

Ting Scheme
Lectures: 3 hrs/week
Course Outcomes:
At the end of the course students will be able to
1. understand basic terminologies and concepts associated with Robotics and Automation
2. Demontrate comprehension of various Robotic sub-systems
3. Understand kinematics and dynamics to explain exact working pattern of robots
4. Aware of the associated recent updates in Robotics.

Syllabus Contents

Unit 1:
Introduction, Basic Concepts such as Definition, three laws, DOF, Misunderstood devices etc., Elements of Robotic Systems i.e. Robot anatomy, Classification, Associated parameters i.e. resolution, accuracy, repeatability, dexterity, compliance, RCC device, etc. Automation - Concept, Need, Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations, introduction to automation productivity.

Unit 2 Robot Grippers:
Types of Grippers , Design aspect for gripper, Force analysis for various basic gripper system.Sensors for Robots:- Characteristics of sensing devices, Selections of sensors, Classification and applications of sensors. Types of Sensors, Need for sensors and vision system in the working and control of a robot.

Unit 3 Drives and control systems: Types of Drives, Actuators and its selection while designing a robot system. Types of transmission systems,Control Systems -Types of Controllers, Introduction to closed loop control Control Technologies in Automation:- Industrial Control Systems, Process Industries Verses Discrete-Manufacturing Industries, Continuous Verses Discrete Control, Computer Process and its Forms. Control System Components such as Sensors, Actuators and others.

Unit 4 Kinematics:. Transformation matrices and their arithmetic, link and joint description, Denavit – Hartenberg parameters, frame assignment to links, direct kinematics, kinematics redundancy, kinematics calibration, inverse kinematics, solvability, algebraic and geometrical methods. Velocities and Static forces in manipulators:- Jacobians, singularities, static forces, Jacobian in force domain. **Dynamics-**
Introduction to Dynamics , Trajectory generator.

Unit 5 Machine Vision System: Vision System Devices, Image acquisition, Masking, Sampling and quantisation, Image Processing Techniques, Noise reduction methods, Edge detection, Segmentation.Robot Programming :- Methods of robot programming, lead through programming, motion interpolation, branching capabilities, WAIT, SIGNAL and DELAY commands, subroutines, Programming Languages: Introduction to various types such as RAIL and VAL II etc, Features of type and development of languages for recent robot systems.

TEXT BOOKS:

1. John J. Craig, Introduction to Robotics (Mechanics and Control), Addison-Wesley,2nd Edition, 04
2. Mikell P. Groover et. Al., Industrial Robotics: Technology, Programming and Applications, McGraw – Hill International, 1986.

REFERENCE :

1. S h i m o n Y. Nof , Handbook of Industrial Robotics , John Wiley Co, 01.
2. Automation, Production Systems and Computer Integrated Manufacturing, M.P. Groover, Pearson Education.
3. Industrial Automation: W.P. David, John Wiley and Sons.
4. Richard D. Klafter , Thomas A. Chemielewski, Michael Negin, Robotic Engineering An Integrated Approach , Prentice Hall India, 02.
5. Handbook of design, manufacturing & Automation: R.C. Dorf, John Wiley and Sons.

M.Tech II Semester	L	T	P	C
	3	0	0	3

Fracture Mechanics (20312T05)

Timing Scheme
Lectures: 3 hrs/week
Course Outcomes:
At the end of the course:

1. Students will be able to use any one of the four parameters for finding out damage tolerance: stress intensity factor, energy release rate, J integral, Crack tip opening displacement.
2. Students will be able to manage singularity at crack tip using complex variable.
3. Students will understand important role played by plastic zone at the crack tip.
4. Students will learn modern fatigue and will able to calculate the fatigue life of a component with or without crack in it.
5. Students will learn modern sophisticated experimental techniques to determine fracture toughness and stress intensity factor.

Syllabus

Unit 1: Modes of fracture failure, Brittle and Ductile fracture,

Unit 2: Energy release rate: crack resistance, stable and unstable crack growth.Stress intensity factor: Stress and displacement fields, edge cracks, embedded cracks.

Unit 3: Crack tip plasticity: Shape and size of plastic zone, effective crack length, Effect of plate thickness, J-Integral. Crack tip opening displacement.

Unit 4: Test methods for determining critical energy release rate, critical stress intensity factor,and J-Integral.

Unit 5: Fatigue failure: Crack propagation, effect of an overload, crack closure, variable amplitude fatigue load.Environment-assisted cracking. Dynamic mode crack initiation and Growth, various crack detection techniques.

TEXT BOOKS:

1. Brook D, “Elementary engineering fracture mechanics”.
2. Liebowitz H., “Fracture” Volume I to VII.

References:

1. A Nadai, W. S. Hemp, “Theory of flow and fracture of solids”, McGraw Hill Book Company, 1950.

M.Tech II Semester	L	T	P	C
	3	0	0	3

Multi-body Dynamics (20312T06)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes: At the end of this course, the students will be able to:
1. Derive equations of motion for interconnected bodies in multi-body systems with three- dimensional motion.
2. Implement and analyze methods of formulating equations of motion for interconnected bodies.
3. Write programs to solve constrained differential equations for analyzing multi-body systems.
4. Simulate and analyze all types of static and dynamic behaviors of the multi-body systems including the kineto-static analysis.
5. Lead team projects in academic research or the industry that require modeling and simulation of multi-body systems.
6. Demonstrate an improved technical writing and presentation skills.

Syllabus Contents

Unit 1. Introduction:
The method of constraints for planar kinematic analysis. Revolute, prismatic, gear and cam pairs are considered together with other 2 degrees-of-freedom types of constraints.

Basic principles for analysis of mulyi-body systems:
The automatic assembly of the systems of equations for position, velocity and acceleration analysis. Iterative solution of systems of non linear equations. Geometry of masses. The principle of virtual work and Lagrange's equations.

Unit 2. Dynamics of Planar Systems:
Dynamics of planar systems. Systematic computation and assembly of mass matrix. Computation of planar generalized forces for external forces and for actuator-spring-damper element. Simple applications of inverse and forward dynamic analysis.
Numerical integration of first-order initial- value problems. The method of Baumgarte for the solution of mixed differential-algebraic equations of motion. The use of coordinates partitioning, QR and SVD decomposition for the orthogonalization of constraints.

Unit 3. Kinematics of rigid bodies in space:
Reference frames for the location of a body in space. Euler angles and Euler parameters. The formula of Rodrigues. Screw motion in space. Velocity, acceleration and angular velocity. Relationship between the angular velocity vector and the time derivatives of Euler parameters.

Unit 4. Kinematic analysis of spatial systems:
Basic kinematic constraints. Joint definition frames. The constraints required for the description in space of common kinematic pairs (revolute, prismatic, cylindrical, and

spherical). Equations of motion of constrained spatial systems.

Unit 5. Computation of Forces:
Computation of spatial generalized forces for external forces and for actuator-spring-damper element. Computation of reaction forces from Lagrange's multi- pliers.

TEXT BOOKS:

1. Wittenburg, J., *Dynamics of Systems of Rigid Bodies*, B.G. Teubner, Stuttgart, 1977.
2. Kane, T.R, Levinson, D.A., *Dynamics: Theory and Applications*, McGraw-Hill Book Co.,1985.

REFERENCES:

1 Nikravesh, P.E., *Computer Aided Analysis of Mechanical Systems*, Prentice-Hall Inc., Englewood Cliffs, NJ, 1988.
2. Roberson, R.E., Schwertassek, R., *Dynamics of Multibody Systems*, Springer-Verlag, Berlin, 1988.
3. Haug, E.J., *Computer-Aided Kinematics and Dynamics of Mechanical Systems-Basic Methods*, Allyn and Bacon, 1989.
4. Huston, R.L., *Multibody Dynamics*, Butterworth-Heinemann, 1990.
5. Schielen, W. *ed.*, *Multibody Systems Handbook*, Springer-Verlag, Berlin, 1990.
6. de Jalon, J.C., Bayo, E., *Kinematic and Dynamic Simulation of Multibody Systems*, Springer-Verlag, 1994.
7. Shabana, A.A., *Computational Dynamics*, John Wiley & Sons, 1994.
8. Why Do Multi-Body System Simulation?" by Rajiv Rampalli, Gabriele Ferrarotti & Michael Hoffmann, Published NAFEMS Publications, January 12
9."Principles of Dynamics" by Donald T. Greenwood, 2nd ed., Prentice Hall

M.Tech II Semester	L	T	P	C
	3	0	0	3

Optimization Techniques in Design ((20312T08)

Ting Scheme
Lectures: 3 hrs/week
Course Outcomes:
At the end of the course:
1. Students will know the principles of optimization.
2. Students will have knowledge of algorithms for design optimization
3. Students will be able to formulate an optimization problem.
4. Students should be able to find the optimum solution of their problems using optimization techniques.

Syllabus Contents:

Unit 1: Introduction to optimization, classification of optimisation problems. Classical optimization techniques,

Unit 2: Linear programming, simplex method and Duality in linear programming. Sensitivity or post-optimality analysis, Karmarkar's methods.

Unit 3: Non-Linear Programming: - One dimensional minimization. Unconstrained and constrained minimization, direct and indirect methods.

Unit 4:Geometric programming,Optimum design of mechanical elements like beams, columns and gears, shafts, etc.

Unit 5: Introduction to Genetic Algorithms, Operators and Applications to engineering optimization problems.

TEXT BOOKS:
1. S. S. Stricker, "Optimising performance of energy systems" Battelle Press, New York,1985.
2. R.C. Johnson, "Optimum Design of Mechanical Elements", Willey, New York, 1980.

REFERENCES:
1. J. S. Arora, "Introduction to Optimum Design", McGraw Hill, New York, 1989.
2. Kalyanmoy Deb, "Optimization for Engineering Design", Prentice Hall of India, New Delhi, 05
3. L.C.W. Dixon, "Non-Linear Optimisation - Theory and Algorithms", Birkhauser, Boston, 1980.
4. R.J. Duffin, E.L. Peterson and C.Zener "Geometric Programming-Theory and Applications", Willey, New York, 1967.

M.Tech II Semester

L	T	P	C
0	0	4	2

Lab – III ((18312L11) and Lab-IV (20312L12)

Course Outcomes:

At the end of the course:

1. Students will be able to use various experimental techniques relevant to the subject.
2. Students will acquire hands on experience on the various test-rigs, Experimental set up.
3. Students will be able to function as a team member
4. Students will develop communication skills.
5. Students will be able to write technical reports.
6. Students will be able to use different software's. **Syllabus Contents:**

Lab-III: Computer Aided Design lab

1. CAD Introduction.
2. Sketcher
3. Solid modeling –Extrude, Revolve, Sweep, etc and Variational sweep, Loft ,etc,
4. Surface modeling –Extrude, Sweep, Trim ..etc and Mesh of curves, Free form etc,
5. Feature manipulation – Copy, Edit, Pattern, Suppress, History operations etc,
6. Assembly-Constraints, Exploded Views, Interference check,
7. Drafting-Layouts, Standard & Sectional Views, Detailing & Plotting.
8. Exercises in Modeling and drafting of Mechanical Components – Assembly using Parametric and feature based Packages like PRO-E / SOLID WORKS /CATIA / NX etc.

Lab-IV : Simulation lab

1. Structural Analysis using any FEA Package for different structures that can be discretised with 1-D,2-D & 3-D elements
2. Static Analysis
3. Modal Analysis
4. Harmonic Analysis
5. Spectrum Analysis
6. Buckling Analysis
7. Analysis of Composites
8. Fracture mechanics

II. Thermal Analysis using any FEA Package for different structures that can be discretised with 1-D,2-D & 3-D elements

1. Steady state thermal analysis
2. Transient thermal analysis

III. Transient analysis using any FEA Package for different structures that can be discretised with 1-D,2-D & 3-D elements

IV. Prudent Design – a case study

M.Tech III Semester	L	T	P	C
	3	0	0	3

Advanced Finite Element Method (20313T01)

Ting Scheme
Lectures: 3 hrs/week

Course Outcomes:
At the end of the course, the students will be able to

1. Demonstrate understanding of FE formulation for linear problems in solid mechanics
2. Understand behaviour of elastic-plastic materials and visco-plasticity, Use of Newton- Raphson method for solving nonlinear equations of equilibrium
3. Understand flow rules and strain hardening, loading and unloading conditions, Drucker's stability postulates, J2 flow of theory of plasticity
4. Demonstrate use of FE formulation to solve the problems of large deformation of structures under loads
5. Able to solve contact problems oby using the techniques of non-linear FEM.

Syllabus Contents

Unit 1. Review of linear FEA:
FE formulation of 1D bar, 3D linear elastic continuum, 2D plane strain, plane stress, and axisymmetric elements; Iso-parametric mapping; numerical integration.

Unit 2. FE formulation for 1D plasticity:
Elastic-perfectly plastic material; Isotropic and kinematic hardening; Integration algorithms for 1D plasticity; FE formulation; Newton-Raphson method for solving nonlinear equilibrium equations;1D visco-plasticity and integration algorithm.

Continuum theories of plasticity:
Review of tensor algebra; Yield condition, flow rule and hardening rules; loading and unloading conditions; Drucker's stability postulates; Convexity and normality; J2 flow theory of plasticity and visco-plasticity, Gurson model.

Unit 3. FE procedures for 2D and 3D plasticity:
Integration algorithms for rate independent plasticity—explicit forward Euler and implicit backward Euler; Return mapping algorithm; visco-plasticity.FE formulation; Consistent linearization; Algorithmic and consistent tangent modulii; Treatment of incompressible deformation (Locking); B-bar method.

Unit 4. FE procedures for large deformation problems:
Continuum mechanics—deformation gradient, polar decomposition, Green-Lagrange strain, rate of deformation, Cauchy stress, P-K stresses, Balance laws; Principle of objectivity and isotropy. Constitutive equations for hyperelasticity;Neo-Hookean model; FE formulation—Total Lagrangian and updated Lagrangian descriptions; Tangent Stiffness Matrix. Introduction to finite strain plasticity.

U**nit 5. Contact Problems:**
Condition of impenetrability; Gap elements for modelling contact.Tangent stiffness matrix and force vectors for 2D frictionless contact problems.

TEXT BOOKS:

1) K. J. Bathe, Finite Element Procedures, Prentice-Hall of India Private Limited, New Delhi,1996
2) J. C. Simo and T. J. R. Hughes, Computational Inelasticity, Springer-Verlag New York, Inc., New York, 1998

REFERENCES:

1) O. C. Zienkiewicz and R. L. Taylor, Finite Element Method: Volume 2 Solid Mechanics, Fifth Edition, Butterworth-Heinemann, Oxford, 00
2) T. Belytschko and W. K. Liu and B. Moran, Nonlinear Finite Elements for Continua and Structures, John Wiley & Sons Ltd., England, 00
3) D. R. J. Owen and E. Hinton, Finite Elements in Plasticity: Theory and Practice, Pineridge Press Ltd., 00

M.Tech III Semester

L	T	P	C
3	0	0	3

ADVANCED METALLURGY (20313T02)

Ting Scheme
Lectures: 3 hrs/week
Course Outcomes: At the end of the course, the students will be able to:

1. Demonstrate understanding of various aspects of crystal and lattice structure and their imperfection
2. Understand importance of equilibrium diagrams and their uses in developing materials
3. Understand the process of heat treatment of different nonferrous alloys and tool steel and decide a heat treatment to acquire their desired properties
4. Demonstrate acquisition of knowledge of composites, ceramics, orthodontal and bio- materials.

Syllabus Contents:

Unit 1. Aspects of Physical Metallurgy: Crystal structure, systems and Barvias lattices, Indexing of lattice planes (Miller's Indices), Indexing of lattice directions.Co-ordination Number (Ligency), Density calculations and imperfections in crystals.

Unit 2. Study of Equilibrium diagrams for Fe-C systems, Cu - Bronze alloys i.e. Cu:Zn, Cu:Sn, Cu:Al etc., Developments in metallic materials like HSLA state, maraging steels, dual phased steels, creep resisting steels, materials for high and low temperature applications, Nimerics, Inconels, Haste Alloys etc., Al, Ni alloys, Ti, Mg alloys.Heat Treatment of Nonferrous alloys, Heat Treatment of Tool steels

Unit 3. Orthodental materials, Bio material, Prosthetic materials. Nano materials, super conducting materials, sports materials.

Unit 4. Composites, ceramics, cermets.Shape memory alloys their manufacturing techniques, advantages and limitations.

Unit 5. Surface coatings and their tribological aspects. PVD, CVD, IVD ion implantation method.

TEXT BOOKS:

1. Engineering Metallurgy, R. A. Higgins, Viva Books Pvt. Ltd.
2. Elements of Material Science and Engineering, Lawrence H., Van Vlack Addison- Wesley Publishing Company

Reference Books

1. Principles of Material Science and Engineering, William F. Smith, McGraw-Hill Book
2. Material Science, R. B. Gupta, Satya Publications, New Delhi.
3. A Text Book of Material Science and Metallurgy, O. P. Khanna, Dhanpat Rai and Sons, New Delhi.

M.Tech III Semester	L	T	P	C
	3	0	0	3

OPEN ELECTIVES
Business Analytics (20313T03)

Teaching scheme

Lecture: - 3 h/week
Course objective
1.Understand the role of business analytics within an organization.
2.Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3.To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4.To become familiar with processes needed to develop, report, and analyze business data.
5.Use decision-making tools/Operations research techniques.
6.Mange business process using analytical and management tools.
7.Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Syllabus Contents:
Unit 1: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.
Unit 2: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel,Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.
Unit 3: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical
Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit-5

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.Recent Trends in : Embedded and collaborative business intelligence, Visual data
recovery, Data Storytelling and Data journalism.

COURSE OUTCOMES:

1. Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
4. Students will demonstrate the ability to translate data into clear, actionable insights.

TEXT BOOKS:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara
G.Schniederjans, Christopher M. Starkey, Pearson FT Press.

2. Business Analytics by James Evans, persons Education.

M.Tech III Semester

L	T	P	C
3	0	0	3

OPEN ELECTIVES
INDUSTRIAL SAFETY (20313T04)

Teaching Scheme
Lecture: - 3 h/week
Syllabus Contents

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance,Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, Draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance.Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

TEXT BOOKS:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

REFERENCE:

1. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

M.Tech III Semester

L	T	P	C
3	0	0	3

OPEN ELECTIVES
OPERATIONS RESEARCH (20313T05)

Teaching Scheme
Lectures:3hrs/week

Course Outcomes: At the end of the course, the student should be able to

1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it.

Unit 1:
Optimization Techniques, Model Formulation, models, General L.R Formulation. Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2
Formulation of a LPP - Graphical solution revised simplex method.
Duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit 3:
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem. Max flow problem - CPM/PERT

Unit 4
Scheduling and sequencing - single server and multiple server models.
Deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5
Competitive Models,Single and Multi-channel Problems, Sequencing Models.
Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

TEXT BOOKS:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

REFERENCE:

1. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
2. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
3. Pannerselvam, Operations Research: Prentice Hall of India 2010
4. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

M.Tech III Semester	L	T	P	C
	3	0	0	3

Open Elective
COST MANAGEMENT OF ENGINEERING PROJECTS (20313T06)

Teaching scheme
Lecture: - 3 h/week

Introduction and Overview of the Strategic Cost Management Process

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

TEXT BOOKS:

1.Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi.
2.Charles T. Horngren and George Foster, Advanced Management Accounting.

REFERENCES:

1. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting.
2.Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher.
3.N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

M.Tech III Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Open Elective
COMPOSITE MATERIALS (20313T07)

Syllabus

UNIT–I: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix.Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements.Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method,Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure.
Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

REFERENCES:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W.Tasi

M.Tech III Semester

L	T	P	C
3	0	0	3

Open Elective

WASTE TO ENERGY (20313T08)
SYLLABUS

Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue.Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application.Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation. Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors.Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion -Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

M.Tech III Semester

L	T	P	C
0	0	20	10

Dissertation (Phase-I) (20313P08)	
Ting Scheme Lectures: hr/week	

Course Outcomes:
At the end of the course:

1. Students will learn to survey the relevant literature such as books, national/international refereed journals and contact resource persons for the selected topic of research.
1. Students will be able to use different experimental techniques.
2. Students will be able to use different software/ computational/analytical tools.
3. Students will be able to design and develop an experimental set up/ equipment/test rig.
4. Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.
5. Students will be able to either work in a research environment or in an industrial environment.

Syllabus Contents:

The Project Work will start in semester III and should preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution. Seminar should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M. Tech. The examination shall consist of the preparation of report consisting of a detailed problem statement and a literature review. The preliminary results (if available) of the problem may also be discussed in the report. The work has to be presented in front of the examiners panel set by Head and PG coordinator. The candidate has to be in regular contact with his guide and the topic of dissertation must be mutually decided by the guide and student.

M.Tech IV Semester

L	T	P	C
0	0	32	32

Dissertation (Phase- II)
(20314P01)

Ting Scheme Practical Hours: 32 per week	

Course Outcomes:
At the end of the course:

1. Students will develop attitude of lifelong learning and will develop interpersonal skills to deal with people working in diversified field will.
2. Students will learn to write technical reports and research papers to publish at national and international level.
3. Students will develop strong communication skills to defend their work in front of technically qualified audience.

Syllabus Contents:
It is a continuation of Project work started in semester III. He has to submit the report in prescribed format and also present a seminar. The dissertation should be presented in standard format as provided by the department. The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion. The report must bring out the conclusions of the work and future scope for the study. . The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a guide, co-guide etc. as decided by the Head and PG coordinator. The candidate has to be in regular contact with his guide.

M.Tech I & II Semester

L	T	P	C
2	0	0	0

AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING (20311T10) & (20312T09)

Course objectives:
Students will be able to:
1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title

Ensure the good quality of paper at very first-time submission

Syllabus

Units	CONTENTS	Hours
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

SUGGESTED STUDIES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge

University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

M.Tech I & II Semester

L	T	P	C
2	0	0	0

AUDIT 1 and 2: DISASTER MANAGEMENT (20311T10) & (20312T09)

Course Objectives: -Students will be able to: 1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response. 2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives. 3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations. 4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in		
Syllabus		
Uni Ts	**CONTENTS**	**Hours**
1	**Introduction** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	**Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	**Disaster Prone Areas In India** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4

4	**Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5	**Risk Assessment** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival. Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation.	4

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

M.Tech I & II Semester	L	T	P	C
	2	0	0	0

AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE (20311T10) & (20312T09)

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.

Syllabus:

Unit	***Content***	***Hours***
1	• Alphabets in Sanskrit, • Past/Present/Future Tense, • Simple Sentences	8
2	• Order • Introduction of roots • Technical information about Sanskrit Literature	8
3	• Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Suggested reading

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delh.

2. Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Sansthanam, New Delhi Publication.

3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

M.Tech I & II Semester

L	T	P	C
2	0	0	0

AUDIT 1 and 2: VALUE EDUCATION
(20311T10) & (20312T09)

Course Objectives :
Students will be able to
1.Understand value of education and self- development

2. Imbibe good values in students

3. Let the should know about the importance of character

Syllabus

Unit	*Content*	*Hours*
1	• Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. • Moral and non- moral valuation. Standards and principles. • Value judgements	4
2	• Importance of cultivation of values. • Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. • Honesty, Humanity. Power of faith, National Unity. • Patriotism.Love for nature ,Discipline	6
3	• Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. • Punctuality, Love and Kindness. • Avoid fault Thinking. • Free from anger, Dignity of labour. • Universal brotherhood and religious tolerance. • True friendship. • Happiness Vs suffering, love for truth. • Aware of self-destructive habits. • Association and Cooperation. • Doing best for saving nature	6
4	• Character and Competence –Holy books vs Blind faith. • Self-management and Good health. • Science of reincarnation. • Equality, Nonviolence ,Humility, Role of Women. • All religions and same message. • Mind your Mind, Self-control. • Honesty, Studying effectively	6

Suggested reading

1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University
Press, New Delhi

Course outcomes

Students will be able
to

1.Knowledge of self-development

2.Learn the importance of Human values

M.Tech I & II Semester	L	T	P	C
	2	0	0	0

AUDIT 1 and 2: CONSTITUTION OF INDIA
(20311T10) & (20312T09)

Course Objectives:
Students will be able to:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

Syllabus

Units	Content	Hours
1	• **History of Making of the Indian Constitution:** • History • Drafting Committee, (Composition & Working)	4
2	• **Philosophy of the Indian Constitution:** • Preamble • Salient Features	4
3	• **Contours of Constitutional Rights & Duties:** • Fundamental Rights • Right to Equality • Right to Freedom • Right against Exploitation • Right to Freedom of Religion • Cultural and Educational Rights • Right to Constitutional Remedies • Directive Principles of State Policy • Fundamental Duties.	4
4	• **Organs of Governance:**	4
	• Parliament • Composition • Qualifications and Disqualifications • Powers and Functions • Executive • President • Governor	

5	• **Local Administration:** • District's Administration head: Role and Importance, • Municipalities: Introduction, Mayor and role of Elected Representative, CEO • of Municipal Corporation. • Pachayati raj: Introduction, PRI: Zila Pachayat. • Elected officials and their roles, CEO Zila Pachayat: Position and role. • Block level: Organizational Hierarchy (Different departments), • Village level: Role of Elected and Appointed officials, • Importance of grass root democracy • **Election Commission:** • Election Commission: Role and Functioning. • Chief Election Commissioner and Election Commissioners. • State Election Commission: Role and Functioning. • Institute and Bodies for the welfare of SC/ST/OBC and women.	4

SUGGESTED READING

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

COURSE OUTCOMES:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

M.Tech I & II Semester

L	T	P	C
2	0	0	0

AUDIT 1 and 2: PEDAGOGY STUDIES
(20311T10) & (20312T09)

Course Objectives:

Students will be able to:

4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

Syllabu

Units	Conten	Hours
1	• **Introduction and Methodology:** • Aims and rationale, Policy background, Conceptual framework and terminology • Theories of learning, Curriculum, Teacher education. • Conceptual framework, Research questions. • Overview of methodology and Searching.	4
2	• Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. • Curriculum, Teacher education.	2
3	• Evidence on the effectiveness of pedagogical practices • Methodology for the in depth stage: quality assessment of included studies. • How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? • Theory of change. • Strength and nature of the body of evidence for effective pedagogical practices. • Pedagogic theory and pedagogical approaches. • Teachers' attitudes and beliefs and Pedagogic strategies.	4
4	• Professional development: alignment with classroom practices and follow- up support • Peer support • Support from the head teacher and the community. • Curriculum and assessment • Barriers to learning: limited resources and large class sizes	4

5	• **Research gaps and future directions** • Research design • Contexts • Pedagogy • Teacher education • Curriculum and assessment • Dissemination and research impact.	2

SUGGESTED READING

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

COURSE OUTCOMES:

Students will be able to understand:

1.What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

2.What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?

3.How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

M.Tech I & II Semester

L	T	P	C
2	0	0	0

AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA
(20311T10) & (20312T09)

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

Unit	*Content*	*Hours*
1	• Definitions of Eight parts of yog. (Ashtanga)	8
2	• Yam and Niyam. • Do`s and Don't's in life. • i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	8
3	• Asan and Pranayam • i) Various yog poses and their benefits for mind & body ii)Regularization of breathing techniques and its effects- Types of pranayam	8

Suggested reading

1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur

2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also

2. Improve efficiency

M.Tech I & II Semester	L	T	P	C
	2	0	0	0

AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (20311T10) & (20312T09)

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Syllabus

Unit	Content	Hours
1	• Neetisatakam-Holistic development of personality • Verses- 19,20,21,22 (wisdom) • Verses- 29,31,32 (pride & heroism) • Verses- 26,28,63,65 (virtue) • Verses- 52,53,59 (dont's) • Verses- 71,73,75,78 (do's)	8
2	• Approach to day to day work and duties. • Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, • Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17,23, 35, • Chapter 18-Verses 45, 46, 48.	8
3	• Statements of basic knowledge. • Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 • Chapter 12 -Verses 13, 14, 15, 16,17, 18 • Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, • Chapter 4-Verses 18, 38,39 • Chapter18 – Verses 37,38,63	8

SUGGESTED READING

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata

2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,Rashtriya Sanskrit Sansthanam, New Delhi.

COURSE OUTCOMES

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life

2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity

3. Study of Neetishatakam will help in developing versatile personality of students.

M. Tech: POWER ELECTRONICS AND DRIVES

COURSE STRUCTURE

I Year, Semester – I

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20211T01	PCC	Mathematical Modeling of Machines	3	-	-	3	3
2	20211T02	PCC	Analysis of power Electronic Converters	3	-	-	3	3
3	20211T03	PCC	Power Electronic Control of DC Drives	3	-	-	3	3
4	20211T04	PCC	Digital Signal processing	3	-	-	3	3
5	20211T05	HSMC	Research Methodology & IPR	3	-	-	3	3
6	20211L06	PCC	Simulation of Electrical Machines and Converters	-	-	6	6	3
							Total number of credits	**18**

I Year, Semester – II

<table>
<tr><th rowspan="2">S.No</th><th rowspan="2">Course Code</th><th rowspan="2">Course Category</th><th rowspan="2">Course Title</th><th colspan="3">Hours per week</th><th rowspan="2">Total Contact Hours</th><th rowspan="2">Credits</th></tr>
<tr><th>Lecture</th><th>Tutorial</th><th>Practical</th></tr>
<tr><td>1</td><td>20212T01</td><td>PCC</td><td>Power Electronic Control of AC Drives</td><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td></tr>
<tr><td>2</td><td>20212T02</td><td>PCC</td><td>Advanced Power Electronic Converters</td><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td></tr>
<tr><td colspan="4">Professional Elective-I</td><td rowspan="4">3</td><td rowspan="4">-</td><td rowspan="4">-</td><td rowspan="4">3</td><td rowspan="4">3</td></tr>
<tr><td rowspan="3">3</td><td>20212T03</td><td rowspan="3">PEC</td><td>Renewable Energy Sources</td></tr>
<tr><td>20212T04</td><td>Special Electrical Machines</td></tr>
<tr><td>20212T05</td><td>Digital Control Systems</td></tr>
<tr><td colspan="4">Professional Elective-II</td><td rowspan="4">3</td><td rowspan="4">-</td><td rowspan="4">-</td><td rowspan="4">3</td><td rowspan="4">3</td></tr>
<tr><td rowspan="3">4</td><td>20212T06</td><td rowspan="3">PEC</td><td>Smart Grids</td></tr>
<tr><td>20212T07</td><td>Flexible AC Transmission Systems</td></tr>
<tr><td>20212T08</td><td>Optimization Techniques</td></tr>
<tr><td>5</td><td>20212L09</td><td>PCC</td><td>Electric Drives Lab</td><td>-</td><td>-</td><td>6</td><td>6</td><td>3</td></tr>
<tr><td>6</td><td>20212P10</td><td>P</td><td>Mini Project with Seminar</td><td>-</td><td>-</td><td>6</td><td>6</td><td>3</td></tr>
<tr><td colspan="8">Total number of credits</td><td>18</td></tr>
</table>

II Year, Semester – III

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20213T01	PCC	Digital Control of Drives	3	-	-	3	3
Professional Elective-III								
2	20213T02	PEC	Embedded Systems	3	-	-	3	3
	20213T03		VLSI Design					
	20213T04		Image Processing					
3	20213T03	PROJ	Phase – I Dissertation	-	-	-	20	10
Total number of credits								**16**

II Year, Semester – IV

S.No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20214P01	PROJ	Phase – II Dissertation	-	-	-	32	16
Total number of credits								**16**

M.Tech I Semester

L	T	P	C
3	0	0	3

20211T01 MATHEMATICAL MODELING OF MACHINES

Unit-I

Basic Concepts of Rotating Machines-Calculation of air gap mmf and per phase machine inductance using physical machine data; Voltage and torque equation of dc machine.

UNIT – 2: Basic concepts of Modeling

Basic Two-pole Machine representation of Commutator machines, 3-phase synchronous machine with and without damper bars and 3-phase induction machine, Kron's primitive Machinevoltage, current and Torque equations.

UNIT – 3: DC Machine Modeling

Mathematical model of separately excited D.C motor – Steady State analysis-Transient State analysis-Sudden application of Inertia Load-Transfer function of Separately excited D.C Motor- Mathematical model of D.C Series motor, Shunt motor-Linearization Techniques for small Perturbations

UNIT- 4: Reference frame theory& Modeling of single and three phase Induction Machines

Linear transformation-Phase transformation - three phase to two phase transformation (abc to αβ0) and two phase to three phase transformation αβ0 to abc - -Power equivalence- Mathematical modeling of single phase induction machines.

Generalized model in arbitrary reference frame-Electromagnetic torque-Derivation of commonly used Induction machine models- Stator reference frame model-Rotor reference frame model-Synchronously rotating reference frame model-state space model with flux linkages as variables

UNIT –5: Modeling of Synchronous Machine& Special machines

Synchronous machine inductances –voltage equations in the rotor's dq0 reference rame electromagnetic torque-current in terms of flux linkages-three synchronous machine model modeling of PM Synchronous motor, modeling of BLDC motor, modeling of Switched Reluctance motor

Reference Books:

1. Electric Motor Drives - Modeling, Analysis& control -R.Krishnan- Pearson Publications-
1st edition -2002

2. P.S.Bhimbra," Generalised theory of Electrical Machines"-Fifth edition,Khanna publishers.

M.Tech I Semester

L	T	P	C
3	0	0	3

20211T02 ANALYSIS OF POWER ELECTRONIC CONVERTERS

UNIT –1: AC-DC converters

Single phase Half controlled and Fully controlled Converters with RL load– Evaluation of input power factor and harmonic factor-Continuous and Discontinuous load current-Power factor improvements-Extinction angle control-symmetrical angle control-PWM single phase sinusoidal PWM-Single phase series converters- numerical problems. Three Phase ac-dc Converters- Half controlled and fully controlled Converters with RL load– Evaluation of input power factor and harmonic factor-Continuous and continuous load current-three phase dual converters-Power factor improvements-three phase PWM-twelve pulse converters- numerical problems

UNIT-2:DC-DC Converters PWM Inverters

Analysis and design of DC to DC converters. Control of DC-DC converters: Buck converters, Boost converters, Buck-Boost converters, Cuk converters.

Principle of operation-Voltage control of single phase inverters - sinusoidal PWM – modified PWM – phase displacement Control – Trapezoidal, staircase, stepped, harmonic injection and delta modulation – numerical problems. Voltage Control of Three-Phase Inverters- Sinusoidal PWM- 60^{0} PWM- Third Harmonic PWM- Space Vector Modulation-Comparison of PWM Techniques-current source inverters-Variable dc link inverter - numerical problems

UNIT 3: Multi level inverters

Introduction, Multilevel Concept, Types of Multilevel Inverters- Diode-Clamped Multilevel

Inverter, Principle of Operation, Features of Diode-Clamped Inverter, Improved Diode-Clamped Inverter- Flying-Capacitors Multilevel Inverter- Principle of Operation, Features of Flying- Capacitors Inverter- Cascaded Multilevel Inverter- Principle of Operation-Features of Cascaded Inverter- Switching Device Currents-DC-Link Capacitor Voltage Balancing- Features of Multilevel Inverters- Comparisons of Multilevel Converters

UNIT 4 : AC Converters

AC to AC power conversion using voltage regulators. Choppers and cyclo-converters. Consideration of harmonics, introduction to Matrix converters.

UNIT-5: AC voltage Controllers

Single Phase AC Voltage Controllers with RL and RLE loads-ac voltage controller’s with PWM control-Effects of source and load inductances –synchronous tap changers – Application numerical problems Three Phase AC Voltage controllers-Analysis of Controllers with star and delta connected resistive, resistive –inductive loads-Effects of source and load inductances–Application - numerical problems.

Reference books:

1. Power Electronics-Md.H.Rashid –Pearson Education Third Edition- First Indian Reprint- 2008

2. Power Electronics- Ned Mohan, Tore M.Undelan and William P.Robbins –John Wiley & Sons -2nd Edition.

3. Modern power Electronics and AC Drives – B.K.Bose

M.Tech I Semester

L	T	P	C
3	0	0	3

20211T03 POWER ELECTRONIC CONTROL OF DC DRIVES

UNIT-I Dynamics of Electric Drives: Fundamentals of torque equation. Speed torque convention and multi-quadrant operation, components of load torques.
Classification of load torques steady state stability. Load equation, Speed control and drive classification. Close loop control of drives.

UNIT-II Introduction on single phase convertor fed DC motor drive:
Single phase full-convertor and half-convertor fed dc drives for continuous and discontinuous mode of operation. Four quadrant operation of drive using dual convertor.

UNIT-III Three phase AC-DC convertor fed DC motor drive:
Three phase full-convertor and half-convertor fed dc drives for continuous and discontinuous mode of operation. Four quadrant operation of drive using three phase dual convertor. Pulsating
torque

UNIT-IV Modeling of AC-DC convertor fed DC drive components & design of controller:
Transfer function of Dc motor and load, convertor, current and speed controllers, current and speed feedback elements. Design of current controller and speed controller. Closed loop two quadrant DC motor drive, closed loop four quadrant DC motor drive, introduction to simulation of DC motor drive.

UNIT-V DC-DC convertor fed DC motor drive:
Four quadrant DC-DC convertor fed dc motor drive, steady state analysis of DC-DC convertor dc motor drive, pulsating torques. Closed loop operation of DC-DC convertor fed dc motor **drive-**Design of current controller, design of speed controller, modeling of current and speed controller, introduction to simulation of speed controlled dc motor drive.

REFERENCE BOOKS:
1. Electrical Motor Drives Modeling, Analysis and Control – R. Krishna, Prentice Hall India.
2. Power Semiconductor Controlled Drives – G.K. Dubey.Prentice Hall India.
3. Power Electronics and Motor control – Shepherd, Hulley, Liang-II Edition, Cambridge University Press.
4. Power electronic circuits, devices and applications – M.H.Rashid – PHI.

M.Tech I Semester

L	T	P	C
3	0	0	3

20211T04 DIGITAL SIGNAL PROCESSING

UNIT-I Discrete Time Signals and Systems: Introduction to Digital signal processing, discrete time Signals, Discrete time systems, Analysis of Linear Time-Invariant Systems, Convolution, Causality and Stability.

UNIT-II The Z- Transform: Definition, Properties of Z-Transform, Inverse z Transform, Computation of Frequency Response, Solution of linear constant coefficient difference equations using Z Transforms

UNIT-III The Discrete Fourier Transform (DFT): Introduction to DFT, Properties of the DFT, Circular Convolution, , overlap add method, overlap save method, Relationship of DFT to other Transforms. Radix-2 Decimation-In-Time (DIT) and Decimation-In-Frequency (DIF) FFT Algorithms, Inverse FFT.

UNIT-IV Design of IIR Digital Filter : Design procedure for Analog Butterworth and Chebyshev filters, Design of IIR Digital Filters using Bilinear Transformation, Analog Design using Digital Filters, Design of Digital Filters using Digital to Digital Transformation, Impulse Invariant Design.

UNIT-V Design of FIR Digital Filters: Introduction to FIR Filters, Design of Linear phase FIR Digital Filters using Windows (Rectangular, Bartlett, Blackman, Hamming and Hanning windows) and Frequency Sampling Method. Realization of Discrete time systems,: Realization of IIR and FIR systems-Direct, Cascade, Parallel, Ladder realizations.

Multirate Digital Signal Processing :Introduction, Decimation and Interpolation by integer factor, Sampling rate conversion by Rational number, Multistage approach to sampling rate Conversion, Applications of Multirate Signal processing.

Reference Books:

1. A.V. Oppenheim and R. W. Schafer, “Discrete Time Signal Processing”, Prentice Hall, 1989.

2. J. G. Proakis and D.G. Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications”, Prentice Hall, 1997.

M.Tech I Semester	L	T	P	C
	3	0	0	3

20211T05 RESEARCH METHODOLOGY & IPR

Unit 1:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2:

Effective literature studies approaches, analysis Plagiarism, Research ethics

Unit 3:

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 4:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 5:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Reference Books:

1. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008.
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

M.Tech I Semester

L	T	P	C
0	0	6	3

20211L06 SIMULATION OF ELECTRICAL MACHINES AND CONVERTERS LAB

LIST OF EXPERIMENTS

1. Modelling of DC Machine.
2. Modelling of Induction Machine along Stationary Reference frame
3. Modelling of Induction Machine along synchronously rotating Reference frame
4. Modelling of Induction Machine along Rotor Reference frame
5. Modelling of Synchronous Machine.
6. Simulation of single phase half controlled converter with Rand R L load
7. Simulation of single phase Full converter with Rand R L load
8. Simulation of Three phase half controlled converter with Rand R L load
9. Simulation of Three phase Full converter with Rand R L load
10. Simulation of single phase AC Voltage controller with R and R L Load.
11. Simulation of Single phase Cyclo Converter with R and R L Load.
12. Simulation of Chopper with R and R L Load.

M.Tech II Semester	L	T	P	C
	3	0	0	3

20212T01 POWER ELECTRONIC CONTROL OF AC DRIVES

UNIT-I: 3-phase induction motor drives – Part 1

Analysis of IM fed from non-sinusoidal supply, harmonic equivalent circuit, transient analysis –starting and plugging; variable frequency control, torque-slip relation, starting torque and braking torque, closed-loop VSI fed IM drive. Slip-ring IM control, closed-loop speed control with static rotor resistance, closed-loop speed control by using slip power recovery scheme.

UNIT-II: 3-phase induction motor drives – Part 2

Concept of space vector, vector control of IM: direct or feed-back vector control, flux vector estimation, indirect or feed forward vector control, vector control of line side PWM converter, stator flux oriented vector control, vector control of converter fed inverter drive.

UNIT-III: Synchronous motor and BLDC motor drives

Variable frequency control of synchronous motor, closed-loop control of inverter fed synchronous motor drive. Permanent magnet synchronous motor drive. BLDC motor drives, VSI fed BLDC motor drives, back emf, phase current and torque waveforms, control of BLDC motors with sensors, sensor-less control of BLDC motors

UNIT-IV: Traction drives

Motors employed in railway traction and road-vehicles, control of railway traction dc motors using ac-dc converters, control of railway traction ac motors using ac-dc and dc-ac converters, power electronic control circuits of electric vehicles and hybrid electric vehicles

UNIT-V: Switched reluctance and stepper motor drives and Industrial Drives

Switched reluctance motor operation and control: modes of operation, converter circuits closed loop speed control. Stepper motor characteristics drive circuits for uni-polar and bipolar stepper motors. Digital Control of Electric Drives. Stepper motor.Servo motor and their Applications

Reference Books

1. “Electric motor drives, modeling, analysis and control”, R. Krishnan, PHI Publishers
2. “Power Electronics: Converters, Application and design” ,Mohan, Undeland and Robbins, Wiley Publications.
3. “Urban transport and hybrid electric vehicles”, Edited by SerefSoylu, Published

online, 20 Aug 2010. Available: http://www.intechopen.com/books/urban-transport

4. "Power semiconductor drives", G. K. Dubey, Printice Hall International
5. "Fundamentals of electric drives", G. K. Dubey, Narosa Publishing House

M.Tech II Semester	L	T	P	C
	3	0	0	3

20212T02: ADVANCED POWER ELECTRONIC CONVERTERS

UNIT-I: Non-isolated switch mode converters:

Control of DC-DC converters, Buck converters, Boost converters, Buck-Boost converter, CUK Converter, Converter realization with nonideal components.

UNIT-II: Resonant converters:

Basic resonant circuit concepts, series resonant circuits, parallel resonant circuits, zero current switching Quasi-resonant buck converter, zero current switching Quasi- resonant boost converter, zero voltage switching Quasi-resonant buck converter, zero voltage switching Quasi-resonant boost converter

UNIT-III: Isolated switch-mode converters:

Forwarded converter, fly back converter, Push-pull converter, half-bridge converter, full bridge converter

UNIT-IV: Control schemes of switching converters:

Voltage-mode control, Current-mode control, control scheme for resonant converters, proportional integral controller. Magnetic design consideration: Transformers design, DC inductor and capacitor design.

Three phase utility interphases and control-Buck, Boost, Buck-Boost SMPS
Topologies.

UNIT-V: Modeling& Control design based on linearization:

Formulation of averaged models for buck and boost converters average circuits models, small –signal analysis and linearization. Control design based on linearization: Transfer function of converters, control design, large signal issues in voltage-mode & current- mode control.

Reference Books

1. Power Electronics – Issa Bataresh, Jhon willey publications,2004
2. Elements of Power Electronics – Philip T. Krein, Oxford University press.
3. Power Electronics: converters Applications & Design – Mohan, Undeland, Robbins- Wiley publications

M.Tech II Semester	L	T	P	C
	3	0	0	3

20212T03: RENEWABLE ENERGY SYSTEMS

UNIT-I

Need for Distributed generation.Renewable sources in distributed generation and current scenario in Distributed Generation

UNIT-II

Solar Energy - Availability - Solar radiation data and measurement - Estimation of average solar radiation - Solar water heater types - Heat balance – Flat plate collector efficiency – Efficiency of heat removal - Thermo siphon flow calculation - Forced circulation calculation – Evacuated collectors - Basics of solar concentrators Solar Energy Applications - Solar air heaters – Solar Chimney - Crop driers - Passive solar system - Active solar systems - Water desalination - Output from solar still – Principle of solar ponds.

UNIT-III

Wind Energy – Nature of wind – Characteristics – Variation with height and time – Power in wind –Aerodynamics of Wind turbine – Momentum theory – Basics of aerodynamics – Aero foils and their characteristics – HAWT – Blade element theory – Prandtl's lifting line theory (prescribed wake analysis) VAWT aerodynamics – Wind turbine loads – Aerodynamic loads in steady operation – Yawed operation and tower shadow. Wind Energy Conversion System – Siting – Rotor selection – Annual energy output – Horizontal axis wind turbine (HAWT) – Vertical axis wind turbine (VAWT) – Rotor design considerations – Number of blades – Solidity - Blade profile – Upwind/Downwind – Yaw system – Tower – Braking system - Synchronous
and asynchronous generators and loads – Integration of wind energy converters to electrical networks – Inverters – Control system – Requirement and strategies – Noise Applications of wind energy

UNIT-IV

Biomass energy - Bio fuel classification – Examples of thermo chemical, Pyrolysis, biochemical and agrochemical systems – Energy farming – Direct combustion for heat – Process heat and electricity – Ethanol production and use – Anaerobic digqaestion for biogas – Different digesters – Digester sizing – Applications of Biogas - Operation with I.C.Engine

UNIT-V

Ocean Energy - OTEC Principle - Lambert's law of absorption - Open cycle and closed cycle - heat exchanger calculations – Major problems and operational experience. Tidal Power - Principles of power generation - components of power plant – Single and two basin systems – Turbines for tidal power - Estimation of energy – Maximum and minimum power ranges – tidal powerhouse. Wave Energy

Geothermal Energy - Classification- Fundamentals of geophysics - Dry rock and hot aquifer energy analysis - Estimation of thermal power - Extraction techniques - Prime movers.

Reference Books:

1. Renewable Energy Resources / John Twidell and Tony Weir / E &F.N.Spon
2. Renewable Energy Resources Basic Principles and Applications / G.N.Tiwari and M.K.Ghosal / Narosa
3. Solar Energy - Principles of thermal collection and storage/ S.P. Sukhatme / TMH
4. Solar Energy Thermal Processes,/Duffie& Beckman
5. Solar Heating and Cooling / Kreith&Kreider, CRC press.
6. Wind Energy Handbook / Tony Burton, David Sharpe, Nick Jenkins and Ervin Bossanyi /WileyWind Electrical Systems / S.N.Bhadra, D.Kastha and S.Banerjee / Oxford
7. Biogas Technology - A Practical Hand Book / K.Khendelwal& S.S. Mahdi / McGraw-Hill.

M.Tech II Semester

L	T	P	C
3	0	0	3

20212T04 SPECIAL ELECTRICAL MACHINES

UNIT I

Switched Reluctance Motor

Principle of operation, design of stator and rotor pole arc, power converter for switched reluctance motor. Stepper Motors Construction, principle of operation, theory of torque production, hybrid stepping motor, variable reluctance stepping motor.

UNIT II

Brushless DC Motor

Construction, principle of operation, theory of brushless DC motor as variable speed synchronous motor.

UNIT III

Linear Induction Motor

Construction, principle of operation, application of linear induction drive for electric traction. Permanent Magnet Motors , Hysteresis loop, permanent magnet DC Motors, equivalent circuit, electrically commutated DC Motor.

UNIT IV

Control of special machines

Stepper motors (open loop control, closed loop control). Characteristics of stepper motor in open–loop drive. Comparison of open loop and closed loop systems.

Control of switched reluctance motor for fraction type load. Control of brushless dc motor, rotor position sensing and switching logic for brushless dc motor.

UNIT V

Electric Motors for traction drives

AC motors, DC motors, single sided linear induction motor for traction drives, comparison of AC and DC traction.

Text Books:

1. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford.

2. Special electrical Machines, K. Venkata Ratnam, University press, 2009, New Delhi.

M.Tech II Semester	L	T	P	C
	3	0	0	3

20212T05 DIGITAL CONTROL SYSTEMS

UNIT – I:

Introduction and signal processing

Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Signals and processing – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT–II:

z–transformations

z–Transforms – Theorems – Finding inverse z–transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses.

UNIT–III:

State space analysis and the concepts of Controllability and observability

State space representation of discrete time systems – State transition matrix and methods of evaluation – Discretization of continuous – Time state equations – Concepts of controllability and observability – Tests(without proof).

UNIT – IV: Stability analysis

Mapping between the s–Plane and the z–Plane – Primary strips and Complementary strips – Stability criterion – Modified Routh's stability criterion and Jury's stability test.

UNIT – V:

Design of discrete–time control systems and State feedback controllers:

Transient and steady state specifications – Design using frequency response in the w–plane for lag and lead compensators – Root locus technique in the z–plane.

Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

Text Book:

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.
2. Digital Control and State Variable Methods by M.Gopal, TMH, 4th Edition.

Reference Books:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003

M.Tech II Semester	L	T	P	C
	3	0	0	3

20212T06: SMART GRIDS

UNIT-I Introduction to Smart Grid, Evolution of Electric Grid. Concept of Smart Grid, Definitions, Need of Smart Grid.Concept of Robust &Self-Healing Grid, Present development & International policies in Smart Grid

UNIT-II Introduction to Smart Meters, Real Time Prizing, Smart Appliances. Automatic Meter Reading (AMR).Outage Management System (OMS).Plug in Hybrid Electric Vehicles(PHEV).Vehicle to Grid, Smart Sensors. Home & Building Automation, Smart Substations, Substation Automation, Feeder Automation

UNIT III Geographic Information System (GIS).Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro. Compressed Air Energy Storage. Wide Area Measurement System (WAMS) Phase Measurement Unit (PMU).

UNIT IV Concept of micro-grid, need & applications of micro-grid.Formation of micro-grid, Issues of interconnection.Protection & control of micro-grid.Plastic & Organic solar cells, Thin film solar cells. Variable speed wind generators, fuel-cells, micro-turbines. Captive power plants, Integration of renewable energy sources. Power Quality & EMC in Smart Grid.Power Quality issues of Grid connected Renewable Energy Sources. Power Quality Conditioners for Smart Grid.Web based Power Quality monitoring, Power Quality Audit

UNIT V Advanced Metering Infrastructure (AMI), Home Area Network (HAN). Neighbourhood Area Network (NAN), Wide Area Network (WAN).Bluetooth, ZigBee, GPS, Wi-Fi, Wi-Max based communication.Wireless Mesh Network. Basics of CLOUD Computing &Cyber Security for Smart Grid. Broadband over Power line (BPL). IP based protocols

Reference Books

1. Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011.

2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press, 2009.

3. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, "Smart Grid: Technology and Applications", Wiley 2012.

4. Stuart Borlas'e, "Smart Grid: Infrastructure, Technology and solutions "CRC Press.

5. A. G. Phadke,"Synchronized Phasor Measurement and their Applications", Springer.

M.Tech II Semester

L	T	P	C
3	0	0	3

20212T07: FLEXIBLE AC TRANSMISSION SYSTEMS

UNIT-I

Reactive power flow control in Power Systems – Control of dynamic power unbalances in Power System. Power flow control -Constraints of maximum transmission line loading –Benefits of FACTS Transmission line compensation. Uncompensated line -Shunt compensation - Series compensation –Phase angle control. Reactive power compensation. Shunt and Series compensation principles – Reactive compensation at transmission and distribution level

UNIT-2

Static versus passive VAR compensator, Static shunt compensators: SVC and STATCOM - Operation and control of TSC, TCR and STATCOM -Compensator control. Comparison between SVC and STATCOM.

UNIT-3

Static series compensation: TSSC, SSSC -Static voltage and phase angle regulators – TCVR and TCPAR Operation and Control –Applications, Static series compensation – GCSC, TSSC, TCSC and Static synchronous series compensators and their Control.

SSR and its damping Unified Power Flow Controller: Circuit Arrangement, Operation and control of UPF.

UNIT-4

Introduction to interline power flow controller. Modeling and analysis of FACTS Controllers – Simulation of FACTS controllers Power quality problems in distribution systems, harmonics. Loads that create harmonics, modeling, harmonic propagation, series and parallel resonances, mitigation of harmonics, passive filters, active filtering – shunt , series and hybrid and their control.

UNIT-5

Voltage swells, sags, flicker, unbalance and mitigation of these problems by power line conditioners- IEEE standards on power quality.

Reference Books:

1. K R Padiyar, “FACTS Controllers in Power Transmission and Distribution”, New

Age lntemational Publishers, 2007.

2. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.

M.Tech II Semester	L	T	P	C
	3	0	0	3

20212T08: OPTIMIZATION TECHNIQUES

UNIT – 1 Introduction and Classical Optimization Techniques:

Statement of an Optimization problem – design vector – design constraints – constraint surface –objective function – objective function surfaces – classification of Optimization problems. Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT – 2: Linear Programming

Standard form of a linear programming problem – geometry of linear programming problems –definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm - Duality in Linear Programming – Dual Simplex method.

UNIT – 3: Nonlinear Programming

Unconstrained cases - One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method – Uni variate method, Powell's method and steepest descent method.

Constrained cases - Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem.

UNIT – 4:

Introduction to Evolutionary Methods:

Evolutionary programming methods - Introduction to Genetic Algorithms (GA)– Control parameters –Number of generation, population size, selection, reproduction, crossover and mutation – Operator selection criteria – Simple mapping of objective function to fitness function

– constraints – Genetic algorithm steps – Stopping criteria –Simple examples.

UNIT – 5:

Introduction to Swarm Intelligence Systems:

Swarm intelligence programming methods - Basic Partial Swarm Optimization – Method – Characteristic features of PSO procedure of the global version – Parameters of PSO (Simple PSO algorithm – Operators selection criteria – Fitness function constraints) – Comparison with other evolutionary techniques – Engineering applications of PSO.

Reference Books:

1. Soft Computing with Matlab Programming by N.P. Padhy & S.P.Simson, Oxford University Press – 2015
2. Linear Programming by G.Hadley., Narosa Publishers.

M.Tech II Semester	L	T	P	C
	0	0	6	3

20212L05 ELECTRIC DRIVES LAB

LIST OF EXPERIMENTS

1. Analysis and speed control of DC motor drive using 3-phase full Converter.
2. Analysis of a four quadrant Chopper feeding DC motor.
3. Analysis of a 3-phase A.C. Voltage controller fed to R & RL - load.
4. Analysis of Buck, Boost, Buck-Boost DC-DC converters.
5. Analysis of Single Phase IGBT based PWM Inverter connected to R & R-L load
6. Analysis of 3-phase IGBT based PWM Inverterfeeding R & R-L load.
7. Analysis and speed control of 3 phase slip ring Induction motor by Static Rotor Resistance controller.
8. Analysis of DSP based V/F Control of 3 phase Induction motor.
9. Regenerative/ Dynamic breaking operatation for DC motor study using software.
10. PC/PLC based AC/DC motor control operation.

M.Tech III Semester

L	T	P	C
3	0	0	3

20213T01 DIGITAL CONTROL OF DRIVES

UNIT-1

Review of numerical methods. Application of numerical methods to solve transients in D.C. Switched R, L, R-L, R-C and R-L-C circuits. Extension to AC circuits.

UNIT-2

Modelling of diode in simulation. Diode with R, R-L, R-C and R-L-C load with AC supply. Modelling of SCR, TRIAC, IGBT and Power Transistors in simulation. Application of numerical methods to R, L, C circuits with power electronic switches. Simulation of gate/base drive circuits, simulation of snubber circuits.

UNIT-3

State space modelling and simulation of linear systems. Introduction to electrical machine modelling: induction, DC, and synchronous machines, simulation of basic electric drives, stability aspects

UNIT-4

Simulation of single phase and three phase uncontrolled and controlled (SCR) rectifiers. Converters with self-commutated devices- simulation of power factor correction schemes.

Simulation of converter fed DC motor drives. Simulation of thyristor choppers with voltage. Current and load commutation schemes. Simulation of chopper fed DC motor.

UNIT-5

Simulation of single and three phase inverters with thyristors and self commutated devices. Space vector representation. Pulse-width modulation methods for voltage control. Waveform control. Simulation of inverter fed induction motor drives.

Reference Books:

1. Simulink Reference Manual, Math works, USA

M.Tech III Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

20213T02 EMBEDDED SYSTEMS

UNIT-I

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-III

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation, Device Drivers.

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

UNIT-IV

EMBEDDED SYSTEM DEVELOPMENT: The integrated development environment, Types of files generated on cross-compilation, Deassembler/ Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

UNIT-V

EMBEDDED SYSTEM IMPLEMENTATION AND TESTING: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

M.Tech III Semester	L	T	P	C
	3	0	0	3

20213T03: VLSI Design

UNIT-I: Introduction and Basic Electrical Properties of MOS Circuits: Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and
BiCMOS technology.

UNIT-II:

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2µm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2µm Double Metal,Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.

UNIT-III:

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

UNIT-IV:

Chip Input and Output circuits: ESD Protection, Input Circuits, Output Circuits and L(di/dt) Noise, On-Chip clock Generation and Distribution.

Design for Testability: Fault types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based Techniques and Built-In Self Test techniques.

UNIT-V:

FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, FPGA families- Altera Flex 8000FPGA, Altera Flex 10FPGAFPGA Implementation of Half adder and full adder.

Introduction to Low Power VLSI Design: Introduction to Deep submicron digital

IC design**,** Low Power CMOS Logic Circuits: Over view of power consumption, Low –power design through voltage scaling, Estimation and optimisation of switching activity, Reduction of switching capacitance.

Text Books:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGraw-Hill Education, 2003.

References:

1. Advanced Digital Design with the Verilog HDL, Michael D.Ciletti, Xilinx Design Series, Pearson Education
2. Analysis and Design of Digital Integrated Circuits in Deep submicron Technology, 3’rd edition, David Hodges.

M.Tech III Semester

L	T	P	C
3	0	0	3

20213T04: IMAGE PROCESSING

UNIT-1

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms

UNIT-2

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Combining spatial enhancement methods

Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

UNIT-3

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position – Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean

square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter ,image reconstruction from projections.

UNIT-4

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding.

Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation.

UNIT-5

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

Text Books

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.

2. Jayaraman, S. Esakkirajan, and T. Veerakumar,” Digital Image Processing”, Tata McGraw-Hill Education,2011.

Reference Books

1. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 9th Edition, Indian Reprint,2002.

2. B.Chanda, D.Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2009.

COURSE STRUCTURE
M.Tech (VLSI and Embedded Systems)
I Year I Semester

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs./ Wk.	Credits
1	20411T01	Digital System Design	3	0	0	3	3
2	20411T02	Embedded system Design	3	0	0	3	3
3	20411T03	Analog VLSI Design	3	0	0	3	3
4	20411T04 20411T05 20411T06	**Programme Elective I** 1.VLSI Technology and Design 2.CMOS Digital IC Design 3. System on Chip Design	3	0	0	3	3
5	20411T07 20411T08 20411L09	**Programme Elective II** 1. Advanced Operating Systems 2. Soft Computing Techniques 3. Network Security and Cryptography	3	0	0	3	3
6	20411L10	VLSI System design Lab-I	0	0	4	2	2
7	20411L11	Digital System Design using Verilog and VHDL	0	0	4	2	2
8	20411T12	Research Methodology	2	0	0	2	2
						Total Credits	**21**

I Year II Semester

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs./ Wk.	Credits
1	20412T01	Embedded Real Time Operating Systems	3	0	0	3	3
2	20412T02	Low Power VLSI Design	3	0	0	3	3
3	20412T03	CMOS Mixed Signal Circuit Design					
4	20412T04 20412T05 20412T06	**Programme Elective III** 1. VLSI Signal Processing 2. CPLD & FPGA Architectures and Applications. 3. Advanced Computer Architecture	3	0	0	3	3
5	20412T07 20412T08 20412L09	**Programme Elective IV** 1.Design of IOT 2. DSP Processors & Architectures 3. Semiconductor Memory Design and Testing.	3	0	0	3	3
6	20412L10	Embedded System Design lab	0	0	4	4	2
7	20412L11	VLSI System design Lab-II	0	0	4	4	2
8	20412T12	Intellectual Property Rights And Patents	2	0	0	2	2
						Total Credits	**21**

II Year III Semester

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs./ Wk.	Credits
1	20413L01	Comprehensive Viva-Voce	4	0	0	4	4
2	20413L02	Seminar	2	0	0	2	2
3	20413L03	Project Work part-1	0	0	14	14	7
						Total Credits	**13**

II Year IV Semester

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs./ Wk.	Credits
1	20414L01	Project Work Part -II	0	0	26	26	13
						Total Credits	**13**

I-Year I Semester

Course Code	Course Title	L	T	P	C
20411T01	Digital System Design	3	0	0	3

UNIT-I

Minimization Procedures and CAMP Algorithm

Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs,, CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II

PLA Design, PLA Minimization and Folding Algorithms

Introduction to PLDs, basic configurations and advantages of PLDs, PLA Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm(IISc algorithm), PLA folding algorithm(COMPACT algorithm)-Illustration of algorithms with suitable examples.

UNIT –III

Design of Large Scale Digital Systems

Algorithmic state machine charts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV

Fault Diagnosis in Combinational Circuits

Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V

Fault Diagnosis in Sequential Circuits

Fault detection and location in sequential circuits, circuit test approach, initial state identification, Haming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS:

1. Logic Design Theory-N. N. Biswas, PHI
2. Switching and Finite Automata Theory-Z. Kohavi , 2nd Edition, 2001,TMH

3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

1. Fundamentals of Logic Design – Charles H. Roth, 5th Ed., Cengage Learning.
2. Digital Systems Testing and Testable Design – Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman- John Wiley & Sons Inc.

Course Code	Course Title	L	T	P	C
20411T02	Embedded System Design	3	0	0	3

UNIT-I

Introducing Microcontroller Family Introduction, The external interface of the Standard 8051, Reset requirements, Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption and Reading Switches.

UNIT-II

ARM Architecture ARM Design Philosophy, Registers, PSR, Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families.

UNIT-III

ARM Programming Model-I Instruction Set: Data Processing Instructions, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions.

UNIT-IV

ARM Programming Model-II Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions, Single- Register and Multi Register Load-Store Instructions, Stack, Software
Interrupt Instructions.

UNIT-V

ARM Programming Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops.
Memory Management Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Content Switch.

TEXT BOOKS:

1. ARM Systems Developer's Guides- Designing & Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright, 2008, Elsevier.

REFERENCE BOOKS:

1. Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes / Cole, 1999, Thomas Learning.

Course Code	Course Title	L	T	P	C
20411T03	Analog VLSI Design	3	0	0	3

UNIT 1: Analog MOS transistor models Temperature effects and Noise in MOS transistor MOS resistors, characterization of resistive, capacitive elements and MOS devices .Passive and active CMOS current sink/ sources– basics of single stage CMOS amplifiers common Source, common gate and source follower stages frequency response.

UNIT 2: CMOS Differential Amplifiers: CMOS Operational Amplifiers one stage and two stage gain boosting Common mode feedback (CMFB) Cascade and Folded cascade structures

UNIT 3: High Performance Op-amps – High speed/ high frequency op-amps, micro power op-amps, low noise op-amps and low voltage op-amps. Current mirrors, filter implementations

UNIT4: Supply independent and temperature independent references Band gap references PTAT current generation and constant Gm biasing – CMOS comparators – Multipliers and wave shaping circuits – effects due to nonlinearity and mismatch in MOS circuits. Switched Capacitor Circuits: First and Second Order Switched Capacitor Circuits

UNIT 5: Switched Capacitor filters, CMOS oscillators, simple and charge pump CMOS PLLs non ideal effects in PLLs, Delay locked loops and applications, basics of CMOS data converters – Medium and high speed CMOS data converters, over sampling converters.

Text Books:

1. "Analog Integrated Circuit Design", David. A. Johns and Ken Martin, John Wiley and Sons, 2001.
2. "Design of Analog CMOS Integrated Circuit", Behzad Razavi, Tata McGraw HILL, 2002.
3. "CMOS Analog Circuit Design", Philip Allen & Douglas Holberg, Oxford University Press, 2002.

References:

1. "Analog VLSI – Signal Information and Processing", Mohammed Ismail &Feiz , John Wiley and Sons.

Course Code	Course Title	L	T	P	C
20411T04	**Programme Elective- I** **VLSI Technology and Design**	3	0	0	3

UNIT-I

VLSI Technology

Fundamentals and applications, IC production process, semiconductor processes, design rules and process parameters, layout techniques and process parameters. **VLSI Design Issues**: Design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

UNIT-II

VLSI Design: Electronic design automation concept, ASIC and FPGA design flows, SOC designs, design technologies: combinational design techniques, sequential design techniques, state machine logic design techniques and design issues.

UNIT-III

CMOS VLSI Design: MOS Technology and fabrication process of pMOS, nMOS, CMOS and BiCMOS technologies**,** comparison of different processes. **Building Blocks of a VLSI circuit**: Computer architecture, memory architectures, communication interfaces, mixed signal interfaces.

UNIT-IV

Basic electrical properties of MOS and Bi CMOS circuits, MOS and Bi CMOS circuit design processes, Basic circuit concepts, scaling of MOS circuits-qualitatitive and quantitative analysis with proper illustrations and necessary derivations of expressions.

UNIT-V

Subsystem Design and Layout: Some architectural issues, switch logic, gate logic, examples of structured design (combinational logic), some clocked sequential circuits, other system considerations. **Subsystem Design Processes:** Some general considerations and an illustration of design processes, design of an ALU subsystem. Floor Planning

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, K. Eshraghian, Douglas A. Pucknell, Sholeh Eshraghian, 2005, PHI Publications.
2. Modern VLSI Design-Wayne Wolf, 3rd Ed., 1997, Pearson Education.
3. VLSI Design-Dr.K.V.K.K.Prasad, Kattula Shyamala, Kogent Learning Solutions Inc., 2012.

REFERENCE BOOKS:

1. VLSI Design Technologies for Analog and Digital Circuits, Randall L.Geiger, Phillip E.Allen, Noel R.Strader, TMH Publications, 2010.
2. Introduction to VLSI Systems: A Logic, Circuit and System Perspective-Ming-BO Lin, CRC Press, 2011.

Course Code	Course Title	L	T	P	C
20411T05	**Programme Elective- I CMOS Digital IC Design**	**3**	**0**	**0**	**3**

UNIT-I

MOS Devices and Modeling The MOS Transistor, Passive Components-Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT-II

MOS Design Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-III

Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-IV

Sequential MOS Logic Circuits Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-V

Dynamic Logic Circuits Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits. Semiconductor Memories

TEXT BOOKS:

1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011

2. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.

Course Code	Course Title	L	T	P	C
20411T06	Programme Elective- I System on Chip Design	3	0	0	3

UNIT-I

Introduction to the System Approach

System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT-II

Processors Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III

Memory Design for SOC Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

UNIT-IV

Interconnect Customization and Configuration Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time.

UNIT-V

SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable

Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

Application Studies / Case Studies SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

TEXT BOOKS:

1. Computer System Design System-on-Chip - Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.

REFERENCE BOOKS:

1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM.
3. System on Chip Verification – Methodologies and Techniques – Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

Course Code	Course Title	L	T	P	C
20411T07	Programme Elective- II Advanced Operating System	3	0	0	3

UNIT-I

Introduction to Operating Systems Overview of computer system hardware, Instruction execution, I/O function, Interrupts, Memory hierarchy, I/O Communication techniques, Operating system objectives and functions, Evaluation of operating System

UNIT-II

Introduction to UNIX and LINUX Basic Commands & Command Arguments, Standard Input, Output, Input / Output Redirection, Filters and Editors, Shells and Operations

UNIT –III

System Calls: System calls and related file structures, Input / Output, Process creation & termination.

Inter Process Communication : Introduction, File and record locking, Client – Server example, Pipes, FIFOs, Streams & Messages, Name Spaces, Systems V IPC, Message queues, Semaphores, Shared Memory, Sockets & TLI.

UNIT –IV

Introduction to Distributed Systems: Goals of distributed system, Hardware and software concepts, Design issues. **Communication in Distributed Systems:** Layered protocols, ATM networks, Client - Server model, Remote procedure call and Group communication.

UNIT –V

Synchronization in Distributed Systems: Clock synchronization, Mutual exclusion, E-tech algorithms, Bully algorithm, Ring algorithm, Atomic transactions **Deadlocks:** Dead lock in distributed systems, Distributed dead lock prevention and distributed dead lock detection.

EMBEDDED OS: Discussions on Basics of Linux supportive RTOS – uCOS-C Executive for development of RTOS Application –introduction to Android Environment -The Stack – Android User Interface – Preferences, the File System, the Options Menu and Intents, with one Case study

TEXT BOOKS:

1. The Design of the UNIX Operating Systems – Maurice J. Bach, 1986, PHI.
2. Distributed Operating System - Andrew. S. Tanenbaum, 1994, PHI.
3. The Complete Reference LINUX – Richard Peterson, 4th Ed., McGraw –Hill.

REFERENCE BOOKS:

1. Operating Systems: Internal and Design Principles - Stallings, 6th Ed., PE.
2. Modern Operating Systems - Andrew S Tanenbaum, 3rd Ed., PE.
3. Operating System Principles - Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 7th Ed., John Wiley

Course Code	Course Title	L	T	P	C
20411T08	Programme Elective- I Soft Computing Techniques	3	0	0	3

UNIT –I

Introduction: Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, and Knowledge representation - Expert systems.

UNIT –II

Artificial Neural Networks: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network.

UNIT-III

Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –IV

Fuzzy Logic System: Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT –V

Genetic Algorithm: Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search techniques for solving optimization problems, Applications.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. & Folger T.A., Prentice-Hall of India Pvt. Ltd.,
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994.
3. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
4. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
5. Elements of Artificial Neural Networks - Kishan Mehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.

Course Code	Course Title	L	T	P	C
20411T09	Programme Elective- II Network security and Cryptography	3	0	0	3

UNIT-I

Introduction Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. Classical Techniques: Conventional Encryption model, Steganography, Classical
Encryption Techniques.

UNIT-II

Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.
Algorithms: Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block cifers.

UNIT-III

Conventional Encryption: Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation. Public Key **Cryptography:** Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

UNIT-IV

Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.
Message authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

UNIT-V

Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC. Digital signatures and Authentication Protocols: Digital signatures, Authentication Protocols, Digital signature standards. Authentication Applications: Kerberos, X.509 directory Authentication service. Electronic Mail Security: Pretty Good Privacy, S/MIME, IP Security.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice – William Stallings, 2000, PE.

REFERENCE BOOKS:

1. Principles of Network and Systems Administration, Mark Burgess,John Wiey.

Course Code	Course Title	L	T	P	C
20411T12	Research Methology	2	0	0	2

Unit-I

Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process. Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance

Unit-II

Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.

UNIT-III

Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches. Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio.

UNIT-IV

Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.

Unit-V

Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association. Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism, Use of Encyclopedias and Tools.

Text Books:-

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press.
3. Research Methodology – C.R.Kothari

Course Code	Course Title	L	T	P	C
20411L10	VLSI System design Lab-I	0	0	4	2

PART-A: VLSI Lab (Front-end Environment)

• The students are required to design the logic circuit to perform the following experiments using necessary simulator to verify the logical / functional operation and to perform the analysis with appropriate synthesizer (Mentor Graphics Precision RTL) and then verify the implemented logic with different hardware modules/kits (CPLD/FPGA kits).

• The students are required to acquire the knowledge in the Platforms (Mentor graphics) by perform at least SIX experiments on each Platform.

List of Experiments:

1. Realization of Logic gates.
2. Parity Encoder.
3. Random Counter
4. Synchronous RAM.
5. ALU.
6. UART Model.
7. Fire Detection and Control System using Combinational Logic circuits.
8. Traffic Light Controller using Sequential Logic circuits
9. Pattern Detection using Moore Machine.
10. Finite State Machine (FSM) based logic circuit.

PART-B: VLSI Lab (Back-end Environment)

• The students are required to design and implement the Layout of the following experiments of any FOUR using CMOS 130nm Technology with Mentor Graphics Tool.

List of Experiments:

1. Inverter Characteristics.
2. Full Adder.
3. RS-Latch, D-Latch and Clock Divider.
4. Synchronous Counter and Asynchronous Counter.
5. Static and Dynamic RAM.
6. ROM
7. Digital-to-Analog-Converter.
8. Analog-to-Digital Converter.

Lab Requirements:

Software:

Mentor Graphics-Questa Simulator, Mentor Graphics-Precision RTL, Mentor Graphics Back End/Tanner Software tool.

Hardware:

Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.

Course Code	Course Title	L	T	P	C
20411L11	Digital system design using Verilog and VHDL	0	0	4	2

Note: The students are required to design and draw the internal logical structure of the following Digital Integrated Circuits and to develop VHDL and Verilog HDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer. All the experiments are required to verify and implement the logical operations on the latest FPGA Hardware in the Laboratory.

List of Experiments :(Minimum of Ten Experiments has to be performed using FPGA Trainer kit)

1. Realization of Logic Gates
2. Design of Full Adder using 3 modeling systems
3. 3 to 8 Decoder
4. 8 to 3 Encoder (with and without parity)
5. 8 x 1 Multiplexer-and 2x 4 De-multiplexer-
6. 4- Bit comparator
7. D Flip-Flop
8. Decade counter
9. Shift registers
10. 8-bit serial in-parallel out and parallel in-serial out
11. Fast In & Fast Out (FIFO)
12. MAC (Multiplier & Accumulator)
13. ALU Design.

Equipment/Software required:

1. Xilinx software / Equivalent Industry Standard Software
2. FPGA Training Boards
3. Personal computer system with necessary software to run the programs and Implement

I-Year II Semester

Course Code	Course Title	L	T	P	Credits
20412T01	Embedded Real Time Operating Systems	3	0	0	3

UNIT-I
Introduction
Introduction to Operating Systems Overview of computer system hardware, Instruction execution, I/O function, Interrupts, Memory hierarchy, I/O Communication techniques, Operating system objectives and functions, Evaluation of operating System

UNIT-II
RTOS Introduction
OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and IO Systems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls, Real-Time Operating Systems, Basic Design Using an RTOS, RTOS Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics, OS Security Issues.

UNIT-III
RTOS Programming
Basic Functions and Types of RTOS for Embedded Systems, RTOS mCOS-II, RTOS Vx Works, Programming concepts of above RTOS with relevant Examples, Programming concepts of RTOS Windows CE, RTOS OSEK, RTOS Linux 2.6.x and RTOS RT Linux.

UNIT-IV
Program Modeling – Case Studies
Case study of embedded system design and coding for an Automatic Chocolate Vending Machine (ACVM) Using Mucos RTOS, case study of digital camera hardware and software architecture, case study of coding for sending application layer byte streams on a TCP/IP Network Using RTOS Vx Works, Case Study of Embedded System for an Adaptive Cruise Control (ACC) System in Car, Case Study of Embedded System for a Smart Card, Case Study of Embedded System of Mobile Phone Software for Key Inputs.

UNIT-V
Target Image Creation & Programming in Linux
Off-The-Shelf Operating Systems, Operating System Software, Target Image Creation for Window XP Embedded, Porting RTOS on a Micro Controller based Development Board. Overview and programming concepts of Unix/Linux Programming, Shell Programming and System Programming.

TEXT BOOKS:

1. Dr. K.V.K.K. Prasad: "Embedded/Real-Time Systems" Dream Tech Publications, Black pad book.
2. Rajkamal: "Embedded Systems-Architecture, Programming and Design", Tata McGraw Hill Publications, Second Edition, 2008.

REFERENCES:

1. Rob Williams," Real time Systems Development", Butterworth Heinemann Publications.

Course Code	Course Title	L	T	P	C
20412T02	Low Power VLSI Design	3	0	0	3

UNIT-I

Basics of MOS circuits: MOS Transistor structure and device modeling MOS Inverters MOS Combinational Circuits - Different Logic Families Sources of Power dissipation: Dynamic Power Dissipation Short Circuit Power Switching

UNIT-II

Fundamentals of Low Power VLSI Design Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT-III

Low-Power Design Approaches Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach – Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT-IV

Low-Voltage Low-Power Adders Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low- Power Design Techniques –Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

UNIT-V

Low-Voltage Low-Power Multipliers Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

Low-Voltage Low-Power Memories Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power
SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

REFERENCE BOOKS:

1. Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998.
2. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.
3. Practical Low Power Digital VLSI Design – Gary K. Yeap, Kluwer Academic Press, 2002.

Course Code	Course Title	L	T	P	C
20412T03	CMOS Mixed Signal Circuit Design	3	0	0	3

UNIT-I

MOS TRANSISTOR PRINCIPLES AND CMOS INVERTER: MOS(FET) Transistor Characteristic under Static and Dynamic Conditions, MOS Transistor Secondary Effects, Process Variations, Technology Scaling, CMOS Inverter - Static Characteristic, Dynamic Characteristic, Power, Energy, and Energy Delay parameters.

UNIT-II

Switched Capacitor Circuits Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators
first order filters, Switch sharing, biquad filters.

UNIT-III

Phased Lock Loop (PLL) Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs- PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT-IV

Data Converter Fundamentals DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT-V

Nyquist Rate A/D Converters Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time interleaved converters.

Oversampling Converters Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibit quantizers, Delta sigma D/A

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002

2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
3. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

REFERENCE BOOKS:

1. CMOS Integrated Analog-to- Digital and Digital-to-Analog converters- Rudy Van De Plassche, Kluwer Academic Publishers, 2003
2. Understanding Delta-Sigma Data converters-Richard Schreier, Wiley Interscience, 2005.
3. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

Course Code	Course Title	L	T	P	C
20412T04	Programme Elective- III VLSI Signal Processing	3	0	0	3

UNIT-I

Introduction to DSP Typical DSP algorithms, DSP algorithms benefits, Representation of DSP algorithms Pipelining and Parallel Processing Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power Retiming Introduction – Definitions and Properties – Solving System of Inequalities – Retiming Techniques

UNIT-II

Folding: Introduction -Folding Transform - Register minimization Techniques – Register minimization in folded architectures – folding of multirate systems **Unfolding:** Introduction – An Algorithm for Unfolding – Properties of Unfolding – critical Path, Unfolding and Retiming – Applications of Unfolding

UNIT-III

Systolic Architecture Design

Introduction – Systolic Array Design Methodology – FIR Systolic Arrays – Selection of Scheduling Vector – Matrix Multiplication and 2D Systolic Array Design – Systolic Design for Space Representations contain Delays

UNIT-IV

Fast Convolution Introduction – Cook-Toom Algorithm – Winogard algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

UNIT-V

Low Power Design Scaling Vs Power Consumption –Power Analysis, Power Reduction techniques – Power Estimation Approaches **Programmable DSP:** Evaluation of Programmable Digital Signal Processors, DSP Processors for Mobile and Wireless Communications, Processors for Multimedia Signal Processing.

Numerical strength reduction and PIPELINING: Sub expression elimination, multiple constant multiplication, iterative matching, synchronous pipelining and clocking styles, clock skew in edge-triggered single phase clocking, two-phase clocking, wave pipelining. Asynchronous pipelining bundled data versus dual rail protocol.

TEXT BOOKS:

1. VLSI Digital Signal Processing- System Design and Implementation – Keshab K. Parhi, 1998, Wiley Inter Science.
2. VLSI and Modern Signal Processing – Kung S. Y, H. J. While House, T. Kailath, 1985, Prentice Hall.

REFERENCE BOOKS:

1. Design of Analog – Digital VLSI Circuits for Telecommunications and Signal Processing – Jose E. France, Yannis Tsividis, 1994, Prentice Hall.
2. VLSI Digital Signal Processing – Medisetti V. K, 1995, IEEE Press (NY), USA.

Course Code	Course Title	L	T	P	C
20412T05	Programme Elective- III CPLD and FPGA Architectures and Applications.	3	0	0	3

UNIT-I

Introduction to Programmable Logic Devices Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/ Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

UNIT-II

SYSTEM LEVEL DESIGN: Controller, data path and functional partitions, Parallel adder cell, parallel adder sequential circuits, counters, multiplexers, parallel controllers.

UNIT-III

Field Programmable Gate Arrays Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

UNIT –IV

SRAM Programmable FPGAs Introduction, Programming Technology, Device Architecture, The Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT –V

Anti-Fuse Programmed FPGAs Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

Design Applications General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

TEXT BOOKS:

1. Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition.
2. Digital Systems Design - Charles H. Roth Jr, Lizy Kurian John, Cengage Learning.

REFERENCE BOOKS:

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
2. Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/ Samiha Mourad, Pearson Low Price Edition.
3. Digital Systems Design with FPGAs and CPLDs - Ian Grout, Elsevier, Newnes.
4. FPGA based System Design - Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.

Course Code	Course Title	L	T	P	C
20412T06	Programme Elective- III Advanced Computer Architecture	3	0	0	3

UNIT -I: Fundamentals of Computer Design: Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law. Instruction set principles and examples- Introduction, Classifying instruction set- Memory addressing- type and size of operands, Operations in the instruction set.

UNIT –II: Pipelines: Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design: Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT -III: Instruction Level Parallelism the Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation.

UNIT-IV : ILP Software Approach Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

UNIT –V: Multi Processors and Thread Level Parallelism: Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization.

TEXT BOOKS

1. John L. Hennessy, David A. Patterson – Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

REFERENCES

1. John P. Shen and Miikko H. Lipasti – Modern Processor Design : Fundamentals of Super Scalar Processors
2. Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs., MC Graw Hill.
3. Advanced Computer Architecture – A Design Space Approach – Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson Ed

Course Code	Course Title	L	T	P	C
20412T07	Programme Elective- IV Design for IOT	3	0	0	3

UNIT I – OVERVIEW IoT:-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

UNIT II – REFERENCE ARCHITECTURE: IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT III – IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS:PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

UNIT IV – TRANSPORT & SESSION LAYER PROTOCOLS: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

UNIT V – SERVICE LAYER PROTOCOLS & SECURITY: Service Layer - oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer

TEXT BOOKS:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, Academic Press, 2014.

2. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI

REFERENCES BOOKS:

1. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

2. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118- 47347-4, Willy Publications

3. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-onApproach)”, 1 st Edition, VPT, 2014.

4. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

Course Code	Course Title	L	T	P	C
20412T08	**Programme Elective- IV DSP Processors and Architecture**	**3**	**0**	**0**	**3**

UNIT-I

Introduction to Digital Signal Processing Introduction, a Digital signal processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT),
Linear time-invariant systems, Digital filters, Decimation and interpolation.

UNIT-II

Computational Accuracy in DSP Implementations Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-III

Architectures for Programmable DSP Devices Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-IV

Programmable Digital Signal Processors Commercial Digital signal processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX Instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-V

Analog Devices Family of DSP Devices Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
3. Embedded Signal Processing with the Micro Signal Architecture: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007

REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Programming and Applications- B. Venkataramani and M. Bhaskar, 2002, TMH.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.

Course Code	Course Title	L	T	P	C
20412T09	Programme Elective- IV Semiconductor Memory Design and Testing.	3	0	0	3

UNIT-I

Random Access Memory Technologies SRAM – SRAM Cell structures, MOS SRAM Architecture, MOS SRAM cell and peripheral circuit operation, Bipolar SRAM technologies, SOI technology, Advanced SRAM architectures and technologies,

UNIT-II

Application Specific: SRAMs, DRAM – DRAM technology development, CMOS DRAM, DRAM cell theory and advanced cell structures, BICMOS DRAM, soft error failure in DRAM, Advanced DRAM design and architecture, Application specific DRAM.

UNIT-III

Non-volatile Memories Masked ROMs, High density ROM, PROM, Bipolar ROM, CMOS PROMS, EPROM, Floating gate EPROM cell, One time programmable EPROM, EEPROM, EEPROM technology and architecture, Non-volatile SRAM, Flash Memories (EPROM or EEPROM), advanced Flash memory architecture

UNIT-IV

Memory Fault Modeling Testing and Memory Design for Testability and Fault Tolerance RAM fault modeling, Electrical testing, Pseudo Random testing, Megabit DRAM Testing, non-volatile memory modeling and testing, IDDQ fault modeling and testing, Application specific memory testing, RAM fault modeling, BIST techniques for memory

UNIT-V

Semiconductor Memory Reliability and Radiation Effects General reliability issues RAM failure modes and mechanism, Non-volatile memory reliability, reliability modeling and failure rate prediction, Design for Reliability, Reliability Test Structures, Reliability Screening and qualification, Radiation effects, Single Event Phenomenon (SEP), Radiation Hardening techniques

Advanced Memory Technologies and High-density Memory Packing Technologies

Ferroelectric RAMs (FRAMs), GaAs FRAMs, Analog memories, magneto resistive RAMs (MRAMs), Experimental memory devices, Memory Hybrids and MCMs

(2D), Memory Stacks and MCMs (3D), Memory MCM testing and reliability issues, Memory cards, High Density Memory Packaging Future Directions.

TEXT BOOKS:

1. Semiconductor Memories Technology – Ashok K. Sharma, 2002, Wiley.
2. Advanced Semiconductor Memories – Architecture, Design and Applications - Ashok K. Sharma- 2002, Wiley.
3. Modern Semiconductor Devices for Integrated Circuits – Chenming C Hu, 1st Ed., Prentice Hall.

Course Code	Course Title	L	T	P	C
20412L10	Embedded Design lab	0	0	4	2

The Students are required to write the programs using C-Language according to the Experiment requirements using RTOS Library Functions and macros ARM-926 developer kits and ARM-Cortex.

• The following experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation, execution and implement the same using necessary hardware kits for verification. The programs developed for the implementation should be at the level of an embedded system design.

• The students are required to perform at least SIX experiments from Part-I and TWO experiments from Part-II.

List of Experiments:

Part-I:

Experiments using ARM-926 with PERFECT RTOS

1. Register a new command in CLI.
2. Create a new Task.
3. Interrupt handling.
4. Allocate resource using semaphores.
5. Share resource using MUTEX.
6. Avoid deadlock using BANKER'S algorithm.
7. Synchronize two identical threads using MONITOR.
8. Reader's Writer's Problem for concurrent Tasks.

Part-II

Experiments on ARM-CORTEX processor using any open source RTOS.(Coo-Cox-Software-Platform)

1. Implement the interfacing of display with the ARM- CORTEX processor.
2. Interface ADC and DAC ports with the Input and Output sensitive devices.
3. Simulate the temperature DATA Logger with the SERIAL communication with PC.
4. Implement the developer board as a modem for data communication using serial port communication between two PC's.

Lab Requirements:

Software:

(i) Eclipse IDE for C and C++ (YAGARTO Eclipse IDE), Perfect RTOS Library, COO- COX Software Platform, YAGARTO TOOLS, and TFTP SERVER.

(ii) LINUX Environment for the compilation using Eclipse IDE & Java with latest version.

Hardware:

(i) The development kits of ARM-926 Developer Kits and ARM-Cortex Boards.

(ii) Serial Cables, Network Cables and recommended power supply for the board.

Course Code	Course Title	L	T	P	C
20412L11	VLSI System design Lab-II	0	0	4	2

SYSTEMS DESIGN LAB

Systems Design experiments

• The students are required to design the logic to perform the following experiments using necessary Industry standard simulator to verify the logical /functional operation, perform the analysis with appropriate synthesizer and to verify the implemented logic with different hardware modules/kits (CPLD/FPGA kits).

• Consider the suitable switching function and data to implement the required logic if required.

List of Experiments:

1. Determination of EPCs using CAMP-I Algorithm.
2. Determination of SPCs using CAMP-I Algorithm.
3. Determination of SCs using CAMP-II Algorithm.
4. PLA minimization algorithm (IISc algorithm)
5. PLA folding algorithm(COMPACT algorithm)
6. ROM design.
7. Control unit and data processor logic design
8. Digital system design using FPGA.
9. Kohavi algorithm.
10. Hamming experiments.
11. Multipliers

12 DSP processing systems (FFT)

Lab Requirements:

Software: Industry standard software with perpetual licence consisting of required simulator, synthesizer, analyzer etc. in an appropriate integrated environment.

Hardware: Personal Computer with necessary peripherals, configuration and operating System
and relevant VLSI (CPLD/FPGA) hardware Kits.

Course Code	Course Title	L	T	P	C
20412T12	Intellectual Property Rights And Patents	2	0	0	2

UNIT I

Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO –Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR – Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II

Copyrights and Neighboring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III

Patents

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations – Ownership and Transfer –– Revocation of Patent – Patent Appellate Board - Infringement of Patent – Double Patenting ––Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV

Trademarks

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership –Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V

Trade Secrets

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret –Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law. Cyber Law and Cyber Crime

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi

COURSE STRUCTURE
MBA I SEMESTER

S. No	Course Code	Course Title	Hours per week			Total Marks	Credits
			Lecture	Tutorial	Practical		
1	20MB1T01	Management Process & Organizational Behavior	4	0	0	100	4
2	20MB1T02	Managerial Economics	4	0	0	100	4
3	20MB1T03	Financial Accounting & Analysis	4	0	0	100	4
4	20MB1T04	Business Communication & Soft Skills	4	0	0	100	4
5	20MB1T05	Quantitative Techniques For Business Decisions	4	0	0	100	4
6	20MB1T06	Business Environment & Legal Aspects	4	0	0	100	4
7	20MB1L07	Information Technology LAB + Tally	0	0	3	100	3
8	20MB1L08	Business Communication & Soft Skills LAB	0	0	3	100	3
		Total	**24**	**0**	**04**	**800**	**30**

MBA II SEMESTER

S. No	Course Code	Course Title	Hours per week			Total Marks	Credits
			Lecture	Tutorial	Practical		
1	20MB2T01	Financial Management	4	0	0	100	4
2	20MB2T02	Human Resource Management	4	0	0	100	4
3	20MB2T03	Marketing Management	4	0	0	100	4
4	20MB2T04	Production and Operations Management	4	0	0	100	4
5	20MB2T05	Research Methodology for Managers	4	0	0	100	4
6	20MB2T06	Business Ethics &Corporate Governance	4	0	0	100	4
7	20MB2L07	Data Science Using R	0	0	3	100	3
8	20MB2T08	MOOC's/Swayam/NPTEL Management Courses other than listed courses in the syllabus	0	0	0	100	3
		Total	**24**	**0**	**2**	**800**	**30**

MBA III SEMESTER

S. No	Course Code	Course Title	Hours per week			Total Marks	Credits
			Lecture	Tutorial	Practical		
1	20MB3T01	Strategic Management	4	0	0	100	4
2	20MB3T02	Operations Research	4	0	0	100	4
3		Elective -1 Paper 1	4	0	0	100	3
4		Elective -1 Paper 2	4	0	0	100	3
5		Elective -2 Paper 1	4	0	0	100	3
6		Elective -2 Paper 2	4	0	0	100	3
7	20MB3T28	Industrial Project based on Summer Internship	0	0	0	100	3
		Total	**28**	**0**	**0**	**700**	**23**

MBA IV SEMESTER

S. No	Course Code	Course Title	Hours per week			Total Marks	Credits
			Lecture	Tutorial	Practical		
1	20MB4T01	Logistics and Supply Chain Management	4	0	0	100	4
2	20MB4T02	Entrepreneurship & Innovative Management	4	0	0	100	4
3		Elective -1 Paper 3	4	0	0	100	3
4		Elective -1 Paper 4	4	0	0	100	3
5		Elective -2 Paper 3	4	0	0	100	3
6		Elective -2 Paper 4	4	0	0	100	3
7	20MB4T29	Comprehensive Viva-Voce	0	0	0	100	3
		Total	**24**	**0**	**0**	**700**	**23**

MIC20 MBA II YEAR

Electives: The student ought to choose any **TWO** specializations from the following areas and also from each specialization any **TWO** courses have to be chosen at the beginning of III semester.

III Semester	**Finance**
20MB3T03	Financial Markets and Services
20MB3T04	Security Analysis & Portfolio Management
20MB3T05	Banking & Insurance Management
20MB3T06	Global Financial Management
20MB3T07	Behavioral Finance

IV Semester	**Finance**
20MB4T03	Risk Management &Derivatives
20MB4T04	Cost Management Accounting
20MB4T05	Strategic Financial Management
20MB4T06	Mergers, Acquisitions and Corporate Restructuring
20MB4T07	Taxation

III Semester	**Marketing**
20MB3T08	Consumer Behavior &Analysis
20MB3T09	Digital & Social Media Marketing
20MB3T10	Promotion & Distribution Management
20MB3T11	Retail Management
20MB3T12	Strategic Marketing Management

IV Semester	**Marketing**
20MB4T08	International Marketing Management
20MB4T09	Customer Relations & Services Marketing
20MB4T10	Advertising & Brand Management
20MB4T11	Green Marketing
20MB4T12	Rural Marketing

III Semester	**Human Resource Management**
20MB3T13	Performance Evaluation& Compensation Management
20MB3T14	Human Resource Metrics & Analytics
20MB3T15	Strategic Human Resource Management
20MB3T16	Leadership and Change Management
20MB3T17	Human Capital Management

IV Semester	**Human Resource Management**
20MB4T13	Leadership Management & Team dynamics
20MB4T14	Labor Welfare and Employment Laws
20MB4T15	Training and Development
20MB4T16	Employee Relations and Engagement
20MB4T17	International Human Resource Management
III Semester	**Business Analytics**
20MB3L18	Data Mining for Business Decisions
20MB3L19	Database Management System
20MB3T20	Web Designing
20MB3T21	Business Analytics
20MB3T22	Managing Digital Innovation and Transformation
IV Semester	**Business Analytics**
20MB4L18	Big Data Analytics
20MB4L19	Enterprise Resource Planning
20MB4L20	Cyber Laws and Security
20MB4T21	Information Systems Audit
20MB4T22	Artificial Intelligence and Machine Learning
III Semester	**Entrepreneurship**
20MB3T23	Indian Models in Entrepreneurship
20MB3T24	Social Entrepreneurship
20MB3T25	Business Plan Preparation for Small Business
20MB3T26	Entrepreneurial Marketing
20MB3T27	Family Business Management
IV Semester	**Entrepreneurship**
20MB4T23	Marketing for Small Business
20MB4T24	Finance and Accounting for Small Business
20MB4T25	Technology Appreciation and Intellectual Property Rights
20MB4T26	Innovation Technology Management
20MB4T27	Venture Valuation and Accounting

MBA I SEMESTER

L	T	P	C
4	0	0	4

20MB1T01 MANAGEMENT PROCESS & ORGANIZATIONAL BEHAVIOR

COURSE OBJECTIVES

1. To familiarizing the students with the basic concepts of Management.
2. To help the students gain understanding of the functions and responsibilities of managers.
3. To provide them tools and techniques to be used in the performance of the managerial job.
4. To enable them to analyze and understand the environment of the organization.
5. To help the students to develop cognizance of the importance of management principles.

COURSE OUTCOMES

On completion of this course, the students will be able to
CO1: Understand the concepts related to Business.
CO2: Demonstrate the roles, skills and functions of management.
CO3: Analyze effective application of PPM knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.
CO4: Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.

COURSE CONTENT

Unit – I

Nature of Management: Importance of Management, Evolution of Management Thought, Principles of Management, Management Process/Functions, and a System View. Social Responsibilities of Business - Manager and Environment Levels in Management - Managerial Skills.

Unit—II

Planning: Steps in Planning Process - Scope and Limitations - Short Range and Long Range Planning - Flexibility in Planning ¬Characteristics of a sound Plan - Management by Objectives (MBO) - Policies and Strategies - Scope and Formulation - Decision Making - Techniques and Processes - Management of Innovation - Entrepreneurial Management - Benchmarking

Unit-III

Organizing: Organization Structure and Design - Authority and Responsibility Relationships - Delegation of Authority and Decentralization - Interdepartmental Coordination - Emerging Trends in Corporate Structure, Strategy and Culture - Impact of Technology on Organizational design - Mechanistic vs Adoptive Structures - Formal and Informal Organization.

Unit – IV

Perception and Learning: Personality and Individual Differences - Motivation and Job Performance - Values, Attitudes and Beliefs - Stress Management - Communication Types-Process - Barriers - Making Communication Effective.

Unit – V

Group Dynamics: Leadership - Styles - Approaches - Power and Politics - Organisational Structure - Organisational Climate and Culture - Organisational Change and Development, Comparative Management Styles and approaches - Japanese Management Practices Organisational Creativity and Innovation - Best Management Practices across the world - Select cases of Domestic & International Corporations - Management of Diversity.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Durai, P. (2015). Principles of Management, Text and Cases. New Delhi: Pearson Education.
2. Koontz, H. (2010). Essentials of Management. New Delhi: Tata McGraw-Hill Education.

REFERENCES

1. Stoner, Freeman & Gilbert Jr. (2009). Management. New Delhi: Prentice Hall.
2. Weihrich, H. & Koontz, H. (2010). Management- A Global Perspective: New Delhi: Tata McGraw-Hill Education.
3. Robbins & Coulter (2013). Management. New Delhi: Prentice Hall.
4. Robbins, S.P. &Decenzo, D. A. (2014). Fundamentals of Management: Essential Concepts and Applications. New Delhi: Pearson Education.
5. Luthans, F. (2010). Organizational Behaviour. New York: McGraw-Hill.

MBA I SEMESTER

L	T	P	C
4	0	0	4

20MB1T02 MANAGERIAL ECONOMICS

COURSE OUTCOME

The students are imbibed with basic and intermediate economic concepts and make them to be best at economic and business analysis

UNIT -I

Introduction to Managerial Economics: Definition, Nature and Scope, Relationship with other areas, the role of managerial economist. Concept of opportunity cost, Incremental concept, Discounting Principle.

UNIT -II

Demand Analysis: Concept of demand, Demand Function, Determinant Factors, and Elasticity of demand, types and significance of Elasticity of Demand - Measurement of price Elasticity of Demand – Need for Demand forecasting, forecasting techniques.

UNIT -III

Production Analysis: Production function, Production functions with one/two variables, Marginal Rate of Technical Substitution, Cobb-Douglas Production Function, Returns to Scale and Laws of returns, economies and diseconomies in Production function.

UNIT -IV

Cost theory and estimation: Cost concepts, determinants of cost, cost – output relationship in the short run and long run —cost curves– Average total cost curve – Cost - Volume – Profit analysis and decision making.

UNIT-V

Market Structure and Pricing practices: Features and Types of different Markets – Price- Output determination in Perfect competition, Monopoly, Monopolistic competition and Oligopoly. Pricing methods in practice – Managerial Theories of a firm – Marris& Williams Models.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Paul, Koushil: “Managerial Economics”, Cengage Learning, New Delhi,
2. Siddiqui S A,Siddiqui A S: “Managerial Economics”, and Financial Analysis”, New Age International Publishers, New Delhi, 2008.
3. VanitaAgarwal: “Managerial Economics”, Pearson, New Delhi, 2013.
4. Dominick Salvatore: “Managerial Economics”, Oxford University Press, New Delhi,2010.
5. D.L. Ahuja: “Managerial Economics”, S. Chand & Company ltd,New Delhi-55.

REFERENCES

6. O’Sullivan, Sheffrin, Perez “Micro Economics: Principles, Applications and Tools”, Pearson Education.
7. Mithani D M: ‘’Managerial Economics”, Himalaya Publishing House, Mumbai, 2008.

8. Atmanand: “Managerial Economics”, Excel Publications. New Delhi, 2012.
9. Varshney, R.L and Maheswari, K L: ‘’Managerial Economics”, Sultan Chand and Sons, New Delhi, 2002.
10. Narayanan Nadar E, Vijayan S: ‘’Managerial Economics”, PHI Private Limited, New Delhi,2009.

MBA I SEMESTER

L	T	P	C
4	0	0	4

20MB1T03 FINANCIAL ACCOUNTING & ANALYSIS

COURSE OBJECTIVE
The objective of this course is to acquaint the students regarding various accounting concepts and its application in managerial decision making.

UNIT-I
Accounting Process: Definition of accounting, Accounting Cycle, Process. Classification of accounts, Branches of accounting, accounting equation – objectives, Scope and nature of accounting. Users of accounting information. introduction to GAAP, Accounting Concepts and conventions. Books of original entry, ledger- Preparation of Trial balance.

UNIT-II
Understanding Terminal accounts: Preparation and Presentation of income statement - Balance Sheet with Adjustments- Accounting standards - Preparation and Presentation of Company Final Accounts.

UNIT-III
Valuation of Fixed Assets: Meaning, definition of asset. Classification of Assets Concept of depreciation; Causes of depreciation; Depreciation, depletion, amortization, and dilapidation; Depreciation Accounting; Methods of recording depreciation; Methods for providing depreciation; Depreciation of different assets.

UNIT-IV
Financial Statement Analysis: The scope and purpose of financial analysis - financial statement analysis - Funds flow analysis - concepts of funds; ascertaining funds from operations ; Sources of funds - Uses of funds - Preparation and analysis of funds flow statement and cash flow statement.

UNIT-V
Financial Analysis: Ratioanalysis – Meaning of ratio, scope, importance, Objectives and limitations of Ratioanalysis – liquidity, activity, solvency and profitability ratios (Problems)

Relevant case studies have to be discussed in each unit and in examination one case study is compulsory from any unit.

TEXT BOOKS

1 Ashish K .Bhattacharya "Financial Accounting & Analysis" PHI, 2012.
2 V.Rajasekharam "Financial Accounting & Analysis" Pearson Education, New Delhi, 2012
3 Ranjan Kumar Bal: "Financial Accounting & Analysis", S.Chand, New Delhi, .2012

REFERENCES

4 Dr.P.Vijay Kumar: "Accounting For Managers" HPH-2014.
5 K.K.Verma "Financial Accounting & Analysis" PHI, 2012.

MBA I SEMESTER

L	T	P	C
4	0	0	4

20MB1T04 BUSINESS COMMUNICATION AND SOFT SKILLS

COURSE OBJECTIVE

To acquaint the students with fundamentals of communication, help them honing oral, written and non-verbal communication skills and to transform them as effective communicators.

COURSE OUTCOMES

The students are groomed with a channel of business communication skills and are best at bringing out productive work from within their colleague and associates.

COURSE CONTENT

Unit – I

Role of Communication in Business – Objective of Communication – The Process of Human Communication – Media of Communication, Written Communication – Oral Communication – Visual Communication, Audio Visual Communication – Silence - Developing Listening Skills – Improving Non–verbal Communication kills – Understanding Cultural Effects of Communication.

Unit – II

Managing Organization Communication - formal and Informal Communication-Intra and Personal Communication – Models for Inter Personal Communication – Exchange Theory, Johari Window and Transactional Analysis.

Unit-III

Managing Motivation to Influence Interpersonal Communication – Inter-Personal Perception – Role of Emotion in Inter Personal Communication- Communication Styles – Barriers of Communication – Gateways to Effective Interpersonal Communication.

Unit-IV:

Business Writing Skills – Significance of Business Correspondence, Essentials of Effective Business Correspondence, Business Letter and Forms - Academic Report Writing Difference between Academic and Business Reports Proposal Writing and Process Description, Oral Presentations – Meetings, Telephone Communication – Use of Technology in Business Communication, E-mail Messages.

Unit-V:

Report Writing: Meaning and Significance; Structure of Reports; Negative, Persuasive and Special Reporting; Informal Report – Proposals; Formal Reports; Organization of Press Report - Technical Proposals-Writing Proposals - Supplementary Parts / Appended Parts- Citing sources

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. K Bhardwaj, Professional Communication, IK Int Pub House, New Delhi
2. Krizan, Merrier, Logan and Williams, Effective Business Communications, Cengage, New Delhi
3. HC Gupta, SG Telang, Business Communication, Wisdom, Delhi

REFERENCE

4. Penrose, Business Communication for Managers, Cengage, New Delhi
5. McGrath, Basic Managerial Skills for All 5th ed., Prentice Hall of India.
6. UrmilaRai& S.M. Rai, Business Communication, Himalya Publishers,
7. Meenalshi Raman—Business Communication Oxford University Press.
8. Lesikar I Flatley, Basic Business Communication, Tata McGraw Hill.

MBA I SEMESTER

L	T	P	C
4	0	0	4

20MB1T05 QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS

COURSE OBJECTIVES

Students would be able to acquire an understanding of descriptive statistical tools like measures of central tendency & measures of variation and apply these tools to real life situations.

Unit I

Basic Mathematical & Statistical Techniques: Linear, Quadratic, Logarithmic and Exponential Functions- Permutations and Combinations – Matrices - Elementary operations of matrices.

Unit II

Measures of Central Tendency – Measures of Dispersion –Simple Correlation and Regression Analysis Concept of Probability- Probability Rules – Joint and Marginal Probability – Baye‘s Theorem- Probability Distributions- Binomial, Poisson, Normal and Exponential Probability Distributions.

UNIT III

Introduction to Decision Theory: Steps involved in Decision Making, different environments in which decisions are made, Criteria for Decision Making, Decision making under uncertainty, Decision making under conditions of Risk-Utility as a decision criterion, Decision trees, Graphic displays of the decision making process, Decision making with an active opponent.

Unit-IV

Sampling and Sampling Distributions – Estimation – Point and Interval Estimates of Averages and proportions of small and Large Samples –Concepts of Testing Hypothesis –One Sample Test for Testing Mean and Proportion of Large and Small Samples.

Unit-V

Tests Two Samples –Tests of Difference between Mean and Proportions of Small and Large Samples – Chi- square Test of Independence and Goodness of Fitness-Analysis of Variance.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. N.D.Vohra: ―Quantitative Techniques in Management‖, Tata-McGraw Hill Private Limited, New Delhi, 2011.
2. Gupta S.P: ―Statistical Methods‖, S. Chand and Sons, New Delhi.
3. Anand Sharma: ―Quantitative Techniques for Business decision Making‖, Himalaya Publishers, New Delhi, 2012.

REFERENCES

4. D P Apte: ―Operation Research and Quantitative Techniques‖, Excel Publication, New Delhi, 2013.
5. Hamdy, A.Taha: ―Operations Research: An Introduction‖, Prentice-Hall of India, New Delhi 2003.

6. Anderson: ―Quantitative Methods for Business‖, Cengage Learning, New Delhi 2013.
7. Sancheti, Dc & VK Kapoor, ―Business Mathematics‖, S Chand and Sons, NewDelhi.

MBA I SEMESTER

L	T	P	C
4	0	0	4

20MB1T06 BUSINESS ENVIRONMENT & LEGAL ASPECTS

COURSE OURCOMES

To provide knowledge of the environment in which businesses operate, the economic operational and financial framework with particular application to the transaction of business.

LEARNING OUTCOMES

At the end of the course, student should be able to:

1. Discuss the supply and demand theory and its impact on business.
2. Explain the effects of government policy on the economic environment and business.
3. Outline how an entity operates in a business environment.
4. Describe how financial information is utilized in business.
5. Explain the legal framework that regulates the business environment.

COURSE CONTENT

Unit –I

The concept of Business Environment: Internal, External, Micro, Macro and Global Environment as a tool of Managerial Practices, Business Environment in India - Social, Political, Demographic and Technological, Interaction Matrix of Different Environmental Factors, Indian economics: Issues and Challenges, Economic Systems, Balance of Payments.

Unit –II Circular Flow of Money in a Multi-sector Economy:

Concepts and Measurement of National Income, Business Cycles: Phases, Privatization and Disinvestment - Concept of Inflation, Deflation, Stagflation etc. and Unemployment.

Unit –III

Income Generation Theories: Consumption, Saving and Investment, Autonomous vs. Induced Investment and Multiplier, Pump Priming.

Unit –IV Indian Economic Policies:

Industrial Policy, Monetary Policy & Fiscal Policy in an open
Economy, Consumer Protection Policy, IPR, Taxation Policy-GST, RTI, FERA & FEMA, IT Act., International business environment: Nature- significance-Challenges and mechanisms, EXIM Policy, WTO: Agreements in the Uruguay round, TRIPS, TRIMS and GATS, Disputes settlement Mechanism, Dumping and antidumping.

Unit-V Legal Frame:

Competition Act, Bankruptcy code, NITI AYOG, SICA 1985 - Industrial
Sickness in India, BIFR 1995, Environmental Laws - Central Banking System, Financial Markets, FDI and FII Policy.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Mishra, S. K. and Puri, V. K. - Economic Environment and Business, Himalaya Publishing House, New Delhi, fifth and Revised Edition, 2009.
2. Sapiro, E. - Macro Economic Analysis, Galgotia Publishing House, New Delhi, Fifth Edition.

REFERENCES

1. Cherunillam, F. - Business Environment, Himalaya Publishing House, New Delhi
2. Dhingra, I. C. - The Indian Economy; Environment and Policy, Sultan Chand Publishers, New Delhi.
3. Dornbusch, R., Fischer, F. and Startz, R. - Macroeconomics, McGraw-Hill
4. Gupta, R.D. and Rana, A.S. - Keynes Post-Keynesian Economics, Kalyani Publisher, New Delhi. (Latest Edition)

MBA I SEMESTER

L	T	P	C
0	0	3	3

20MB1L07 INFORMATION TECHNOLOGY LAB

UNIT- 1

Introducing spreadsheet: Choosing the correct tool; Creating and Saving; Spreadsheet workspace; Managing the workspace; Entering and editing data; Data entry; Selecting cells; Saving time when entering data. Presenting a spreadsheet; Number and date/time format tools; Percentages; Dates and Times; Currency; Text; Performing calculations; Basic arithmetic; Using functions; Replicating formulae; Absolute cell addressing; References between worksheets.

UNIT -II

Ranges and functions: Creating named ranges; Using named ranges; Finding and inserting functions; Excel – Functions: what if, Conditional count, sum and average, Multiple criteria with count, sum and if. Time and date calculations.

UNIT- III

Basic of Accounting: Type of Accounts, Rules of Accounting, Principles of concepts and conventions, double entry system, book keeping Mode of Accounting, Financial Statements, Transaction, Recording Transactions. Getting the functional with Tally, Creation and setting up of company in Tally.

UNIT- IV

Accounting Masters in Tally- Features- Configurations- Setting up Account Heads.

UNIT- V

Inventory in Tally- Stock – groups – Stock Categories - Godowns / Location Units of Measure - Stock Items - Creating Inventor y Masters for National Traders

MBA I SEMESTER

	L	T	P	C
	0	0	3	3

20MB1L08 Business Communication & Soft Skills LAB

Course Objective

To acquaint the students with fundamentals of communication, help them honing oral, written and non-verbal communication skills and to transform them as effective communicators.

Unit: 1

Listening and speaking skills- Conversational skills (formal and informal) – group discussion. Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on YouTube. (Presenting before the class).

Activities for Unit-1:

1) Dos and Don‘ts of Group Discussions.
2) Tell me about yourself.
3) Self SWOT Analysis
4) Analysis of Academic Video clip uploaded on the system for the student.
5) News Presentation- Current affairs.

Unit – II

Organizational Communication:

Choosing the organization – goal setting - Time management — leadership traits – Team work – communicating across teams- designing career and life planning.

Activities for Unit-II:

1) Individual goal setting – process / SMART goals.
2) Designing a team activity to be conducted in the class.
3) Preparing a schedule plan for conducting an event (with proper time management).
4) Designing a self-career plan.
5) Prepare a time management chart for your daily schedule. (Prioritization)

Unit – III

Non-verbal communication and Body Language:

Understanding Body Language Aspects and presenting oneself to an interviewer, Proper handshakes.

Activities for Unit-III:

1) Maintaining the body language for interviews.
2) Presenting oneself to an interviewer.
3) Importance of kinesics in an interview.
4) Role plays on cross cultural communication.

Unit – IV

Written communication:

Writing job applications – cover letter – resume – emails – letters – memos – reports – blogs
– Writing for publications.

Activities for Unit-IV:

1) Preparation of effective Resume.
2) Write dialogues for the following situation: Mr. A calls a Hotel in Shimla to make a reservation for four people.
3) Write dialogues for the following situation: Mr. K gives direction to his friend how to reach the JNTUK University.
4) Write a covering letter for job application in TCS.
5) Write at least 5 E-mail etiquette.

Unit- V

Presentation skills:

Designing presentations and enhancing presentation skills.

Activities for Unit-V:
1) Prepare a PowerPoint presentation on presentation skills.
2) How to make an effective presentation.
3) Prepare and present a PPT on any topic given by the examiner.

TEXT BOOKS

1.Mallika Nawal: ―Business Communication‖, Cengage Learning, New Delhi, 2012.
2.Edwin A. Gerloff, Jerry C. Wofford, Robert Cummins Organisational Communication: The key stone to managerial effectiveness.
3.Meenakshi Rama: ―Business Communication‖, Oxford University Press, NewDelhi
4. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai
5. Paul Turner: ―Organisational Communication‖, JAICO Publishing House, New Delhi.

REFERENCES

6. SathyaSwaroopDebasish, Bhagaban Das‖ ―Business Communication‖, PHIPrivate Limited, New Delhi, 2009.
7. R.K.Madhukar: ―Business Communication‖, Vikas Publishing House, New Delhi, 2012.
8. Kelly M Quintanilla, Shawn T.Wahl:―Business and Professional Communication‖, SAGE,New Delhi, 2012.
9. Sangita Mehta, NeetyKaushish: ―Business Communication‖, University Science Press, New Delhi, 2010.
10. Anjali Ghanekar: ―Business Communication Skills‖, Everest Publishing House, New Delhi,2011

MBA II SEMESTER

L	T	P	C
4	0	0	4

20MB2T01 FINANCIAL MANAGEMENT

COURSE OBJECTIVES

The Course is designed for the students to understand the Financial Management concepts and to identify, enrich and fulfill the needs of Financial Markets.

COURSE OUTCOMES

The students will be prepared with appropriate knowledge in Finance domain, making them masters & give their best at critical thinking & problem solving skills.

COURSE CONTENT

UNIT –I

Financial Management: Concept - Nature and Scope - Evolution of financial Management -Goals and objectives of financial Management - Profit maximization Vs. Wealth maximization Vs Value Maximization - Major decisions of financial manager.

UNIT-II

Financing Decision:

Sources of Finance: Introduction to Sources of finance- Long Term. Concept of Capital Structure, Capital Structure Decisions– EBIT –EPS analysis. Concept of leverage and types of leverage. Cost of Capital: Weighted Average Cost of Capital.

UNIT –III

Investment Decision: Concept of Time Value of money – Techniques of Time Value of Money– Nature and Significance of Investment Decision – Estimation of Cash flows – Capital Budgeting Process – Techniques of Investment Appraisal – DCF Techniques- Net Present Value, Profitability Index and Internal Rate of Return.

UNIT-IV

Dividend Decision: Meaning and Significance-Major forms of dividends-Theories of Dividends-Determinants of Dividend-Dividends Policy and Dividend valuation-Bonus Shares-Stock Splits-Dividend Policies of Indian Corporate.

UNIT-V

Liquidity Decision: Meaning - Classification and Significance of Working Capital – Components of Working Capital – Factors determining the Working Capital – Estimating Working Capital requirement.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. I.M. Pandey: “Financial Management”,Vikas Publishers, New Delhi, 2013.
2. Sudarshan Reddy: Financial Management, HPH, New Delhi.

REFERENCES

1 P.Vijaya Kumar, M.Madana Mohan, G. SyamalaRao:“Financial Management”, Himalaya Publishing House, New Delhi,2013.
2 Rajiv Srivastava, Anil Misra: “Financial Management”, Oxford University Press, New Delhi, 2012. Delhi, 2012.
3. Prasanna Chandra: “Financial Management Theory and Practice”, Tata McGrawHill 2011.

MBA II SEMESTER

L	T	P	C
4	0	0	4

20MB2T02 HUMAN RESOURCE MANAGEMENT

COURSE OBJECTIVES:
To equip the students with basic concepts of Human Resource Management and the various functions of HRM including Industrial Relations in the liberalized, socialism environment.
COURSE OUTCOME
The students will be best endowed with leadership & team work and shall be toned professionals with ethics and social responsibility.
COURSE CONTENT
UNIT –I
HRM: Definition and Functions and Significance –Scope and evolution of HRM-Principles - HR policies–Functions of HR Manager-Role and position of HR department – Human Resource Management in Changing Environment-emerging trends in HRM.

UNIT –II
FUNCTIONAL HRM: HR Planning -Recruitment and Selection- Tests and Interview Techniques - Training and Development- Techniques – Training evaluation - retention - Job Analysis – job description and specifications -HRD concepts.

UNIT –III
PERFORMANCE APPRAISASL: Meaning and Importance - Traditional and Modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation, Concepts and Principles- Influencing Factors- Current Trends in Compensation – Collective Bargaining–disputes resolution mechanisms-Grievances

UNIT –IV
WAGE AND SALARY ADMINISTRATION: Wage and Salary- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials – Job design and Evaluation-Methods - Concept of Industrial Relations-Trade Unions - Employee Participation Scheme

UNIT-V
WELFARE MEASURES: Welfare management: Nature and concepts – statutory and non-statutory welfare measures –Role of Welfare officer- incentive mechanisms-Safety at work – nature and importance – work hazards – safety mechanisms -Managing work place stress - HRIS-HR Accounting HR Audit.
Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.
TEXT BOOKS
1. K Aswathappa: “Human Resource and Personnel Management”, Tata McGraw Hill, New Delhi, 2013

2. N.SambasivaRao and Dr. Nirmal Kumar: “Human Resource Management andIndustrial Relations”, Himalaya Publishing House, Mumbai

REFERENCES

1. Mathis, Jackson,Tripathy:“Human Resource Management:Asouth-Asin Perspective”, Cengage Learning, New Delhi, 2013
2. SubbaRao P: “Personnel and Human Resource Management-Text and Cases”, Himalaya Publications, Mumbai, 2013.
3. MadhurimaLall, SakinaQasimZasidi: “Human Resource Management”, Excel Books, New Delhi, 2010

MBA II SEMESTER

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20MB2T03 MARKETING MANAGEMENT

COURSE OBJECTIVES

The Course is designed for the students to understand the Marketing concepts and to identify, enrich and fulfill the needs of customers and markets.

COURSE OUTCOMES

The students are provided with basic domain knowledge and acts as a stepping stone for further proceedings and better helps in understanding business environment and global exposure in Marketing perspective.

COURSE CONTENT

UNIT –I

Introduction to Marketing: Concept of Market, Marketing and Marketing Mix - Product and Production Concept - Sales and Marketing Concept - Societal Marketing Concept - Indian Marketing Environment.

UNIT –II

Market Segmentation, Targeting& Positioning: Identification of Market Segments - Consumer andInstitutional/corporate Clientele - Segmenting Consumer Markets – Segmentation Basis – Evaluation and Selection of Target Markets – Positioning for competitive advantage.

UNIT –III

Pricing Strategy: Objectives of Pricing - Methods of Pricing - Selecting the Final price -Adopting price - Initiating the price cuts - Imitating price increases - Responding to Competitor's price changes.

UNIT –IV

Marketing Communication: Communication Process – Communication Mix - ManagingAdvertising Sales Promotion - Public relations and Direct Marketing - Sales force -Objectives of Sales force - Structure and Size - Sales force Compensation - Green marketing;Cyber marketing; Relationship marketing and other developments of marketing.

UNIT –V

Marketing Research: Meaning and scope of marketing research; Marketing research process. Marketing Organisation and Control: Organising and controlling marketing operations, Social, ethical and legal aspects of marketing; Marketing of services; International marketing;

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Text Books

1. Lamb, Hair, Sharma: "MKTG" CengageLearning , New Delhi, 2013
2. Phillip Kotler: "Marketing Management ", Pearson Publishers, New Delhi, 2013.

References

3. RajanSexena: “Marketing Management”, Tata McGraw Hill, New Delhi, 2012.
4. R.Srinivasan: “Case Studies in Marketing”, PHI Learning, New Delhi, 2012
5. Tapan K Pand: “Marketing Management”, Excel Books, New Delhi, 2012
6. Paul Baines, Chris Fill, Kelly Page Adapted by Sinha K: “Marketing”, Oxford University Press, Chenni, 2013.

MBA II SEMESTER

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20MB2T04 PRODUCTION & OPERATIONS MANAGEMENT

COURSE OBJECTIVES

This Course is designed to make student understand the strategic significance of Operation management, to acquaint them with application of discipline to deal with real life business problem.

COURSE OUTCOMES

The students are trained at critical thinking, business analysis and innovative problem solving skills with adequate domain knowledge

COURSE CONTENT

UNIT –I

Introduction: Overview & Definition of Production and Operations Management-.Understanding similarities and difference among products, goods and services. Nature and Scope of Production and Operations Management- Historical Evolution, Operations management strategy framework –Role & responsibilities of the production manager - Types of Manufacturing Processes.

UNIT –II

Production Planning and Control: Stages in PPC – Gantt – PPC in Mass, Batch, and Job Order Manufacturing- Aggregate planning and Master Scheduling, MRP-I, MRP-II, CRP. Maintenance management & Industrial Safety - ERP, lean system, Constrain management (TOC). . Inventory Control, Costs & Types of Inventory. – ABC, VED and FSN analyses. Value Analysis and value Engineering

UNIT –III

System Design: Product strategy and integrated product development. Plant Location & Layout Planning- Factors influencing location - types of layouts. Capacity Planning – Optimal Production Strategies: Scheduling and Sequencing of Operations. Computer integrated manufacturing, DSS for operational management. Work Design: Method Study and Work Measurement - Work Sampling.

UNIT –IV

Managing of Work Environment: – Automation --Technology Management -Waste Management. Quality Assurance and Quality Circles – Statistical Quality Control – Control Charts for Variables- Average, Range and Control charts for Attributes. Purchase functions and Procedure - Inventory control – Types of Inventory– Safety stock – Inventory Control Systems –JIT, VMI.

UNIT –V

Product Quality Improvement: Basic concepts of quality, dimensions of quality, Juran's quality trilogy, Deming's 14 principles, Quality improvement and cost reduction, ISO 9000-2000 clauses & coverage. Six Sigma, Productivity –factors affecting productivity, improvements in productivity - new product development and design - stages & techniques

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. PannerSelvem: “Production and Operation Management”, Prentice Hall of India, NewDelhi, 2012.
2. K.Aswathappa, K. Shridhara: “Production & Operation Management”, Himalaya Publishing House, New Delhi, 2012

REFERENCES

3. Ajay K Garg: “Production and Operation Management”, TMH, New Delhi,2012
4. Deepak Kumar Battacharya: “Production & Operation Management”, University Press, New Delhi, 2012
5. AlanMuhlemann, JohnOakland,jastiKatyayani: “Production and Operation Management”, Pearson, New Delhi,2013

MBA II SEMESTER

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20MB2T05 RESEARCH METHODOLOGY FOR MANAGERS

COURSE OBJECTIVE
Developing the students in Research orientation and to acquaint them with fundamental of research methods.
COURSE OUTCOMES
The students are trained at critical thinking, business analysis and best equipped with research oriented problem solving skills

COURSE CONTENTS

Unit- I Introduction to Research: Meaning of research; Types of research; the process of research; Research applications in social and business sciences; Features of a Good research study.

Unit-II Research Problem and Formulation of Research Hypotheses: Defining the Research problem; Management Decision Problem vs. Management Research Problem; Problem identification process; Components of the research problem; Formulating the research hypothesis- Types of Research hypothesis; Writing a research proposal Contents of a research proposal and types of research proposals.

Unit–III Research Design: Meaning of Research Designs; Nature and Classification of Research Designs; Exploratory Research Designs: Secondary Resource analysis, Case study Method, Expert opinion survey, Focus group discussions; Descriptive Research Designs: Cross-sectional studies and Longitudinal studies; Experimental Designs, Errors affecting Research Design - Structure of the research report- Preliminary section, Main report, Interpretations of Results and Suggested Recommendations; Report writing: Formulation rules for writing the report: Guidelines for presenting tabular data, Guidelines for visual Representations.

Unit–IV Data and Sampling: Classification of Data; Uses, Advantages, Disadvantages, Types and sources; Primary Data Collection: Observation method, Focus Group Discussion, Personal Interview method. Attitude Measurement and Scaling: Types of Measurement Scales; Attitude; Classification of Scales: Single item vs Multiple Item scale, Comparative vs Non-Comparative scales, Measurement Error, Criteria for Good Measurement. Questionnaire Design: Questionnaire method; Types of Questionnaires; Process of Questionnaire Designing; Advantages and Disadvantages of Questionnaire Method. Sampling: Sampling concepts- Sample vs Census, Sampling vs Non Sampling error; Sampling Design- Probability and Non Probability Sampling design; Determination of Sample size- Sample size for estimating population mean, Determination of sample size for estimating the population proportion.
Unit-V Testing of Hypotheses: Concepts in Testing of Hypothesis – Steps in testing of hypothesis, Test Statistic for testing hypothesis about population mean;

Tests concerning Means- the case of single population; Tests for Difference between two population means; Tests concerning population proportion- the case of single population; Tests for difference between two population proportions.- Chi-square Analysis: Chi square test for the Goodness of Fit; Chi square test for the independence of variables; Chi square test for the equality of more than two population proportions.- Analysis of Variance: Completely randomized design in a one-way ANOVA; Randomized block design in two way ANOVA.
Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Text Books

1.C.R.Kotari-“Research Methodology for Business”-Excel Publishing House.
2. Cooper R.Donald and Schindler S. Pamela: “Business Research Methods”, 9/e, Tata MCGraw Hill, New Delhi.

MBA II SEMESTER

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20MB2T06 BUSINESS ETHICS & CORPORATE GOVERNANCE

COURSE OUTCOMES

The students shall be cultivated with ethics and social responsibility which in turn shall be for the betterment of country and also for the overall development of the organization they are joining.

COURSE CONTENT

Unit-I: Understanding Corporate Governance: Corporate governance – an overview, History of corporate governance- Concepts of Corporate Governance: Theory& practices of corporate governance, corporate governance mechanism and overview – land marks in emergence of corporate governance.

Unit-II: Stakeholders: Rights and privileges; problems and protection, Corporate Governance and Other stakeholders- Board of Directors: A Powerful Instrument in Governance; Role and responsibilities of auditors.

Unit-III: Codes of corporate governance: Development of codes and guidelines and summary of codes of best conduct, Banks and corporate governance; Ganguly committee's Recommendation.

Unit-IV: Business Ethics and Corporate Governance: Corporate Social Responsibility: Justification, Scope and Indian Corporations-Environmental Concerns and Corporations: Indian Environmental Policy, The Role Of Media in Ensuring Corporate Governance; Ethics in Advertising.

Unit- V: Acts & Policies: Monopoly, Competition and Corporate Governance; MRTP Act and Competition Act, The Role of Public Policies in Governing Business, SEBI, The Role of Government in Developing and Transition Economics- Corporate Governance in Developing and Transition economies, Corporate Governance: Indian scenario, The Corporation in a Global Society.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1.Corporate governance: Principles, policies and Practices, Fernando, A.C., Pearson.

2. Business ethics: Concepts & cases, velasquez, Manuel G.,Pearson.

3. Corporate governance: Principles, mechanism, and practices, Parthasarthy, Biztantra

REFERENCES

4.Mallin, A. Christine, Corporate governance, Oxford University press.

5. Bajaj and Aggarwal, Business ethics, Biztantra.

6. Crane &Matten, Business ethics, Oxford.

7. Prasad, corporate governance, PHI learning Pvt Ltd.

MBA II SEMESTER

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20MB2L07 DATA SCIENCE USING R

COURSE OBJECTIVES

In this course students learn how to program in R and how to use R for effective data analysis.. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, and organizing and commenting R code. Topics in statistical data analysis and optimization will provide working examples.

COURSE OUTCOMES

1. Implement the basic concepts and data structures of R.
2. Implement loops and functions in R
3. Implement mathematical functions and handling files
4. Apply the different distributions
5. Use various graphical tools in R
6. Describe the properties of discrete and continuous distribution functions

CONCEPTS TO BE COVERED:

Introduction, How to run R, R Programming Structures, Control Statements, Loops, , Functions, Recursion, Doing Math and Simulation in R, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files, Creating Graphs, Saving Graphs to Files, Probability Distributions, Correlation and Covariance, Linear Models.

LIST OF EXPERIMENTS:

Exercise 1: Introduction to R Programming
Exercise 2: Getting Used to R: working with Data Structures
Exercise 3: Using Conditional & Iterative Statements in R
Exercise 4: Working with functions
Exercise 5: Doing Math and Simulation in R Math Functions

- Calculus
- Linear algebraic operations
- Set operations•

Exercise 6: Reading in Your Own Data Working with files

- Accessing the Keyboard and Monitor,

Exercise 7: Data visualization Charts and plots

- Find the mean, median, standard deviation and quintiles of a set of observations.
- Students may experiment with real as well as artificial data sets.

Exercise 8: Probability Distributions. Generate and Visualize Discrete and continuous distributions using the statistical environment.

- Demonstration of Normal, binomial and Poisson distributions.

Students are expected to generate artificial data using and explore various distribution and its• properties. Various parameter changes may be studied.

Exercise 9: Correlation Calculate the correlation between two variables. Use the scatter plot to investigate the relationship between two variables

Exercise 10: Fitting a straight line of type y= a + bx

- A Statistical Model for a Linear Relationship
- The R Function: lm

TEXT BOOKS:

1) Statistical Learning using R, WHITTON
2) The Art of R Programming, A K Verma, Cengage Learning.
3) R for Everyone, Lander, Pearson
4) The Art of R Programming, Norman Matloff, No starch Press.

REFERENCES:

1) R Cookbook, Paul Teetor, Oreilly.
2) R in Action, Rob Kabacoff, Manning

MBA II SEMESTER

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20MB2T08 MOOCs: SWAYAM/NPTEL (Open Elective)

Related to Management Courses other than listed courses the syllabus

MBA III SEMESTER

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20MB3T01 STRATEGIC MANAGEMENT

COURSE OUTCOME

This Course will create knowledge and understanding of management concepts principles and skills from a people, finance, marketing and organizational perspectives the development of appropriate organizational policies and strategies within a changing context to meet stakeholder interests information systems to learn from failure key tools and techniques for the analysis and design of information systems, including their human and organizational as well as technical aspects.

COURSE CONTENT

UNIT I

STRATEGY AND PROCESS

Conceptual framework for strategic management, the Concept of Strategy and the Strategy Formation Process – Stakeholders in business – Vision, Mission and Purpose – Business definition, Objectives and Goals - Corporate Governance and Social responsibility.

UNIT II

COMPETITIVE ADVANTAGE

External Environment - Porter's Five Forces Model-Strategic Groups Competitive Changes during Industry Evolution- Globalizations and Industry Structure - National Context and Competitive advantage Resources- Capabilities and competencies–core competencies-Low cost and differentiation Generic Building Blocks of Competitive Advantage- Distinctive Competencies Resources and Capabilities durability of competitive Advantage- Avoiding failures and sustaining competitive advantage.

UNIT III

STRATEGIES 10

The generic strategic alternatives – Stability, Expansion, Retrenchment and Combination strategies - Business level strategy- Strategy in the Global Environment-Corporate Strategy Vertical Integration-Diversification and Strategic Alliances- Building and Restructuring the corporation- Strategic analysis and choice - Environmental Threat and Opportunity Profile (ETOP) - Organizational Capability Profile - Strategic Advantage Profile - Corporate Portfolio Analysis - SWOT Analysis - GAP Analysis - Mc Kinsey's 7s Framework - GE 9 Cell Model – Distinctive competitiveness - Selection of matrix - Balance Score Card.

UNIT IV

STRATEGY IMPLEMENTATION & EVALUATION

The implementation process, Resource allocation, Designing organizational structure-Designing Strategic Control Systems- Matching structure and control to strategy-Implementing Strategic change- Politics-Power and Conflict-Techniques of strategic evaluation & control.

UNIT V

OTHER STRATEGIC ISSUES

Managing Technology and Innovation - Strategic issues for Non Profit organizations. New Business Models and strategies for Internet Economy.

Relevant cases have to be discussed in each unit.

TEXTBOOK

1. Hill. Strategic Management: An Integrated approach, 2009 Edition Wiley (2012).

2. John A.Parnell. Strategic Management, Theory and practice Biztantra (2012).

3. Azhar Kazmi, Strategic Management and Business Policy, 3rd Edition, Tata McGraw Hill, 2008.

REFERENCES

1. Adriau HAberberg and Alison Rieple, Strategic Management Theory & Application, Oxford University Press, 2008.

2. Lawerence G. Hrebiniak, Making strategy work, Pearson, 2005.

3. Gupta, Gollakota and Srinivasan, Business Policy and Strategic Management – Concepts and Application, Prentice Hall of India, 2005.

4. Dr.Dharma Bir Singh, Strategic Management & Business Policy, KoGent Learning Solutions Inc., Wiley, 2012.

5. John Pearce, Richard Robinson and Amitha Mittal, Strategic Management, McGraw Hill, 12th Edition, 2012.

MBA III SEMESTER

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18MB3T02 OPERATIONS RESEARCH

COURSE OUTCOMES

- To impart the basic concepts of modeling, models and statements of the operations research.
- Formulate and solve linear programming problem/situations.
- Model strategic behavior in different economic situations.
- To solve transportation problems to minimize cost.
- Apply Queuing theory to solve problems of traffic congestion, counters in banks, railway bookings etc.
- Explain scheduling and sequencing of production runs and develop proper replacement policies.

COURSE CONTENTS

UNIT I

Introduction to Operations Research (OR) & Linear Programming (LP): OR definition - Classification of Models, modeling – Methods of solving OR Models, limitations and applications of OR models; Problem Formulation, Graphical Method, Simplex Method, Big-M Method, Two–Phase Simplex Method.

UNIT II

Transportation and Assignment Problems: Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution –North West Corner Rule, Least Cost Method, Vogel's Approximation Method; Optimality Method – Modified Distribution (MODI) Method; Special Cases – Unbalanced Transportation Problem.

Assignment Problem – Formulation, Hungarian Method for Solving Assignment Problems, Traveling Salesman problem.

UNIT III

Game theory: Optimal solution of two person zero sum games, the max min and min max principle. Games without saddle points, mixed strategies. Reduction by principles of dominance, arithmetic, algebraic method and graphical method.

Sequencing: Introduction to Job shop Scheduling and flow shop scheduling, Solution of Sequencing Problem, Processing of n Jobs through two machines, Processing of n Jobs through m machines, graphical method.

UNIT IV

Queuing Theory: Introduction – Terminology, Arrival Pattern, Service Channel, Population, Departure Pattern, Queue Discipline, Birth & Death Process, Single Channel Models with Poisson Arrivals, Exponential Service Times with finite queue length and non-finite queue length; Multichannel Models with Poisson Arrivals, Exponential Service Times with finite queue length and non - finite queue length.

UNIT V

Replacement and Maintenance Analysis: Introduction – Types of Maintenance, Make or buy decision. Types of Replacement Problems, Determination of Economic Life of an Asset, and Simple Probabilistic Model for Items which completely fail-Individual Replacement Model, Group Replacement Model.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. Sharma S.D., Operations Research: Theory, Methods and Applications, 15th Edition, Kedar Nath Ram Nath, 2010
2. Taha H.A., Operations Research, 9th Edition, Prentice Hall of India, New Delhi, 2010.

REFERENCE

1. Hiller F.S., and Liberman G.J., Introduction to Operations Research, 7th Edition, Tata McGraw Hill, 2010.
2. Sharma J.K., Operations Research: Theory and Applications, 4th Edition, Laxmi Publications, 2009.

MBA IV SEMESTER

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20MB4T01 LOGISTICS AND SUPPLYCHAIN MANAGEMENT

COURSE OUTCOMES

1. Analyze the manufacturing operations of a firm
2. Apply sales and operations planning, MRP and lean manufacturing concepts
3. Apply logistics and purchasing concepts to improve supply chain operations
4. Apply quality management tools for process improvement

COURSE CONTENT

UNIT I

Concept and Scope: Concepts of Logistics and supply chain- Importance of Logistics in these days global Sourcing, Production and consumption- Dimension of Logistics: Macro and Micro aspects- Supply chain contours: Backward and forward linkages- Supply chain efficiency- Logistics as a competitive edge driver- Peculiarities and diversity of needs of Logistics for
Retailing.

UNIT II

Logistics and Procurement: Logistics as a Support function of Procurement and Vendor Facilitation - Logistics as interface function of Demand Forecasting, Global procurement, Tracking inward shipments and Storage Planning- Logistics as an enabler of Just-in-Time (JIT), Kanban (A Scheduling system for lean inventory), Vendor Managed Inventory (VMI) for Vendors and the firm.

UNIT III

Logistics and Marketing: Logistics as a Support function of Order Fulfillment, Assembling &Labeling from Multi-storage points and Delivery- Logistics as an interface of Market forecasting, Stock level management, invoice or sales documentation, picking products, consolidation, transport-packaging, packing, marking, preparing outbound documentation and shipping out by loading into containers- customer facilitation tracking out-bound shipments.

UNIT IV

EXIM Logistics: Importance of Global Logistics- Export Logistics: Special Aspects of EX-IM logistics- Picking, Packing, Vessel Booking [Less-than Container Load(LCL) / Full Container Load (FCL)], Customs, Documentation, Shipment, Delivery to distribution centers, distributors and lastly the retail outlets- Import Logistics: Documents Collection- Valuing- Bonded Warehousing- Customs Formalities- Clearing- Distribution to Units- Security & Insurance- Multimodal Transport- UN International convention on MT of Goods- Terminal Networks: Types and Roles.

UNIT V

Invoice management: call centers, warehouse/distribution facilities – Carrier management- 4PL Specialties: Implementation Center: Business process analysis/scoping, Development of all activities into an open systems framework-

Product/Skill Centers: Supply chain engineering –4PL Value Added services: Knowledge Transfer, Business Development and Functional Support. Special Logistics: Inter-modal and Multimodal Logistics- Logistics for Trade Fairs and Events - Consolidation and Group age- Logistics of Time Perishable and Logistics of Quality Perishables- GS1 System of world-wide supply-chain standards system- E-Logistics –Warehouse Logistics- Reverse Logistics.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. Sahay B.S, *Supply Chain Management for Global Competitiveness*, Macmillan India Ltd., New Delhi.
2. Reguram G, Rangaraj N, *Logistics and Supply Chain Management Cases and Concepts*,
Macmillan India Ltd., New Delhi.
3. Coyle, Bradi&Longby, *The Management of Business Logistics*, West Publishing Co. Martin
Christopher, *Logistics and Supply Chain Management*

REFERENCE

1. Dawson, Larke and Mukoyama, *Strategic Issues in International Retailing,* Routledge, 2007
2. Paul R. Murphy Jr. and Donald Wood, C*ontemporary Logistics*
3. Harvard Business Review, *Managing Supply Chains*

MBA IV SEMESTER

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20MB4T02 ENTREPRENEURSHIP & INNOVATION MANAGEMENT

COURSE OUTCOMES

- Understanding of management in all its diverse aspects and its applicability to a wide range of practical management situations.
- understand the function of the entrepreneur in the successful, commercial application of innovations
- Explore entrepreneurial leadership and management style.

COURSE CONTENT

UNIT I

Entrepreneurship: Importance and growth - Characteristics and Qualities of Entrepreneur- Role of Entrepreneurship, Ethics and Social Responsibilities. Women Entrepreneurship: Role & Importance, Problems of Women Entrepreneurs – corporate entrepreneurship – mobility of
Entrepreneur – entrepreneurial motivation.

UNIT II

Training: Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit -Training for New and Existing Entrepreneurs, Feedback and Performance of Trainees. Creativity and Entrepreneurship: Sources and Methods of Ideas Planning and Development of Programmes

UNIT III

Planning and Evaluation of Projects: Growth of Firm – Project identification and selection - Factors inducing growth- - Project Feasibility Study - Post Planning of Project-Project Planning and Control.

UNIT IV

Meaning and Importance: Difference with creativity, invention and Discovery – Process- Typology – Innovation in Action like lateral thinking, out of box thinking, Disruptive ideas – Case Studies on Innovative business ideas like Red bus,Flipkart, Ola, Big basket etc.

UNIT-V

New ideas and opportunities: Developing business ideas, evaluating the opportunity – feasibility analysis – Developing business model.
Business plan- meaning, significance and contents – Formulation and presentation – Common errors – Preparation of project report.
Source of finance: Traditional and Non-traditional sources – venture capitalists, Angel investors, Private Equity cash.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012.
2. VSP Rao, Kuratko: "Entrepreneurship', Cengage Learning, New Delhi,

REFERENCES

1. K.Ramachandran: "Entrepreneurship Development", TMH, New Delhi, 2012
2. B.Janakiram, M Rizwana: "Entrepreneurship Development" Excel Books, New Delhi, 2011
3. Rajeev Roy: "Entrepreneurship", Oxford University Press, New Delhi, 2012
4. Vinnie jauhari & sudhanshu bhushan "Innovation Management" Oxford University press 2014
5. Sholmomaital, Dvrseshabri "Innovation Management" Response Books 2007

ELECTIVES

FINANACE

MARKETING

HUMAN RESOURCE MANAGEMENT

BUSINESS ANALYTICS

ENTREPRENEURSHIP MANAGEMENT

FINANACE

MBA III SEMESTER

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20MB3T03 FINANCIAL MARKETS AND SERVICES

COURSE OUTCOMES

1 To basic knowledge about the finance concepts, markets and various services provided in those markets.
2 To provides adequate information about the roles of intermediaries and its regulating bodies.
3 To understand financial system in India.

COURSE CONTENT

Unit – I
Introduction - Overview of financial system in India – financial Concepts – Money market vs Capital Market – Composition of Money market – Money market Instruments – Recent developments in Money Market – **New Issue Market** – New issue vs Stock exchange – Methods of floating new issues – Guidelines and principal steps of a Public issue. Players in New issue market. **Secondary Market** – Stock Exchanges in India – Listing of securities – trading and settlement procedures – Online trading

Unit – II
Securities and Exchange Board of India - Malpractices in securities market – Deficiencies – SEBI Guidelines – Prohibition of Unfair trade practices – Investors protection – Measures – functions and working of OTCEI, NSE, BSE, MCE-SX – Depository system (NSDL, CDSL)

Unit – III
Financial Services: Merchant Banking in India – Services of merchant banks – Guidelines for Merchant bankers – Hire purchase origin and Development – Bank Credit for Hire purchase business – Concept of Leasing – Steps – Accounting treatment of lease – Method of Ascertaining Lease rentals – Discounting, Factoring and Forfeiting

Unit – IV
Venture Capital and Mutual Fund: The Indian Scenario of Venture Capital – Suggestions for the growth – Nitin Desai Committee's recommendations – Origin and types of Mutual Fund – Risk involved in MF - NAV of MF – Performance evaluation of MF – Selection of MF – Reasons for slow growth.

Unit – V
Derivatives and Credit Rating: Derivatives – Kinds of Financial Derivatives – Forwards – Futures – Options – Swaps – Recent Developments – Indian Scenario – Credit rating in India – Credit rating New Symbols – Credit rating Agencies in India – SEBI guidelines 1999 - Practical Problems.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. Vasant Desai: “Banks & Institutional Management”, Himalaya Publishing House 2010.
2. Prasanna Chandra, “**Investment Analysis and Portfolio Management**”, TMH, New Delhi,

REFERENCES

1. E. Gordon and K. Natarajan : **Financial Markets and Services**, Himalaya Publishing House, 2015
2. Bharti V. Pathak, “The Indian Financial System”, Pearson Education [India] Ltd., Year 2006.
3. Meir Kohn, Financial Institutions and Market, Tata MC Graw-Hill Publication, Year-1999.

MBA III SEMESTER

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20MB3T04 SECURITY ANALYSIS & PORTFOLIO MANAGEMENT

COURSE OUTCOMES

1 To basic knowledge about the finance concepts, markets and various services provided in those markets.
2 To provides adequate information about the roles of intermediaries and its regulating bodies.
3 To understand financial system in India.

UNIT -I

Investment Analysis: Definition of investment, Investment Decision Process; Sources of investment information; Real investment vs. financial investment, Investment vs. Speculation; Factors to be considered in investment decision: Liquidity, Return, Risk, Maturity, Safety, Tax and Inflation. The concept and measurement of realized return and expected return. Ex-ante and ex-post returns. Measurement of risk & Return, Approaches to investment analysis-Fundamental and Technical Analysis; Efficient Market Hypothesis.

UNIT -II

Valuation of Fixed Income Securities: - Analysis, Valuation and Management Features and types of debt instruments, Bond indenture, factors affecting bond yield. Bond yield measurement-Current yield, holding period return, YTM, AYTM and YTC. Bond valuation: Bond-price theorems, Valuation of compulsorily/optionally convertible bonds, Valuation of deep discount bonds. Bond duration, Macaulay's duration and modified Macaulay's duration, Bond immunization.

UNIT-III

Valuation of Common Stocks: - Analysis and Valuation: Basic Features of Common Stock, Approaches to valuation–Balance sheet model, Dividend-discount model, Intrinsic Valuation. Earnings capitalization models; Price-Earnings multiplier approach, Security Market Indexes, their uses; computational procedure of Sensex and Nifty.

UNIT -IV

Portfolio Theory & Analysis: Concept of portfolio. Portfolio return and risk. Harry Markowitz's Portfolio theory, construction of minimum risk portfolio. The single-index model. Capital market theory: Capital Market Line (CML), Security Market line (SML), Efficient Frontier. Capital asset pricing model (CAPM): over-pricing and underpricing securities. Arbitrage pricing theory (APT).

UNIT -V

Mutual Funds and Portfolio Evaluation: Mutual funds: genesis, features, types and schemes. NAVs, costs, loads and return of mutual funds. Performance measures- Sharpe's reward to variability index, Treynor's reward to volatility index, Jensen's differential index.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. Prasanna Chandra, "Investment Analysis and Portfolio Management", TMH, New Delhi,
2. Preeti Singh, "Investment Management", Himalaya Publishing House. New Delhi.

REFERENCES

1 Punithavathy Pandian, "Security Analysis and Portfolio Management", Vikas Publishing House, New Delhi
2 V.K.Bhalla: "Fundamentals of Investment Management", S.Chand, New Delhi, 2013
3 S.Kevin: "Security Analysis and Portfolio Management" TMH, New Delhi, 2010
4 Sudhindra Bhat, "Security Analysis and Portfolio Management", Excel Books.32
5 Shashi and Rosy: "Security Analysis and Portfolio Management Investment Management", Kalyani Publishers, New Delhi.

REFERENCE

1. Rajni Sofat & PreetiHiro, STRATEGIC FINANCIAL MANAGEMENT, PHI, Delhi, 2011.
2. Weaver& Weston, STRATEGIC CORPORATE FINANCE, Cengage Learning, Delhi, 2001.
3. Chandra, Prasanna, FINANCIAL MANAGEMENT, Tata McGraw Hill, Delhi.

MBA III SEMESTER

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20MB3T05 BANKING & INSURANCE MANAGEMENT

COURSE OUTCOMES

- To make the students understand the various services offered and various risks faced by banks.
- To make them aware of various banking innovations after nationalization.
- To give them an overview about insurance industry.
- To make the students understand various principles, provisions that govern the Life General Insurance Contracts.

Course Content

UNIT I
Introduction to Banking: Introduction to Indian Financial System - Meaning of a Bank and Customer- Bank and customer Relationship - Role of commercial banks in Economic Development - Evolution of Banking in India – origin, nationalization, reforms and Financial Inclusion in India - Financial statements of banks with special focus on Indian banks - Financial statement analysis of banks: CAMEL Approach, Key Performance indicators Sources of Bank Funds.

UNIT II
Uses of Bank Funds: Features of Bank Credit - types of lending - assessment of credit worthiness of a prospective borrower - management of credit process - different types of loans and their features - Loan Pricing: The basic model, pricing fixed & floating rate loans, cost-benefit loan pricing, Customer Profitability Analysis - Non Performing Assets: - gross and net concept of NPAs, causes, implications & recovery of NPAs.

UNIT III
Regulation and Innovations in Banking System: Regulation of Bank Capital: The need to regulate Bank Capital - Concept of Economic Model - Concept of Regulatory Capital, Basel Accords I,II and III. Banc assurance, changing role of Banks as Financial Intermediaries. Customer service quality in Indian banking industry.

UNIT IV
Introduction to Insurance: Insurance as a Risk Management Tool- Principles of Insurance -Characteristics of Insurance contract - Functions of Insurers: Production, Underwriting, Rate Making, Managing Claims and Losses, Investment & Financing, Accounting & Record Keeping and other miscellaneous functions - Types of Insurers- Concept of Reinsurance, uses and advantages.

UNIT V
Life Insurance and General Insurance: The concept of Life Insurance - types of Life Insurance contracts - Tax treatment of Life Insurance- Life Insurance Products Classification of Life Insurance - The Actuarial Science- Provisions of Life Insurance contracts - Special Life Insurance forms - Health and General insurance–Overview, Types, Third Party Administrators- Micro Insurance in India.

Relevant cases have to be discussed in each unit.
Text Books

1. Peter.S.Rose & Sylvia. C. Hudgins: “Bank Management & Financial Services”,

Tata McGraw Hill New Delhi, 2010,
2. James S. Trieschmann, Robert E. Hoyt & David. W. Sommer B:"Risk Managemen & Insurance", Cengage Learning, New Delhi

References

1. Reddy K S and Rao R N: "Banking & Insurance", Paramount Publishing House 2013.
2. Vasant Desai: "Banks & Institutional Management", Himalaya Publishing House 2010.
3. Harold. D. Skipper & W. Jean Kwon: "Risk Management & Insurance, Perspectives in a Global Economy", Blackwell Publishing New Delhi.
4. NIA: "Life Insurance Principles and Practices", Cengage Learning, New Delhi, 2013

MBA III SEMESTER

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20MB3T06 GLOBAL FINANCIAL MANAGEMENT

COURSE OBJECTIVE: to enlighten the students with the Concepts and Practical applications of Global Financial Management.

Unit I
International Monetary and Financial System: Evolution; Breton Woods Conference and Other Exchange Rate Regimes; European Monetary System, South East Asia Crisis and Current Trends.

Unit II
Foreign Exchange Risk: Transaction Exposure; Accounting Exposure and Operating Exposure – Management of Exposures – Internal Techniques, Management of Risk in Foreign Exchange Markets: Forex Derivatives – Swaps, futures and Options and Forward Contracts.

Unit III
Features of Different International Markets: Euro Loans, CPs, Floating Rate Instruments, Loan Syndication, Euro Deposits, International Bonds, Euro Bonds and Process of Issue of GDRs and ADRs.

Unit IV
Foreign Investment Decisions: Corporate Strategy and Foreign Direct Investment; Multinational Capital Budgeting; International Acquisition and Valuation, Adjusting for Risk in Foreign Investment.

Unit V
International Accounting and Reporting: Foreign Currency Transactions, Multinational Transfer Pricing and Performance Measurement; Consolidated Financial Reporting.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Buckley Adrin, Multinational Finance, 3rd Edition, Engle Wood Cliffs, Prentice Hall of India.
2. S.P.Srinivasan, B.Janakiram, International Financial Management, Wiley India, New Delhi.
3. Clark, International Financial Management, Cengage, ND
4. V.Sharan, International Financial Management, 3rd Edition, Prentice Hall of India.

REFERENCES

5. A.K.Seth, International Financial Management, Galgothia Publishing Company.
6. P.G.Apte, International Financial Management, Tata McGrw Hill, 3rd Edition.
7. Bhalla, V.K., International Financial Management, 2nd Edition, New Delhi, Anmol, 2001.
8. V.A.Avadhani, International Financial Management, Himalaya Publishing House.
9. Bhalla, V.K., Managing International Investment and Finance, New Delhi, Anmol, 1997.

MBA III SEMESTER

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20MB3T07 BEHAVIOURAL FINANCE

Objective: To help students appreciate the limitations of rational‘ models of investment decision making; To introduce students to an alternate framework for understanding price discovery in the markets; and to help students identify persistent or systematic behavioral factors that influence investment behavior

Unit – I Introduction to Behavioral Finance – Nature, scope, objectives and application; Investment Decision Cycle: Judgment under Uncertainty :Cognitive information perception - Peculiarities (biases) of quantitative and numerical information perception - Weber law - Subjective probability – Representativeness – Anchoring - Asymmetric perception of gains and losses framing and other behavioral effects - Exponential discounting - Human economic behavior - Discount factors for short and long horizons - Experimental measurement of the discount factor - Hyperbolic discounting.

Unit – II: **Utility/ Preference Functions:** Expected Utility Theory [EUT] and Rational Thought: Decision making under risk and uncertainty - Expected utility as a basis for decision-making – Theories based on Expected Utility Concept – Decision making in historical prospective - Allais and Elsberg‘s Paradoxes - Rationality from an economics and evolutionary prospective – Herbert Simon and bounded rationality- Investor rationality and market efficiency - Empirical data that questions market efficiency.

Unit –III: **Behavioral Factors and Financial Markets:** The Efficient Markets Hypothesis – Fundamental Information and Financial Markets - Information available for Market Participants and Market Efficiency -Market Predictability –The Concept of limits of Arbitrage Model - Asset management and behavioral factors - Active Portfolio Management: return statistics and sources of systematic underperformance. - Fundamental information and technical analysis – the case for psychological influence.

Unit – IV: Behavioral Corporate Finance: Behavioral factors and Corporate Decisions on Capital Structure and Dividend Policy - Capital Structure dependence on Market Timing - Mergers and Acquisitions. Systematic approach to using behavioral factors in corporate decision making. External Factors and Investor Behavior: Mechanisms of the External Factor influence on risk perception and attitudes - Connection to human psychophysiology and emotional regulation Active portfolio management – the source of the systematic underperformance.

Unit – V: Emotions and Decision – Making: Experimental measurement of risk-related - Measuring Risk - Emotional mechanisms in modulating risk-taking attitude - Neurophysiology of risk taking. Personality traits and risk attitudes in different domains.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Text Books

1. Behavioral Finance: Psychology, Decision-Making, and Markets", by Ackert and Deaves.
2. The Psychology of Investing by John R.

3. Understanding Behavioral Finance by Ackert, Nofsinger, Pearson Prentice Hall, (4th Edition)

References

4. What Investors Really Want - Learn the lessons of behavioral Finance, Meir Statman, McGraw-Hill
5. Handbook of Behavioral Finance – Brian R. Bruce
6. Behavioral finance - Wiley Finance - Joachim Goldberg, Rüdiger von Nitzsch

FINANACE

MBA IV SEMESTER

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20MB4T03 RISK MANAGEMENT AND DERIVATIVES

COURSE OUTCOMES

1. Demonstrate an understanding of pricing of forwards, futures and options contracts.
2. Analyze and price diverse derivatives products to generate an optimal risk management strategy.
3. Demonstrate critical thinking, analytical and problem solving skills in the context of derivatives pricing and hedging practice.
3. Explain the binomial model and its extension in continuous time to the Black-Sholes model.

COURSE CONTENTS

UNIT -I

Introduction to Risk Management: Concept, nature and scope of risk. Possible risk events and risk indicators: Risk Management Process: pre-requisites. Types of risk: Product market risk and capital market risk. Comprehensive view of Risk in Financial Institutions. Risk reporting process–internal and external.

UNIT-II

Measurement and Management of Risk: The concept, computation, Measurement of interest rate risk, liquidity risk, credit risk and exchange rate risk and market risk. Managing risk when risk is measured by VaR or CaR. Risk avoidance, Loss Control, Risk retention and Risk transfer. Asset-Liability Management (ALM). Capital adequacy ratio.

UNIT-III

Tools of Risk Management: The concept and importance of Derivatives and types of Derivatives. The role of Derivative securities to manage risk and to exploit opportunities to enhance returns. Players in the stock/ derivative market: Individuals, speculators, hedgers, arbitrageurs and other participants in Derivatives Market.

Forward contracts: Definition, features and pay-off profile of Forward contract, Valuation of forward contracts. Forward Contracts to manage Commodity price risk, Interest rate risk and exchange rate risk- limitations of Forward contract.

Futures contracts: Definition of future contracts. Clearing house, margin requirements, marking to the market. Valuation of futures contracts. Risk management with Futures contracts–the hedge ratio and the portfolio approach to a risk–minimizing hedge.

UNIT-IV

Tools of Risk Management: **SWAPS**; Definition, types of swaps. Interest rate swaps, Currency swaps. Mechanics of Interest rate swaps .Using Interest rate Swaps to lower borrowing costs, hedge against risk of rising and falling interest rates. Valuation of interest rate Swaps. Pricing of Interest rate swaps. Currency Swaps: Types of Currency Swaps. Valuation of currency swaps. Pricing of currency swap.

UNIT –V

Tools of Risk Management: **Options;** Definition of an option. Types of options: call option, put option, American option and European option. Options in the money, at the money and out of the money. Option premium, intrinsic value and time value of options. Pricing of call and put options at expiration and before expiration. Options on stock indices and currencies. The Binominal option pricing model (BOPM): assumptions - single and two period models. Black-Scholes option pricing model (BSOPM).

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. Financial Derivatives and Risk Management, OP Agarwal, HPH
2. Fundamentals of futures and options market, John C Hull: Pearson Education.
3. Risk Management Insurance and Derivatives, G. Koteshwar: Himalaya Publishing House.

REFERENCE

1. Rajiv Srivastava: ”Derivatives Valuation and Risk Management”, Oxford University Press.2012
2. Dhanesh Kumar Khatri: “Derivatives and Risk Management” MacMillon,2012
3. Jayanth Rama Varma: “Derivatives and Risk Management”, TMH, 2012
4. Vivek, P.N.Asthana: “Financial Risk Management”, Himalaya Publishing House,2012

MBA IV SEMESTER

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20MB4T04 COST AND MANAGEMENT ACCOUNTING

Unit I Introduction to Management Accounting: Management Accounting vs Cost Accounting vs Financial Accounting, Role of Accounting information in Planning and control, Cost Concepts and Managerial use of classification of costs. Cost Analysis and control: Direct and Indirect expenses, allocation and appointment of overheads, calculation of machine hour rate and labour hour rate. Costing for specific industries: Unit costing, Job costing, Cost sheet and tender and process costing, inter-process profits, costing for by-products and equivalent production.

Unit II: Marginal Costing: Introduction, Application of Marginal costing in terms of cost of control-income determinants under marginal cost- Absorption cost Vs Marginal Cost, Key or limiting factor.

Unit III: Break-even-analysis: concept of cost-volume-profit relationship- Profit Planning, make or buy decision, Selection of suitable product mix- desired level of profits, Determination of Break-even-point, Break-even-graph and assumptions of BEP, importance, Margin of safety and angle of incidence, application of BEP for various business problems.

Unit IV: Budgetary Control: Budget, Budgetary control, steps in budgetary control, Fixedvs Flexible budgets, and different types of budgets: Sales Budget, Cash Budget, Production Budget, Master Budget, and Budget reports for Management control. Zero based Budgeting.

Unit V: Standard Costing: Standard Cost and Standard Costing, Standard Costing vs Budgetary Control, Standard costing vs Estimated cost, Standard costing and marginal costing, analysis of variance: Material variance, Labor variance and sales variance, Inter- firm comparison.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Text Books

1. Cost and Management Accounting- M.N. Arora, Vikas Publication, New Delhi, 2009
2. Cost and Management Accounting- S.P.Jain, K.L.Narang: Kalyani Publications, New Delhi, 2009
3. Cost and Management Accounting- M.P. Pandi Kumar, Excel Books, New Delhi, 2008

References

4. Management and Cost Accounting- Colling Drury, Cengage Learning, Hyderabad, 2009
5. Advanced Management Accounting- Jawaharlal, S.Chand and Company ltd, New Delhi 2010.
6. Management Accounting- M.E. Thukaram Rao, New Age International (P) Ltd, Publishers, 2003.

MBA IV SEMESTER

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20MB4T05 STRATEGIC FINANCIAL MANAGEMENT

COURSE OUTCOMES

1. Consolidate knowledge of and apply the technical language and practices of financial management.
2. Undertake sophisticated financial analysis with regard to corporate valuation, interest rate and currency risk management and present the information in an appropriate format.
3. Evaluate, synthesize and apply the contemporary theories and empirical evidence concerning Financial Management to a range of problems and situations.
4. Critically evaluate the impact of macro-economics and recognize the role of international financial institutions in the financial management of multinationals.

UNIT – I

Financial Policy and Strategic Planning –Strategic Planning Process – Objectives and Goals – Major Kinds of Strategies and Policies – Corporate Planning – Process of Financial Planning – Types of Financial Plan – Financial Models – Tools or Techniques of Financial Modeling – Uses and Limitations of Financial Modeling – Applications of Financial Models – Types of Financial Models - Process of Financial Model Development.

UNIT – II

Investments Decisions under Risk and Uncertainty – Techniques of Investment Decision – Risk Adjusted Discount Rate, Certainty Equivalent Factor, Statistical Method, Sensitivity Analysis and Simulation Method – Corporate Strategy and High Technology Investments.

UNIT – III

Expansion and Financial Restructuring – Corporate Restructuring - Mergers and Amalgamations – reasons for Merger, Benefits and Cost of Merger – Takeovers – Business Alliances – Managing an Acquisition – Divestitures – Ownership Restructuring – Privatization – Dynamics of Restructuring – Buy Back of Shares – Leveraged Buy-outs (LBOs) – Divestiture – Demergers.

UNIT – IV

Leasing – Importance, Types, Tax Considerations, and Accounting Considerations – Evaluation of Lease from the point of view of Lessor and Lessee – Lease versus Buy Decision – Venture Capital – Concept and Developments in India – Process and Methods of Financing – Fiscal Incentives.

UNIT – V

Financing Strategy - Innovative Sources of Finance – Asset Backed Securities - Hybrid Securities namely Convertible and Non-Convertible Debentures, Deep Discount Bonds, Secured Premium Notes, Convertible Preference Shares – Option Financing, Warrants, Convertibles and Exchangeable Commercial Paper.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. Jeff Madura, “International Financial Management” Cengage Learning Limited, 2008.
2. PG Apte, “International Financial Management” Tata McGraw Hill Limited, 2009.
3. Vyuptakesh Sharan, “International Financial Management” PHI, 2012.
4. V.A. Avadhani, “International Financial Management” Himalaya Publishing House, 2009

REFERENCE

5. Rajni Sofat & Preeti Hiro, Strategic Financial Management, PHI, Delhi, 2011
6. Weaver & Weston, Strategic Corporate Finance, Cengage Learning, Delhi, 2001
7. Chandra, Prasanna, Financial Management, Tata McGraw Hill, Delhi.

MBA IV SEMESTER

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20MB4T06 MERGERS, ACQUISITIONS AND CORPORATE RESTRUCTURING

COURSE OBJECTIVE

To enlighten the students with the Concepts and Practical dynamics of Financial Markets with Mergers & Corporate restructuring

Unit – I

Mergers: Types of merger– theories of mergers- operating, financial and managerial synergy of mergers – value creation in horizontal, vertical and conglomerate mergers – internal and external change forces contributing to M & A activities- Impact of M & A on stakeholders.

Unit – II

M & A: A strategic perspective- industry life cycle and product life cycle analysis in M&A decision, strategic approaches to M&A- SWOT analysis, BCG matrix. Takeovers, types, takeover strategies, - Takeover defenses – financial defensive measures – methods of resistance– anti-takeover amendments – poison pills Legal aspects of Mergers/amalgamations and acquisitions/takeovers- Combination and Competition Act- Competition Commission of India (CCI), The SEBI Substantial Acquisition of Shares and Takeover code

Unit – III

Merger Process: Dynamics of M&A process - identification of targets – negotiation - closing the deal. Five-stage model – Due diligence– Types - due diligence strategy and process - due diligence challenges. Process of merger integration – organizational and human aspects – managerial challenges of M & A.

Unit – IV

Methods of financing mergers: Cash offer, share exchange ratio – mergers as a capital budgeting decision Synergies from M&A: Operating and Financial synergy accounting for amalgamation – amalgamation in the nature of Merger and amalgamation in the nature of purchase- pooling of interest method, purchase method – procedure laid down under Indian companies act of 2013.

Unit – V

Corporate restructuring: significance - forms of restructuring – joint ventures – sell off and spin off – divestitures – equity carve out – leveraged buy outs (LBO) – management buy outs – master limited partnership– Limited Liability Partnership (LLP) in India: Nature and 91 incorporation of LLP-De merger- strategic alliance buyback of shares.

TEXT BOOKS

1. Value Creation from Mergers and Acquisitions, Sudi Sudarsanam – 1/e, Pearson Education, 2003.
2. Merger Acquisitions & Corporate Restructuring – Chandra Shekar Krishna Murthy & Vishwanath. S.R – Sage Publication.
3. Mergers, acquisitions and Corporate Restructuring, Nishikant Jha, Himalaya Publishing House, 2011.

REFERENCES

4. Corporate Restructuring, Bhagaban Das, Debdas Raskhit and Sathya Swaroop Debasish, Himalaya Publishing, 2009.
5. Business Legislation for Management, M.C. Kuchhal and Vivek Kuchhal, 4/e, Vikas Publishing House, 2013.

MBA IV SEMESTER

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20MB4T07 TAXATION

Objective: To acquaint the students with the theoretical and practical aspects of direct taxes including wealth taxes.

Unit –I
General Principles of Tax: Direct and Indirect Taxes – State Power to Levy Tax – Tax System – Provisions of Income Tax Act 1961 – Finance Act – Basic Concepts.

Unit- II
Income Tax: Deductions, Computation, Payment and Accounting-deductions from Gross Total Income, Rebates and Reliefs and Computation of Taxable Income and Tax Payable, Filing of Income Tax Returns – Provisions, Forms and Due Dates, Notices and Assessments.

Unit III
Tax Planning: for Firms, HUFs and AOPs- partnership firm under Income Tax Law, tax deductions available to firms, Provisions relating to interest and remuneration paid to partner, Computation of partnership firms‘ book profit, Set-off and carry-forward of losses of Firms and taxation of HUFs and Associations of Persons (AOPs).

Unit IV:
Corporate Taxation: Computation of taxable income, Carry-forward and set-off of losses for companies, Minimum Alternative Tax (MAT), Set-off and Carry-forward of Amalgamation Losses, Tax Planning for Amalgamation, Merger and Demerger of Companies, Tax Provisions for Venture Capital Funds

Unit V:
Tax Audit and Accounting for Income Tax: Tax Audit, Qualities and Qualifications Required in Tax Auditors, Forms, Reports and Returns and Tax Reporting and Disclosure in Financial Statements

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Dr. V.K. Singhania & Dr. Kapil Singhania, Direct Taxes Law and Practice, Taxman Publications Pvt. Ltd., New Delhi.

2. Bhagavati Prasad, Direct Taxes Law and Practice, Wishwa Prakashan, New Delhi.

3. Dinkar Pagare, Income Tax and Practice, Sultan Chand and Sons, New Delhi.

MARKETING

MBA III SEMESTER

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20MB4T08 CONSUMER BEHAVIOR AND ANALYSIS

COURSE OUTCOMES

1. Identify and explain factors which influence consumer behaviour.
2. Demonstrate how knowledge of consumer behaviour can be applied to marketing.
3. Display critical thinking and problem solving skills.
4. Gain, evaluate and synthesize information and existing knowledge from a number of sources and experiences
5. In a team, work effectively to prepare a professional, logical and coherent report on consumer behaviour issues within a specific context;
6. Deliver an oral presentation in a professional and engaging manner.

COURSE CONTENT

UNIT I

Consumer Behavior: Introduction to Consumer Behaviour; Consumer Behaviour and marketing Strategy, Methods of consumer research, analysis and applications in marketing. Contributing disciplines and areas. Diversity of consumers and their behaviors. Profiling and understanding the consumer needs. Segmentation, Consumer Decision making process and roles, Information Search Process; Evaluative criteria and decision rules. Are consumers Rational or emotional. Involvement theory and applications.

UNIT II

Determinants of CB: Perceptions Thresholds of Perception, and process dynamics.

Social Class, Life Style, Profile of Social Class, and Application of CB Personality: Nature, Theories, self-concept, psychographic and life style. Culture: Characteristics, and Cross Cultural Understanding. Attitude: Structural Model of Attitude, Attitude formation & Change.
Motivation: Needs/Motives & Goals, Dynamic Nature of Motivation, Arousal of Motives, and Theories. Perceptual mapping methods, multi-dimensional scaling, Consumer imagery.

UNIT III
Learning theories and their applications: Brand loyalty, Brand extensions. Conditioning theories, Cognitive learning theories. Attitudes and Attitude Change; Concept and measurement of attitudes. Strategies of attitude change. Attribution theory and Cognitive dissonance. Persuasion and Persuasibility.

UNIT IV
Consumer Decision Making Process: Routinized Response, Limited and Extensive Problem Solving Behavior – Models of CB: Nicosia, Howard & Sheth, Engel-Kollat;

Diffusion of Innovation: Elements, Decisions, Adoption Categories and Process. Family Decision Making – Environmental Influences on Consumer needs, theories of Motivation and their applications.

UNIT V:

Marketing Research: Product Research, Advertising Research, Copy Testing, Test Marketing, Sales & Marketing effectiveness, Cool hunting, and Commercial Eye Tracking – Marketing research in India – Ethical Issues Involved in Marketing Research.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. Assael, H. Consumer Behaviour and marketing Action, Ohio, South Western, 1995
2. Engle, J F etc. Consumer Behaviour, Chicago, Dryden Press, 1993 Electives (Marketing)

REFERENCES

1. Howard, John A etc. Consumer Behaviour in marketing Englewood Cliffs, New Jersey, Prentice Hall Inc.1989
2. Hawkins, D I etc. Consumer Behaviour Implications for Marketing Strategy. Texas, Business, 1995
3. Mowen, John C. Consumer Behaviour , New York, MacMillan, 1993
4. Schiffman, L G and Kanuk, L L Consumer Behaviour New Delhi, Prentice Hall of India, 1994

MBA III SEMESTER

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20MB4T09 DIGITAL & SOCIAL MEDIA MARKETNG

COURSE OUTCOMES

1. Implement various mobile marketing apps like click to call, mobile advertising, SMS marketing.
2. Create opportunities to outperform competitors, chance of user's sharing your site and referring to friends and family.
3. Potential to increase search engine ranking, Google page rank and less need to advertise offline.

COURSE CONTENT

UNIT-I

Introduction: Digital revolution in marketing - technology behind digital marketing – understanding digital customer – Digital marketing for startups. Introduction to Advertising: Objectives, Advertising, emerging trends in Advertising.

UNIT-II

Internet marketing: Micro and macro environments of internet – Internet marketing strategy the internet and marketing mix – relationship marketing using internet interactive marketing communications – maintaining and monitoring online presence – B2C & B2B internet marketing.

UNIT-III

Email and Mobile marketing: Email strategy and planning – advantages and challenges of email marketing. *Mobile marketing*: the role of mobile in personal communication – mobile messaging channels – mobile commerce – mobile for online marketing – augmented reality – mobile analytics.

UNIT-IV

Strategy & Implementation: Market research: Online research strategies – cost and tools – digital data sources - content marketing strategy- design strategies – search engine optimization – The building blocks of marketing strategy – crafting marketing strategy.

UNIT-V

Social media Channels: Social networking – location and social media – tracking social media campaigns- Social media strategy: business challenges – opportunities and threats – online branding.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1 Richard Gay, Alan Charles worth and Rita Essen, Online Marketing, Oxford University Press, 2016.

REFERENCES

1. Dave Chaffey, Fiona Ellis-Chadwick, Richard Mayer, Kevin Johnston. Internet Marketing Strategy, Implementation and Practice, 3rd Ed .Prentice Hall.
2. Rob Stokes e-Marketing: The essential guide to marketing in a digital world. 5th Ed. Quirk e-Marketing (Pty) Ltd.

MBA III SEMESTER

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20MB3T10 PROMOTION & DISTRIBUTION MANAGEMENT

COURSE OUTCOMES

- Identify and respond to clients' advertising and marketing communications objectives by applying principles of marketing and communications.
- Develop an advertising plan and present and defend it persuasively.
- Contribute to evaluating the effectiveness of advertising and marketing communications initiatives.
- Participate in the development of creative solutions to address advertising and marketing communications challenges.
- Complete all work in a professional, ethical and timely manner.

COURSE CONTENT

UNIT I

Introduction to Promotional Management: Sales Display and Sales Promotion- Sales Promotion Objectives- Types of Sales Displays- Factors Influencing Sales Promotion- Tools of Sales Promotion- Sales Promotion Strategies- Sales Promotion and Consumer Behavior Consumers Price Perceptions- Perceived Risk and Attitudes- Types of Promotion.

UNIT II

Introduction to Distribution Management: Physical Distribution Management- the Concepts of Total Distribution Costs and Cost Trade-offs- Customer Service Standards- Strategic Issues in Physical Distribution- Challenges and Opportunities- from Physical Distribution to Marketing Logistics- Major Logistics Functions

UNIT III

Marketing Channels: Nature and Importance of Marketing Channels- Emergence of Marketing Channel Structures- Types of Marketing Channels- Direct Marketing Channels vs Indirect Marketing Channels- Problems in Distribution- Selection of Distribution Channels- Channel Decisions

UNIT IV

Channel Institutions and Designing Channel System: Wholesaling- Agent Wholesaling Middle Man- Patterns in Wholesaling- Wholesaler Marketing Decision- Changing Patterns Channel Design Decisions- Channel Design Comparison Factors- Ideal Channel Structure Types of Channels- Implementation and Integration of Channel Design.

UNIT V

Ethical and Social Issues in Distribution Management: Business Ethics and Sales Management- Ethical Issues facing Sales Managers- Managing Sales Ethics- Modeling Ethical Behavior- Making Decisions on Ethical Problems- Building a Sales Ethics Programme International Distribution- Challenges in Managing an International Distribution Strategy.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. K. Shridhara Bhat: “Sales and Distribution Management”, Himalaya Publishing House, 2011.

2. Dr. Matin Khan: “Sales and Distribution Management”, Excel Books, New Delhi, 2005

REFERENCES

1. Pingali Venugopal: “Sales and Distribution Managment”, Sage Publications, New Delhi, 2008.

2. Dr. S. L. Gupta: “Sales and Distribution Management”, Excel Books, 2010

MBA III SEMESTER

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20MB3T11 RETAIL MANAGEMENT

COURSE OBJECTIVE

This course will enable students to develop decision making skills related to retailing. Topics may include Theories of Retail Development, Innovative Business Models in Indian Retailing, Strategic Retail Planning Process, and Financial Strategies in Retailing, Process of Merchandise Planning, and control.

COURSE OUTCOMES

1. Understand the impact of retailing on the economy.
2. Comprehend retailing's role in society and, conversely, society's impact on retailing.
3. See how retailing fits within the broader disciplines of business and marketing.
4. Recognize and understand the operations-oriented policies, methods, and procedures used by successful retailers in today's global economy.
5. Know the responsibilities of retail personnel in the numerous career positions available in the retail field.

COURSE CONTENT

UNIT I

Introduction to Retailing: Concept, Meaning, Nature, Scope and Importance, and Functions of Retailing – Overview of Global Retailing – Growth and Development of Indian – Theories of Retail Development – Retail organization Structure – Types of Retailing: Store Based and Non-store Based Retailing, Retail Consumer Purchase Decision Making Process – Concepts of Cross shopping, and Cross-buying Behavior – Opportunities and Challenges of Retailing in India– Innovative Business Models in Indian Retailing.

UNIT II

Retail Market Strategy: Concept, Definition, and Need for Retail Market Strategy – Developing a Sustainable Competitive Advantage – Strategic Retail Planning Process –Retail Growth Strategies: Opportunities and Challenges for Domestic and International Expansion – Retail Location: Concept, Types, and Importance of Retail Location – Retail Location Theories – Retail Location Process – Retail Location and Retail Strategy – Retail Site Selection: Local, Legal, and Market Potential Considerations.

UNIT III

Retail Management: Concept, Scope and Process of Retail of Management – Retail HRM: Policies, Practices, and Managing of Human Resources in Retailing Business – Financial Strategies in Retailing: Objectives and Goals – Strategic Profit Model – Financial Performance Assessment in Retailing – Retail Merchandising: Process of

Merchandise Planning, and Methods of Merchandise Procurement – Category Management – Emergence of Private Labels (Store Brands).

UNIT IV

Retail Pricing: Policies, and Strategies of Retail Pricing – Techniques for Increasing Retail Sales – Retail Promotion Mix: Retail Advertising and Sales Promotions – In-store Price, promotions – Retail Communication Budget: Process and Methods of Budgeting – Emergence of Multichannel Retailing: Issues and Challenges – Integrating and Controlling Retail Strategy.

UNIT V

Retail Customer Services Concept, Scope and Importance of Store Management – Store Layout, Design, Atmospherics, and Visual Merchandising, Service Quality, Complaint Handling, Satisfaction, Loyalty, and Retention Strategies & Ethical Issues in Retailing.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. .Chetan Bajaj, RajnishTuli and Srivatsva, Retail Management, Oxford University Press
2. SwapnaPradhan, Retailing Management Texts & Cases McGraw Hill Companies.
3. A.J.Lamba, The art of Retailing, TMH.

REFERENCE

1. Andrew J Newmann&Petescullen, Retailing Management, Thomson Learning.
2. Barry Berman Joel &R Evans, Retailing Management A Strategic Approach, Pearson Education.
3. Gilbert, Retail Marketing Management, Pearson Education.

MBA III SEMESTER

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20MB3T12 STRATEGIC MARKETING MANAGEMENT

COURSE OBJECTIVE

To understand the various components of Business environment and to device strategies to face global competition.

Unit – I

Introduction to Strategic Marketing Management: Strategic marketing process. Concept of strategic marketing. Levels of Strategies-Corporate, Business and Operational level. Strategy Formulation – Vision, Mission, Objectives and Goals of business and their relationship with Strategic Marketing Management. Considerations for formulation of marketing strategies for all components of Product, Price, Promotion and Distribution.

Unit – II

Corporate restructuring and strategy evaluation: Introduction to corporate restructuring, need for corporate restructuring and its forms. Evaluation of strategic alternatives, types of strategic alternatives like portfolio analysis and its techniques. Model as basic foundation of Strategic Marketing - McKinsey‘s 7s framework for analyzing and improving organizational effectiveness.

Unit – III

Marketing Strategy Implementation: Integration of Marketing Strategies and their application to different business sectors – FMCG, Industrial, & Services. Constraints in marketing strategy implementation.

Unit – IV

Marketing Strategy Evaluation: Marketing Audits & their scope – Measurement of Marketing Performance and its feedback to next year‘s Marketing strategy formulation. Economic losses due to disasters-Issues and Strategies for preventing disasters and preparedness measures.

Unit – V

Recent trends in strategic marketing management: Eco-friendly strategies. Growing need of public private partnership. Corporate Social Responsibility (CSR), strategies of linking CSR with profit and sustainability.

Relevant cases have to be discussed in each unit.

Text Books:

1. Thompson/Strickland, Strategic Management : Concepts and Cases, McGrawHill Companies; 11th edition
2. David Hunger and Thomas L. Wheelen "Strategic Management" Addison Wesley; 6 th sub edition.

Suggested Reading

1. William F. Glueck, Business Policy and Strategic Management, McGraw-Hill
2. Azhar Kazmi, Strategic Management and Business Policy, Third Edition
3. John A. Pearce & R.B. Robinson, Strategic Management - Strategy Formulation and Implementation, AIBT Publishers & Distributors, New Delhi, 13th Ed. 2001.

MARKETING

MBA IV SEMESTER

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20MB4T08 INTERNATIONAL MARKETING MANAGEMENT

COURSE OUTCOMES

1. To interpret the special characteristics of an international knowledge-intensive environment and innovations and their role in marketing decision-making.
2. To apply different marketing tools and strategies in the context of technology and knowledge-intensive markets and how to analyze and criticize firms' strategic marketing decisions in these markets.
3. To develop your competencies in analytical skills, intercultural issues and combining business and technology.
4. To apply different marketing tools and strategies in the context of technology.

COURSE CONTENT

UNIT-I

Introduction to Global Marketing: Scope and Significance of global Marketing, -Difference Between global and domestic marketing – The growing attractiveness of developing country market – International orientations, Stages of internationalization, Driving and restraining forces of global markets, Participants in international marketing

UNIT-II

International marketing strategy: Entry strategies in Global markets – modes of entries in global markets global market segmentation – international targeting – criteria for targeting, selecting a global target market – Global product positioning strategy. Business Customs in Global Market – strategies for FDI and FIIs - Entry Strategies of Indian Firms

UNIT III

Global Product & Price management: International product mix – Managing Global Research and Development for product management– Product diffusion and adoption in global markets -International Product Life Cycle – Product and culture – Global brand leadership – Environmental influences on Pricing Decisions – Grey Market goods – Transfer pricing – Global Pricing – Policy Alternatives – Constraints on global pricing

UNIT IV

Global Marketing Channels and Promotion for global markets: channels – Innovations in global channels – Channel strategy for new market entry – Distribution Structures – Global Distribution Patterns – Challenges in Managing An Global Distribution Strategy – Selecting Foreign Country Market intermediaries - Global Advertising and branding - Export Policy Decisions of a firm - Export costing and pricing – EXIM policy of India.

UNIT V

Export procedures and documents: Preliminaries: inquiry and offer – confirmation of offer –export license – finance – production /procurement of goods – shipping space – packing and marketing – quality control and pre – shipment inspection – excise clearance – customs formalities – negotiation and documents – standardization and aligned pre-shipment documents – documents related to goods – documents related to shipments.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. Francis Cherunilam: International marketing, 11th Edition, Himalaya Publication House, 2010
2. Warren J Keegan: Global Marketing Management, 5th Edition, Prentice Hall of India Private Limited.

REFERENCE

1. Philip R. Cateora, John L. Graham: International Marketing 11/e, Tata McGraw-Hill Co. Ltd., 2002.
2. R.Srinivasan: International Marketing, Prentice-Hall of India Pvt. Ltd., 2010
3. U.C Mathur: International Marketing Management, Sage Publications, New Delhi 2008

MBA IV SEMESTER

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20MB4T09 CUSTOMER RELATIONS & SERVICES MARKETING

COURSE OUTCOMES

1. To create insight and new learning in the area of customer relationship management.

2. To equip students with both a conceptual understanding and the knowledge pertaining to practical application of critical skills necessary for building and managing partnering relationships with customers and suppliers.

3. To discuss the conceptual foundations of relationship marketing and its implications for further knowledge development in the field of business.

COURSE CONTENT

UNIT I
Customer Relationship Management: Introduction, Meaning and Definition of CRM, Importance of CRM, Concept and Growth of Relationship Marketing, Scope of Relationship Marketing, concept of Lifetime Customer and Customer Loyalty, Benefits and difficulties of CRM

UNIT II
CRM Process and Implementation: Introduction, Customer Development Process, customer Retention, Customer satisfaction, Importance of customer retention, Customer Retention Strategies, Customer Life Time Value, types of Relationship Management, CRM process for B2B markets

UNIT III
Services Marketing: Introduction, concept and evolution of services marketing, meaning of service marketing, myths encountered in services, need for service marketing, and growth in Services Marketing. Services Marketing Mix and Gaps Model Introduction, 7Ps of service marketing, service gaps framework, perceived service quality, models of service marketing.

UNIT IV
Marketing of Services: Introduction, Overview of Different Service Sectors, Marketing of Banking Services, Marketing in Insurance Sector, Marketing of Education Services, Marketing of Tourism and Airlines, Tourism marketing, Airlines marketing, marketing of Hospitality Services, Healthcare Marketing, Social Service by NGOs, Marketing of Online Services, Marketing of Professional Services

Unit V
Emerging Issues in Service Marketing: Introduction, Strategic approach in Services Marketing, Service Marketing in e-Commerce and e-Marketing, and

Telemarketing Services, Service Marketing Research for Global Markets and Rural Markets, Innovations in Services Marketing, Ethical Aspects in Service Marketing

Relevant cases should be discussed from each unit

TEXT BOOKS

1. S.Shanmuga Sundaram: "Customer Relationship Management" Prentice Hall of India.
2. Dr. S. Shajahan: Services Marketing, Himalaya Publishing House, New Delhi 2009.

REFERENCES

1. Ed Peelen: "Customer Relationship Management" Pearson, Education
2. Roger J Baran, Robert J Galka and Daniel P Strunk: "Customer Relationship Management"
Cengage learning
3. Rajendra Nargundkar: "Services Marketing", Tata McGraw Hill, New Delhi, 2011.
4. S.M. Jha: Service Management and Marketing, Himalaya Publishing House, New Delhi, 2011
5. C. Bhattacharjee: Services Marketing, Excel Books, New Delhi, 2010

MBA IV SEMESTER

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20MB4T10 ADVERTISING AND BRAND MANAGEMENT

COURSE OBJECTIVE:
Expose the students to the dynamism of advertising and brand management and equip them to be able to manage the advertising and branding activities in the business scenario.

Unit – I
Advertising: Its importance and nature; Communication model; Persuasion Process – perception, learning and attitude change; Major advertising decisions and influencing factors; Determining advertising Objectives and budget.

Unit – II
Developing Advertising Campaign: Determining advertising message and copy - Headline, body copy, logo, illustration and layout; Creative styles and advertising appeals; Media planning – media selection and scheduling Advertising through Internet.

Unit – III
Organisation and Evaluation of Advertising Efforts: In-house arrangements; Using advertising agencies – selection, compensation and appraisal of advertising agency; Evaluating Advertising Effectiveness. Importance of branding; Basic Branding concepts – Brand personality, brand image, brand identify, brand equity and brand loyalty; Product vs. Corporate branding: Major branding decisions.

Unit – IV
Identifying and selecting brand name: Building brand personality, image and identity; Brand positioning and re-launch; Brand extension; Brand portfolio; communication for branding Enhancing brand image through sponsorship and even management.

Unit – V
Managing Brand Equity and Loyalty: Brand Building in Different Sectors - Customers, industrial, retail and service brands. Building brands through Internet. Developing International Brands: Pre-requisites and process; Country-of-origin effects and global branding; Building Indian brands for global markets.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. S.H.H Kazmi and SatishK. Batra: Advertising and sales promotion, Excel books Cowley. D: Understanding Brands, Kogan Page Ltd

2. George E.Belch& Michael A. Balch : Advertising and Promotion, TMH

REFERENCES

3. Aaker, Myers & Batra: Advertising Management, Prentice Hall.
4. Wells, Moriarity & Burnett: Advertising Principles & practices , Prentice Hall.

MBA IV SEMESTER

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20MB4T11 GREEN MARKETING

COURSE OBJECTIVES
To make the student understand the concept of Green Marketing and Green Products

Unit – I
Green Marketing and Green Product : Introduction to green marketing-strategic green planning- environment and consumption- Green Product- Green Behavior- Five shades of green consumers Segmenting consumers- Green consumer‘s motives-Buying strategies - Green Business Opportunities- Designing green products-eco-design to eco- innovation-Fundamentals of green marketing-Establishing Credibility-Green distribution and Packaging Contemporary Government policies and subsidies that aids green product development

Unit – II
Green Marketing Concepts: Green Spinning – Green Selling – Green Harvesting – Enviropreneurial Marketing - Compliance Marketing – Green Washing – Climate Performance Leadership Index

Unit – III
Purchase Decision: Meaning of Purchase decision – Factors affecting Purchase decision - Steps in the decision making process - Five stages of consumer buying decision process - Models of buyer decision-making

Unit – IV
Environmental consciousness: Introduction of Environment - Importance of environmentalism - Environmental movement - Benefits of green environment to the society - E-waste exchange - Extended Producer Responsibility Plan - Guidelines for Collection and Storage of E-Waste - Guidelines for Transportation of E-Waste - Guidelines for Environmentally Sound Recycling of E-Waste

Unit – V
Green Marketing Initiatives: Green Firms – HCL‘s Green Management Policy – IBM‘s Green Solutions – IndusInd Bank‘s Solar Powered ATMs – ITCs Paperkraft – Maruti‘s Green Supply Chain – ONCGs Mokshada Green Crematorium – Reva‘s Electric Car – Samsung‘s Eco-friendly handsets- Wipro Infotech‘s Eco-friendly computer peripherals

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Green Marketing and Environmental Responsibility in Modern Corporations, Esakki and Thangasamy, IGI Global, 2017
2. Green Marketing Management, Robert Dahlstrom, Cengage Learning, 2010

REFERENCES

3. Green Marketing: Challenges and Opportunities for the New Marketing Age, Jacquelyn A. Ottman, NTC Business Books, 1993
4. The New Rules of Green Marketing, Jacquelyn A. Ottman, Berrett-Koehler Publishers, 2011.

MBA IV SEMESTER

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20MB4T12 RURAL MARKETING

COURSE OBJECTIVE
To understand the importance of Rural Marketing, Rural Environment, Problems in Rural Marketing in India and Strategies to be adopted by the corporate.

LEARNING OUTCOME
Students will be able to understand:
(a) Rural Marketing opportunities
(b) Rural Economy and Environment
(c) Social and cultural aspects in rural India
(d) Innovations in rural marketing.

Unit – I
Introduction: Meaning - Evolution – Nature and Characteristics of Rural Market – Understanding the Indian Rural Economy –Rural Marketing Models – Rural Marketing Vs Urban Marketing – Parameters differentiating Urban & Rural Market - Differences in consumer behavior in Rural and Urban market.

Unit – II

Rural Market Research: Sources of Information- Factors influencing rural consumers during purchase of products – Rural consumer Life style –Approaches and Tools of Marketing Research - Rural Business Research- Evolution of Rural Marketing Research – Sources and methods of data collection, data collection approaches in rural areas, data collection tools for rural market. Limitation and challenges in rural marketing research, role of rural marketing consulting agencies.

Unit – III
Rural Marketing Mix: Rural Marketing Mix – Additional Ps in Rural Marketing – 4As of Rural Marketing Mix – New Product Development for Rural Market – Rural Market Product Life Cycle – Objectives behind new product launch – New Product development process.

Unit – IV
Rural Market Brand & Channel Management: Brand Loyalty in Rural Market – Regional Brands Vs National Brands – Channel Management – Indian Rural Retail Market – Rural Retail Channel Management – Strategies of Rural Retail Channel Management.

Unit – V

Applications and Innovations: Marketing of Consumer products, services, social marketing, agricultural marketing, rural industry products- Innovation for Rural Market – Marketing Strategies – e-Rural Marketing – Agricultural Co – operative Marketing – Rural Market Mapping –Corporate Social Responsibility – Organized Rural Marketing – IT for Rural Development – e-Governance for Rural India.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. C. S. G. Krishnamacharyulu, LalithaRamakrishnan, Rural Marketing: Text and Cases, Pearson Education, 2009.
2. Pradeep Kashyap, Rural Marketing, 3e Perason Education, 2016.

REFERENCES

3. Balram Dogra &Karminder Ghuman, Rural Marketing, TMH, 2009.
4. Sanal Kumar Velayudhan, Rural Marketing, 2e Sage publications, 2012.
5. T P Gopalaswamy, Rural Marketing, Environment, problems and strategies, 3e Vikas Publications, 2016.

HUMAN RESOURCE MANAGEMENT

MBA III SEMESTER	**L**	**T**	**P**	**C**
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20MB3T13 PERFORMANCE EVALUATION AND COMPENSATFION MANAGEMENT

Unit- I

Introduction: –Definition –concerns-scope-Historical developments in performance management-Over view of performance management-Process for managing performance- Importance –Linkage of PM to other HR processes-Performance Audit.

Unit- II

Performance Management Planning: Introduction-Need-Importance-Approaches-The Planning Process—Planning Individual Performance- Strategic Planning –Linkages to strategic planning- Barriers to performance planning-Competency Mapping-steps-Methods.

Unit-III

Management System: objectives – Functions- Phases of Performance Management System- Competency, Reward and Electronic Performance Management Systems-Performance Monitoring and Counselling: Supervision- Objectives and Principles of Monitoring- Monitoring Process- Periodic reviews- Problem solving- engendering trust-Role efficiency- Coaching- Counselling and Monitoring- Concepts and Skills .

UNIT -IV

Compensation: concept and definition – objectives and dimensions of compensation program – factors influencing compensation –Role of compensation and Reward in Modern organizations Compensation as a Retention strategy- aligning compensation strategy with business strategy - Managing Compensation: Designing a compensation system – internal and external equity– pay determinants - frame work of compensation policy - influence of pay on employee attitude and behaviour - the new trends in compensation management at national and international level.

UNIT V

Compensation Structure: Compensation Structure -History and past practices, elements of ,management compensation –Types of compensation system-Performance based and Pay based structures-Designing pay structures-comparison in evaluation of different types of pay structures-Significance of factors affecting-Tax Planning –Concept of Tax planning-Role of tax planning in compensation benefits-Tax efficient compensation package-Fixation of tax liability salary restructuring.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Prem Chadha: ―Performance Management‖, Macmillan India, New Delhi, 2008.
2. Michael Armstrong & Angela Baron, -Performance Management‖: The New

Realities, Jaico Publishing House, New Delhi, 2010.
3. T.V.Rao, -Appraising and Developing Managerial Performance‖, Excel Books, 2003.
4. David Wade and Ronad Recardo, -Corporate Performance Management‖, Butter Heinemann, New Delhi, 2002.

REFERENCES

5. Dewakar Goel: -Performance Appraisal and Compensation Management‖, PHI Leaarning, New Delhi, 2009
6. A.M. Sarma -Performance Management Systems‖ Himalaya Publishing House, New Delhi, 2010.

MBA III SEMESTER

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20MB3T14 HUMAN RESOURCE METRICS AND ANALYTICS

COURSE OBJECTIVE

Objective of the course is to provide knowledge in developing right HR metrics and analytics based on the organizational requirements. This will lay foundation in pruning HR metrics into Analytics for effective management decisions.

Unit I

HR Metrics: Overview--Concepts, Objectives-- Historical evolution of HR metrics.--Explain how and why metrics are used in an organization--Deciding what metrics are important to your business--HR metrics design principles--Approaches for designing HR metrics--The Inside-Out Approach--The Outside-In Approach-- Align HR metrics with business strategy, goals and objectives--Link HR to the strategy map--

Unit II

Creating levels of metrics measures—HR Effeciency measures—HR Effectiveness measures-- HR value / impact measures. Building HR functions metrics-- Workforce Planning Metrics-- Recruitment Metrics --Training & Development Metrics--Compensation & Benefits Metrics -- Employee relations & Retention Metrics

Unit III

HR Analytics Overview -- What HR Analytics. -- Importance of HR Analytics. --Translating HR metrics results into actionable business decisions for upper management (Using Excel Application exercises, HR dashboards)-- HR information systems and data sources-- HR Metrics and HR Analytics-- Intuition versus analytical thinking-- HRMS/HRIS and data sources-- Analytics frameworks like LAMP-- HCM:21(r) Model.

Unit IV

Diversity Analysis-- Equality, diversity and inclusion, measuring diversity and inclusion, testing the impact of diversity, Workforce segmentation and search for critical job roles. Recruitment and Selection Analytics--Evaluating Reliability and validity of selection models, Finding out selection bias. Predicting the performance and turnover. Performance Analysis-- Predicting employee performance, Training requirements, evaluating training and development.

UNIT V:

Optimizing selection and promotion decisions. Monitoring impact of Interventions--Tracking impact interventions-- Evaluating stress levels and value-change--Formulating evidence based practices and responsible investment-- Evaluation mediation process, moderation and interaction analysis.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Edwards Martin R, Edwards Kirsten (2016),-Predictive HR Analytics: Mastering the HR Metric‖,Kogan Page Publishers, ISBN-0749473924
2. Fitz-enz Jac (2010), -The new HR analytics: predicting the economic value of your company‘s human capital investments‖, AMACOM, ISBN-13: 978-0-8144-1643-3
3. Fitz-enz Jac, Mattox II John (2014), -Predictive Analytics for Human Resources‖, wiley, ISBN- 1118940709

REFERENCES

4. Bernard Marr (2018), Data Driven HR:How to use Analytics and metrics to data driven performance,Kindle Edition.
5. John Sullivan(2003)HR Metrics The World Class Way, Kennedy Information ISBN 978- 1932079012

MBA III SEMESTER

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20MB3T15 STRATEGIC HUMAN RESOURCE MANAGEMENT

UNIT-I

Human Resource Strategy: Introduction to Strategic Human Resource Management - Evaluation objectives and Importance of Human Resources Strategy- Strategic fit – A conceptual framework -Human Resources contribution to strategy - Strategy driven role behaviors and practices – Theoretical Perspectives on SHRM approaches - Linking business strategies to HR strategies.

UNIT-II

Strategic Human Resource Planning: Objectives, benefits, levels of strategic planning - Activities related to strategic HR Planning-Basic overview of various strategic planning models-Strategic HR Planning model-Components of the strategic plan.

UNIT-III

Strategy Implementation: Strategy implementation as a social issue-The role of Human Resource-Work force utilization and employment practices-Resourcing and Retention strategies- Reward and Performance management strategies.

UNIT-IV

Strategic Human Resource Development: Concept of Strategic Planning for HRD Levels in Strategic HRD planning-Training and Development Strategies-HRD effectiveness.

UNIT-V

Human Resource Evaluation: Overview of evaluation - Approaches to evaluation, Evaluation Strategic contributions of Traditional Areas - Evaluating Strategic Contribution of Emerging Areas-HR as a Profit Centre and HR outsourcing strategy.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Charles R. Greer: ‑Strategic Human Resource Management‖ - A General Manager Approach - Pearson Education, Asia
2. Fombrum Charles & Tichy: ‑Strategic Human Resource Management‖ - John Wiley Sons, 1984
3. Dr. Anjali Ghanekar ‑Strategic Human Resource Management‖ Everest Publishing House, Pune 2009

REFERENCES

4. Tanuja Agarwala ‑Strategic Human Resource Management‖ Oxford University Press, New Delhi 2014
5. Srinivas R Kandula ‑Strategic Human Resource Development‖ PHI Learning PVT Limited, New Delhi 2009
6. Dreher, Dougherty ‑Human Resource Strategy‖ Tata Mc Graw Hill Publishing Company Limited, New Delhi 2008

MBA III SEMESTER

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20MB3T16 LEADERSHIP AND CHANGE MANAGEMENT

Unit I

Organizational Leadership: Definition, Components and evaluation of leadership, factors of leadership, Situational Leadership Behavior: Meaning, Fiedler Contingency Model, Path Goal and Normative Models - Emerging Leadership Behavior: Transformational, Transactional and Visionary Leadership - Leadership for the new Millennium Organizations - Leadership in Indian Organizations. Leadership Effectiveness: Meaning, Reddins'3-D Model, Hersey and Blanchard Situational Model, Driving Leadership Effectiveness, Leadership for Organizational Building.

Unit II

Leadership Motivation, Culture: Motivation Theories for Leadership- Emerging Challenges in Motivating Employees. Motivation, Satisfaction, Performance. Organizational Culture: Meaning, Definitions, Significance, Dimensions, Managing Organizational Culture, Changing organizational Cultural. Leadership Development: Leadership development: Significance – Continuous Learning: Principles of learning to develop effective leadership – Vision and Goals for organization: significance of goals for leaders – Charting vision and goals of Indian leaders and abroad.

Unit III

Strategic Leadership: Leader Self-management: significance - Developing self-esteem and balancing emotions – Interpersonal Leadership Skills: Praise – Criticize – Communicate – Leadership Assertiveness: Circle of influence and circle of concern – Leadership with Edification: Tools of edification – Leadership and creativity: Developing creative thinking – Leadership and Team Building: Principles of team building, individual versus Group versus Teams – Leadership and Integrity: Developing character and values.

UNIT IV

Basics of Change Management: Meaning, nature and Types of Change – change programmes – change levers – change as transformation – change as turnaround – value based change.

Mapping change: The role of diagramming in system investigation – A review of basic flow diagramming techniques –systems relationships – systems diagramming and mapping, influence charts, multiple cause diagrams- a multidisciplinary approach -

UNIT V

Organization Development (OD): Meaning, Nature and scope of OD - Dynamics of planned change – Person-focused and role-focused OD interventions –Planning OD Strategy – OD interventions in Indian Organizations – Challenges to OD Practioners

Systems approach to change: systems autonomy and behavior – the intervention strategy model – total project management model (TPMM).

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit

TEXT BOOKS

1. Peter G. Northouse, Leadership, 2010, Sage. Publication.
2. Richard L. Daft -Leadership‖ Cengage Learning 2005.
3. Uday Kumar Haldar -Leadership and Team Building‖ Oxford Higher Education 2010
4. Richard L Hughes, Robert C Ginnett, Gordon J Curphy -Leadrship‖ Tata Mc Graw Hill Education Private Limited 2012.

REFERENCES

5. Peter Lornge, Thought leadership Meets Business, 1st edition, 2009, Cambridge.
6. Cummings: -Theory of Organization Development and Change‖, Cengage Learning, New Delhi, 2013.
7. Robert A Paton: Change Management, Sage Publications, New Delhi, 2011. 3. Nilanjan Sen gupta: Managing Changing Organizations, PHI Learning, New Delhi, 2009

MBA III SEMESTER

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20MB3T17 HUMAN CAPITAL MANAGEMENT

Course Objectives

1. To enable the students to understand the HR Management and system at various levels in general and in certain specific industries or organizations.
2. To help the students focus on and analyze the issues and strategies required to select and develop manpower resources
3. To develop relevant skills necessary for application in HR related issues
4. To enable the students to integrate the understanding of various HR concepts along with the domain concept in order to take correct business decisions

Course Outcomes

On completion of this course, the students will be able
CO1: To develop the understanding of the concept of human resource management and to understand its relevance in organizations.
CO2: To develop necessary skill set for application of various HR issues.
CO3: To analyze the strategic issues and strategies required to select and develop manpower resources.
CO4: To integrate the knowledge of HR concepts to take correct business decisions

Unit I
Economic theories of Human Capital: Nature and Role of Human Capital; The Human Capital Model; Predictions of Human Capital Approach; Socio-economic relevance of labour problems in changing scenario; Evolution of organized labour; Industrialization and Development of Labour Economy; Growth of Labour Market in India in the globalised stetting.

Unit II
Accounting Aspects of Human Capital – Cost Based Models: Meaning, Basic Premises, Need and Significance of HRA, Advantages and Limitation of HRA; Monetary and Non-Monetary Models; Cost Based Models- Acquisition Cost Method, Replacement Cost Model, Opportunity Cost Method, standard cost method, Current Purchasing Power Method (C.P.P.M.); Comparison of Cost incurred on Human capital and the contributions made by them in the light of productivity and other aspects.

Unit III
Accounting Aspects of Human Capital – Value Based Models: Value Based Models - Hermanson‘s Unpurchased Goodwill Method, Hermanson‘s Adjusted Discount Future Wages Model, Lev and Schwartz Present Value of Future Earnings Model, Flamholtz‘s Stochastic Rewards Valuation Model, Jaggi and Lau‘s Human Resource Valuation Model, Robbinson‘s Human Asset Multiplier Method, Watson‘s Return on Effort Employed Method, Brummet, Flamholtz and Pyle‘s Economic Value Method of Group Valuation,

Morse‘s Net Benefit Method; Recent developments in the field of Human Asset/Capital Accounting.

Unit IV

Quality of Work Life: Workers‘ Participation in Management - Worker‘s Participation in India, shop floor, Plant Level, Board Level- Quality Circles. Workers‘ education objectives - Rewarding. Employees Engagement and Empowerment-nature-types-drivers-benefits-measurement of Engagement-Empowerment.

Unit V

Industrial Accidents and safety: meaning and definition of accident-types of industrial accidents-cost and consequences-causes and prevention of accidents- Industrial safety –statutory machineries for industrial safety-safety audit. Social Security: Introduction and types –Social Security in India, Health and Occupational safety programs- work place discipline –work place counselling-meaning –definition –types-advantages-characteristics of an effective counsellor.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. I.L.O., Social & Labour aspects of Economic Development, Geneva
2. Report of the National Commission on Labour
3. Patterson & Schol., Economic Problems of Modern Life. Mc-Graw Hill Book Company.
4. Walter Hageabuch, Social Economics, Cambridge University Press.
5. S. Howard Patterson, Social Aspects of Industry.

REFERENCES

6. Millis and Montgonery, Labours Progress and some Basic Labour Problems. Mc - Graw Hill Book Company.
7. Flamholtz, Eric, Human Resource Accounting, Dickenson Publishing Co., Califf.

HUMAN RESOURCE MANAGEMENT

MBA IV SEMESTER	**L**	**T**	**P**	**C**
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20MB4T13 LEADERSHIP MANAGEMENT & TEAM DYNAMICS

COURSE OBJECTIVES

The students will be able to understand the consequences on performance and reflect on the implications of daily decisions made as managers and leaders. To create new, unpredictable situations that lends themselves to chaotic outcomes causing participants to exhibit new leadership abilities. To experience new awareness of their needs and how to meet them through team effort and "out of the box" thinking.

COURSE OUTCOMES

1. To understand psychological and social-psychological contexts of organization.
2. To understand individual, group and organization factors associated with leadership.
3. Acquisition of critical thinking and skills regarding work with people and their leadership.
4. To develop an understanding of change processes, obstacles to change and decision making
5. To develop interpersonal and intrapersonal competence.

COURSE CONTENT

Unit I

Leadership – Definition, concept and components of leadership. Theories of leadership, Personal characteristics for effective leadership, Leader and values, identity and integrity of leader. Organizational Leadership: Situational Leadership models, Emerging Leadership models, Leadership Effectiveness: Reddins' 3-D Model, Hersey and Blanchard Situational Model.

Unit II

Leadership Motivation, Culture: Motivation: Sources of motivation, stimulation tools, motivation and performance, aspirations, work satisfaction, Major Theories of motivation (3), motivation program in organization. Organizational Culture: Meaning, Definitions, Significance, Dimensions, Managing Organizational Culture, Changing organizational Culture, Intercultural aspects of leadership.

Unit III

Leadership Development: Continuous Learning for effective leadership, Alignment of organizational goals and leaders goals. Leadership Attitude: significance – development. Skills for leadership development: Goal setting, support of employee development and communication of feedback; delegation; solving of conflict situations and negotiation. Couching and mentoring. Emotional intelligence and its significance in the role of leader. Handling emotions and stress. Relation between Leader and followers, LMX theory, Gender and leadership, Leadership and power, Personal risk of leader.

Unit IV

Cross Cultural Leadership: Influence of leadership on organizational culture, Leadership in the cross cultural context and its challenges, GLOBE research program of Wharton School, Global perspectives of leadership – Leadership in USA – Leadership in Japan – European leadership – Leadership in Arab countries – Implications of global leadership – Leadership and Corporate Social Responsibility across globe.

Unit V

Team Dynamics: Leadership and Team Building: Principles of team building, individual versus Group versus Teams – Leadership and Integrity: Developing character and values. Leadership of workgroups and teams, Group structure and dynamics, Individual in a group, Formation of teams and team work, Group problem-solving, Team excellence, Social perception of teamwork in organization.

Relevant cases have to be discussed in each unit.

Text Books

1. Peter G. Northouse, Leadership, 2010, Sage. Publication.
2. Richard L. Daft "Leadership" Cengage Learning 2005.

References

1 Uday Kumar Haldar "Leadership and Team Building" Oxford Higher Education 2010
2. Richard L Hughes, Robert C Ginnett, Gordon J Curphy "Leadrship" Tata Mc Graw Hill Education Private Limited 2012.
3. Peter Lornge, Thought leadership Meets Business, 1st edition, 2009, Cambridge.
4. John ADAIR, Inspiring Leadership, 2008, Viva Books

MBA IV SEMESTER

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20MB4T14 LABOUR WELFARE AND EMPLOYMENT LAWS

UNIT I

Labour Welfare: Concept, scope and philosophy, principles and approaches of labour welfare, Indian constitution on labour, Agencies of labour welfare and their role. Impact of ILO on labour welfare in India.

UNIT II

Labour welfare programmes: Statutory and non-statutory, extra mural and intra mural, Central Board of Workers'Education; Workers'Cooperatives- Welfare Centres -Welfare Officers' Role, Status and Function, Signs of poor welfare.

UNIT III

Labour Legislation: Objectives-Principles-Classification-Evaluation of Labour legislation in India- Factories Act 0948, Definitions - Objectives of Act - Factory Inspectorate: – Measures to be taken by Factories for Health, Safety and Welfare of Workers - Working Hours - Wage and Compensation - Provisions Relating to Hazardous Processes - Annual Leave with Wages - Special Provisions - Obligations by Employer and Employee - Offences and Penalties., Contract Labour (Regulation and Abolition) Act 1970 and A.P.Shops and Establishments Act.

UNIT IV

Industrial Relations Legislation: Industrial Disputes Act 1947Concept, objectives, Types of Strikes and their Legality – Authorities under the Act and their Duties – Voluntary Reference of Disputes to Arbitration – Types of Strikes and Lock-outs Wages for Strike and Lock-out Period– Change in Conditions of Service. Industrial Employment (standing orders) Act 1946 Certification of Draft Standing Orders – Appeals – Date of Operation of Standing Orders – Posting of Standing Orders – Payment of Subsistence Allowance.

UNIT V

Trade Unions Act 1926. Definitions - Scope and Significance – Characteristics - Types of Trade Unions - Reasons for Joining Trade Unions - Advantages and Disadvantages of Trade unions- Legislations of Trade Unions- Rights and Privileges. Wage and Social Security Legislation: Payment of wages Act 1936 - Minimum wages Act 1948 - Payment of Bonus Act 1966 -. Payment of Gratuity Act 1972 - Workmen's Compensation Act 1923 - Employees State Insurance Act 1948 - Maternity Benefit Act 1961 and Employees Provident Fund and Miscellaneous Provisions Act 1952.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Govt. of India (Ministry of Labour, 1969). Report of the Commission on Labour Welfare, New Delhi: Author.
2. Govt. of India (Ministry of Labour, 1983). Report on Royal Commission on Labour in India, New Delhi: Author.
3. Malik, P.L: -Industrial Law‖, Eastern Book Company. Laknow,1977

REFERENCES

4. Moorthy, M.V: ―Principles of Labour Welfare‖, Oxford University Press, New Delhi.
5. Pant, S.C: -Indian Labour Problems‖, Chaitanya Pub. House. Allahabad.

MBA IV SEMESTER

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20MB4T15 TRAINING & DEVELOPMENT

COURSE OBJECTIVES

The course is designed to improve and understand the need of learning, methods of learning, importance of teaching techniques, instruction technology, instructor behavior, and attention versus involvement. This course also enlightens the learners about psychometrics and their administration to analyze the personality of human resource.

COURSE OUTCOMES

1 Understanding factors of Job analysis and its techniques.
2 Planning, designing and evaluation of training.
3 Understanding about contemporary training methods.
4Understanding about the history of psychometrics and their application.
5 Demonstrate the ability to administer various psychometric tests.

COURSE CONTENT
UNIT I
TRAINING & DEVELOPMENT

Concept, Job analysis, job evaluation – methods and techniques – manpower planning – at the start of the business and as ongoing process – performance appraisal – standards, methods, errors, differences between training and development.

UNIT – II

DEVELOPMENT PROCESS
Training Need Identification, Design, Implementation, Evaluation and Development. Role of Development officers – administrators, consultants, designers and instructors, Management development program – Career development program – counseling, evaluation of programs.

UNIT – III
METHODS OF TRAINING

On the job training – Off the job training – Choosing optimum method – the lecture – field trips – panel discussion – behavior modeling – interactive demonstrations – brain storming – case studies – action mazes, incident process, in-baskets, team tasks, buzzgroups and syndicates, agenda setting, role-plays-reverse role plays, rotational role plays, finding metaphors, simulations, business games, clinics, critical incidents, fishbowls, T-groups, data gathering, grouping methods, transactional analysis, exception analysis, e-Learning.

UNIT IV

PSYCHOMETRICS

Principles of Psychology, Evolution of scientific methods in Psychology, Psychometrics-meaning, definitions, need of testing, importance of Psychometrics and Psychological measurement. Social, Ethical and Legal Issues in Testing, Basic Concepts in Measurement, Ethical Principles of Psychologists, Code of Conduct.

UNIT V

PERSONALITY AND PROJECTIVE TESTS

Designing, administration and analysis of Test- PSI test, 16 PF Test, TAT cards, RST, Rorschach Inkblot Test. Psychometrics Quality**:** Threats to Psychometric Quality, Response Bias and Test Bias, Advanced Psychometric Approaches: CFA and Item Response Theory, Future of Psychometrics.

Relevant cases have to be discussed in each unit.

TEXT BOOKS

1. B.Taylor & G.Lippitt: MANAGEMENT DEVELOPMENT AND TRAINING HANDBOOK.

2 Measurement in Psychology: A Critical History of a Methodological Concept, Joel Michell

REFERENCES

1 William E.Blank, Handbook For Developing Competency Based Training Programmes, Prentice-Hall, New Jersey.

2 David A.Decenzo & Stephen P.Robbins: Fundamentals of Human Resource Management.

3 Psychometrics: An Introduction, Dr. R Michael Furr

MBA IV SEMESTER

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20MB4T16 EMPLOYEE RELATIONS AND ENGAGEMENT

UNIT I

Industrial Relations Management: Concept-meaning and scope of IR-system frame work- Theoretical perspective- Evaluation –Background of industrial Relations in India-Influencing factors of IR in enterprise and the consequences. Globalization and IR-Recent Trends in Industrial Relations.

UNIT II

Trade Unions: Introduction-Definition and objectives-growth of Trade Unions in India - Union recognition-Union Problems-Employees Association- Collective Bargaining – Characteristics- Importance-Principles-The process of CB-Participation in the bargaining process-Essential conditions for the success of collective bargaining – Negotiating techniques and skills.

UNIT III

Employee Grievances: Causes of Grievances – Grievances Redressal Machinery – Discipline in Industry -Measures for dealing with Indiscipline–Standing Orders- Code Discipline.

UNIT IV

Industrial Disputes: Meaning, nature and scope of industrial disputes - Cases and Consequences of Industrial Disputes –Prevention and Settlement of industrial disputes in India.

UNIT V

Employee Engagement : Concept-Definition-Elements- Factors- Levels - Driers of Employee Engagement-Measurement-Strategies- The role of managers in engaging the employees.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. C.S Venkataratnam: -Industrial Relations‖, Oxford University Press, New Delhi, 2011
2. Sinha: -Industrial Relations, Trade Unions and Labour Legislation‖, Pearson Education, New Delhi, 2013
3. Mamoria: ―Dynamics of Industrial Relations‖, Himalaya Publishing House, New Delhi, 2010

4. B.D.Singh: -Industrial Relations‖ Excel Books, New Delhi, 2010

REFERENCES

5. Arun Monappa: -Industrial Relations‖, TMH, New Delhi. 2012
6. Prof. N.Sambasiva Rao and Dr. Nirmal Kumar: -Human Resource Management and Industrial Relations‖, Himalaya Publishing House Mumbai
7. Ratna Sen: -Industrial Relations‖, MacMillon Publishers, New Delhi, 2011

MBA IV SEMESTER

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20MB4T17 INTERNATIONAL HUMAN RESOURCE MANAGEMENT

UNIT I

Introduction: A Global HR Perspective in New Economy-Challenges of Globalization - Implications of Managing People and Leveraging Human Resource - Strategic Role of International HRM – Distinction between Domestic and International HRM – HR Challenges at International Level.

UNIT II

Managing International Assignments: Significance -Global HR Planning – Staffing policy – Training and development – performance appraisal –International Labour relations – Industrial democracy - Positioning Expatriate – Repatriate – factors of consideration - Strategies - Legal content of Global HRM- International assignments for Women - Problems.

UNIT III

Cross Culture Management: Importance – Concepts and issues – Understanding Diversity – Managing Diversity Cross- Cultural Theories – Hofstede‘s Model – Kluchkohn - Strodthbeck Model – Andre- Laurent 'Theory – Cultural Issues. Considerations - Problems – Skill building methods – Cross Culture Communication and Negotiation – Cross Culture Teams. Talent crunch – Indian MNCs and Challenges.

UNIT IV

Compensation Management: Objectives -Importance – Concepts- Trends - Issues – Methods – Factors of Consideration – Models – incentive methods – Approaches of Compensation in Global Assignments - global compensation implications on Indian systems - Performance Management.

UNIT V

Global Strategic Advantages through HRD: Measures for creating global HRD Climate – Strategic Frame Work of HRD and Challenges - Globalization and Quality of Working Life and Productivity – Challenges in Creation of New Jobs through Globalization- New Corporate Culture.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Subba Rao P: -International Human Resource Management‖, Himalaya Publishing House, Hyderabad, 2011
2. NilanjanSen Gupta: -International Human Resource Management Text and cases‖ Excel Books, New Delhi.
3. Tony Edwards :—International Human Resource Management‖, Pearson Education, New Delhi, 2012

REFERENCES

4. Aswathappa K, Sadhana Dash: -International Human Resource Management, TMH, New Delhi,
5. Monir H Tayeb: -International Human Resource Management‖, Oxford Universities Press, Hyderabad, 2012.

BUSINESS ANALYTICS

MBA III SEMESTER

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20MB3T18 DATA MINING FOR BUSINESS DECISIONS

COURSE OBJECTIVE
A student will be able to apply Data mining techniques for quicker and better decisions. Whenever there is a need for data mining helps.

Unit I
Introduction to Data Mining: Introduction-- Scope of Data Mining-- What is Data Mining-- How does Data Mining Works-- Predictive Modeling-- Data Mining and Data Warehousing-- Architecture for Data Mining: Profitable Applications-- Data Mining Tools:

Unit II
Business Intelligence: Introduction, Business Intelligence-- Business Intelligence tools-- Business Intelligence Infrastructure-- Business Intelligence Applications-- BI versus Data Warehouse--BI versus Data Mining-- Future of BI. Data Preprocessing: Introduction-- Data Preprocessing Overview-- Data Cleaning-- Data Integration and Transformation-- Data Reduction-- Discretization and Concept Hierarchy Generation.

Unit III
Data Mining Techniques An Overview: Introduction-- Data Mining-- Data Mining Versus Database Management System-- Data Mining Techniques- Association rules—Classification—Regression—Clustering-- Neural networks. Clustering—Introduction—Clustering-- Cluster Analysis-- Clustering Methods- K means-- Hierarchical clustering-- Agglomerative clustering-- Divisive clustering-- clustering and segmentation software-- evaluating clusters.

Unit IV
Web Mining—Introduction—Terminologies-- Categories of Web Mining – Web Content Mining-- Web Structure Mining-- Web Usage Mining-- Applications of Web Mining and Agent based and Data base approaches-- Web mining Software.

Unit V
Applications of Data mining: Introduction-- Business Applications Using Data Mining- Risk management and targeted marketing-- Customer profiles and feature construction-- Medical applications (diabetic screening)-Scientific Applications using Data Mining-- Other Applications.

Relevant cases have to be discussed in each unit and in examination case

is compulsory from any unit.

TEXT BOOKS

1. Introduction to data mining by Tan, Steinbach & Kumar.
2. Data Mining: Concepts and Techniques, Third Edition by Han, Kamber & Pei.
3. Data Mining and Analysis Fundamental Concepts and Algorithms by Zaki & Meira.

REFERENCES

4. Data Mining: The Textbook by Aggarwal.
5. Data Mining for Business Intelligence by Galit Shmueli,Nitin R.Patel,PeterC.Bruce

MBA III SEMESTER

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20MB3L19 DATABASE MANAGEMENT SYSTEMS

COURSE OBJECTIVE

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

COURSE OUTCOMES

At the end of the course, a student will be able to

1. Design Entity Relationship models.
2. Distinguish procedural and non-procedural query languages.
3. Design database schema using normalization.
4. Explain lock-based, time stamping and tree-based protocols.
5. Illustrate Database Recovery methods.

COURSE CONTENT

UNIT-I

History of Data base Systems. Data base System Applications, data base System vs file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL, DML — Transaction Management – data base System Structure – Storage Manager – the Query Processor.

Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.

UNIT-II

Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data– Logical data base Design – Introduction to Views – Destroying / altering Tables and Views. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Relational calculus –Tuple relational Calculus– Domain relational calculus

UNIT-III

Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF– Schema refinement in Data base Design – Multi valued

Dependencies FOURTH Normal Form.

UNIT-IV

Transaction Concept- Simple Transaction Model-Storage Structure- Transaction State- Implementation of Atomicity and Durability, Isolation– Concurrent – Executions – Serializability- Recoverability Implementation of Isolation-Transactions as SQL Statements.

Concurrency Control: Lock – Based Protocols-Dead lock Handling– Timestamp Based Protocols- Validation- Based Protocols-Multi version schemes-insert, delete and predicate operations– Multiple Granularity.

UNIT-V

Recovery System: Recovery and Atomicity – Log – Based Recovery– Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage- Advance Recovery systems- ARIES Data on External Storage – overview of physical storage media- RAID-File Organization and Indexing-Data Dictionary Storage– Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing —B+ Trees: A Dynamic Index Structure.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Raghurama Krishnan, Johannes Gehrke, *"Data base Management Systems"*, 3rd Edition, TATA McGrawHill, 2008.
2. Silberschatz, Korth, *"Data base System Concepts"*, 6th Edition, McGraw Hill, 2010.
3. C.J.Date, "*Introduction to Database Systems"*, 7th Edition, Pearson Education, 2002.

REFERENCES

1. Peter Rob & Carlos Coronel, *"Data base Systems design, Implementation, and Management"*, 7th Edition, Pearson Education, 2000.
2. Elmasri Navrate, *"Fundamentals of Database Systems"*, 5th Edition, Pearson Education, 2007.

MBA IV SEMESTER

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20MB4T20 WEB DESIGNING

UNIT-I:

Web Fundamentals – Introduction To The Web, History of the Web, Protocols Governing the Web, Creating Websites for Individuals and the Corporate World, Web Applications, Writing Web Projects, Identification of Objects, Target User, Web Team, Planning and Process Development, Web Architecture, Major Issues in the Web Solutions Development, Web Servers (Apache Web Server), Web Browsers, Internet Standards, TCP/IP Protocol Suite, IP Addresses, MIME, Cyber Laws.

UNIT-II:

Hyper Text Transfer Protocol (HTTP): Introduction - Web Server and Clients, Resources, URL and its Anatomy – Examples, Message Format, Persistent and Non-Persistent Connections, Web Caching, Proxy. Java Network Programming- Java and the Net, Java Networking Classes and Interfaces, Looking up Internet Address, Client/Server Programs, Socket Programming, E-mail Client.(lab sessions to be conducted)

UNIT-III:

Hyper Text Markup Language (HTML): Introduction, Structure, Text, Lists, Links, Images, Tables, Forms, Frames, Images, and Meta Tags. (lab sessions to be conducted)

UNIT-IV:

Cascading Style Sheets (CSS): Introduction, Advantages, Color, Text, Boxes, Lists, Tables and Forms, Layout, Images, HTML5 Layout. (Lab Sessions to be conducted)

UNIT-V:

Java Script: Introduction, Variables, Literals, Operators, Control Structure, Conditional Statements, Arrays, Functions, Objects, JavaScript and HTML DOM, Advanced JavaScript and HTML Forms (Lab sessions to be conducted).

(Lab Sessions to be conducted wherever it is required)

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Uttam K Roy: ―Web Technologies‖ — Oxford University Press, 2010.
2. Jon Duckett: ―HTML & CSS: Design and Build Websites‖ – John Wiley & Sons, 2014.

MBA III SEMESTER	**L**	**T**	**P**	**C**
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20MB3T21 BUSINESS ANALYTICS

COURSE OBJECTIVE

The course is designed to gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making. The course familiarizes the students with the processes needed to develop, report, and analyze business data.

Unit I

Introduction to Business Analytics: Evolution of Business analytics, scope, Data for Business Analytics, Models in Business Analytics, problem solving with business analytics- Types of data, Integrating Analytics with business, Business Analytics for Competitive Advantage, Descriptive, Predictive, and Prescriptive Analytics, Dashboards Business Analytics Process Cycle.

Unit II

Analytics on Spreadsheets: Basic Excel, Excel Formulas, Excel Functions, Data Queries. Descriptive Analytics: Descriptive Statistical measures - Populations and samples, Statistical notations, Measures of Location, Measures of Dispersion, and Measures of Association. Statistical Inference: Hypothesis testing, one-Sample Test, Two-Sample Test, Two tailed Hypothesis for mean, ANOVA. Predictive Analytics: Simple Linear regression, Multiple Linear regression, Residual Analysis, Building regression models, Regression with categorical Independant variables – CASE STUDIES.

Unit III

Machine Learning, Supervised Learning and Unsupervised Learning, Clustering & Segmentation, Affinity/ Association Analysis, Data Reduction, Visual Analytics and Data Visualization Prescriptive Analytics: Building Linear Optimization models, Implementing Linear Optimization models on spreadsheets, Solving Linear Optimization models- CASE STUDIES.

Unit IV

Marketing Analytics, Models and metrics- Market Insight – Market data sources, sizing, PESTLE trend analysis, and porter five forces analysis - Market basket Analysis, Text Analytics, Spreadsheet Modelling - Sales Analytics: E Commerce sales mode, sales metrics, profitability metrics and support metrics.

Unit V

Introduction to Big Data, Master Data Management. Data Mining on what kind of data, What kinds of patterns can be mined, Which technologies are used, Which kinds of applications are targeted, Major issues in Data Mining. Getting to know your Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Analytics at Work by Thomas H. Davenport, Jeanne G.Harris and Robert Morison, Harvard Business Press, 2010.
2. Getting Started with Business Analytics: Insightful Decision – Making by David Hardoon, Galit Shmueli, Chapman & Hall/CRC, 2013.
3. Business Intelligence: A Managerial Approach by Efraim Turban, Ramesh Sharda, Dursun Delen and Daid King, Pearson Publication, 2012.

REFERENCES

4. Business Intelligence Making Decision through Data Analytics, Jerzy Surma, Business Expert Press, 2011.
5. Successful Business Intelligence: Secrets to Making BI a Killer App by Cindi Howson, Tata McGraw Hill Edition 2012.
6. R for Everyone: Advanced Analytics and Graphics, Jared Lander, Addison Wesley.

MBA III SEMESTER

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20MB3T22 MANAGING DIGITAL INNOVATION AND TRANSFORMATION

COURSE OBJECTIVES

- To understand digital transformations and information in the globalization world
- To explore social media transformation in the business world
- To develop on building digital capabilities
- To understand the challenges on using digital platform for business
- To learn digital transformations in the space of cloud computing

UNIT –I

Introduction to Digital Transformations: The five domains of digital transformations — customer, competition, data, innovation, and value, 1-farness customer networks, turn data into assets, adapt value proposition

UNIT-II

Classification of Digital Transformations: Business Model, product development, data, processes, knowledge, self—service, and organizational culture; Social Media Transformation: understand requirements, document goals, objective and social media tactics, establish potential future state operating model, gap analysis and recommendations.

UNIT-III

Building digital capabilities: challenges ongoing digital, handling employee during digital transformations, developing companywide strategy; Digital transformations in the space of cloud computing: prepare and drive digital transformations.

UNIT –IV

Re-Organization in Order to Bridge the Gap to Digital Customers - Digitalization of Professional Services: Value Creation in Virtual Law Firms - Digital Transformation Supporting Public Service Innovation: Business Model Challenges and Sustainable - Development Opportunities

UNIT – V

Areas of IT management and its challenges, IT services, IT organisation - Enterprise Innovation and the Digital Transformation - Industry, development trends, business competitiveness due to Technology - Using Technology as Innovation, Integration and Interconnection of business - IT strategy, IT governance, IT sourcing and controlling

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Herbert, Lindsay; Digital Transformation: Build your organization's Future for the Innovation Age, Bloomsbury Publication, 2017
2. Venkatraman, V; The Digital Matrix: New rules for business transformation through technology; Lifetree Media Ltd, 2017
3. Velte, A. T; Velte, T. J; and Elsenpeter, R; Cloud Computing: A Practical Approach, Mcgraw Hill Education (India) Private Limited,2017 (23rd reprint)

REFERENCES

4. Rogers, David, The Digital Transformation Playbook — Rethink your Business for the Digital Age (Columbia Business School Publishing), 2016.
5. Westerman, G; Bonnet, D; and McAfee, A; Leading Digital: Turning Technology into Business Transformation; Harvard Business Review Press, 2014.
6. Srinivasan. J, and Suresh. J, Cloud Computing: A Practical Approach for learning and implementation, Pearson Publication, 2014

BUSINESS ANALYTICS

MBA IV SEMESTER	**L**	**T**	**P**	**C**
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20MB4L18 BIG DATA ANALYTICS

COURSE OBJECTIVES

- Understand the Big Data Platform and its Use cases

• Provide an overview of Apache Hadoop, Provide HDFS Concepts and Interfacing with HDFS, Understand Map Reduce Jobs, Provide hands on Hodoop Eco System, Apply analytics on Structured, Unstructured Data, Exposure to Data Analytics with R.

Unit I

Introduction to Big Data: Big Data-definition, Characteristics of Big Data (Volume, Variety,Velocity, Veracity, Validity), Importance of Big Data , Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop [Zikopoulos] - Introduction to Hadoop**:** Hadoop- definition, Understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop—running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker.

Unit II

HDFS: Components of Hadoop -Working with files in HDFS, Anatomy of a Map Reduceprogram, Reading and writing the Hadoop Distributed File system -The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives. Hadoop I/O: Compression— Serialization-- Avro and File-Based Data structures.

Unit III

Map Reduce Programming: Writing basic Map Reduce programs - Getting the patent data set,constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop's API changes, Streaming in Hadoop. MapReduce Advanced Programming: Advanced MapReduce - Chaining Map Reduce jobs,joining data from different sources.

Unit IV

Hadoop Eco System --User Defined Functions-- Data Processing operators. Hive : Hive Shell-- Hive Services-- Hive Metastore-- Comparison with Traditional Databases—HiveQL-- Tables, Querying Data and User Defined Functions. Hbase : HBasics—Concepts—Clients—Example-- Hbase Versus RDBMS. Big SQL : Introduction

Unit V

Graph Representation in MapReduce: Modeling data and solving problems with graphs,Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, BloomFilters. Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Tom White – Hadoop: The Definitive Guide‖ Third Edit on, O‘reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
3. Michael Berthold, David J. Hand, "Intelligent Data Analysis‖, Springer, 2007.
4. Jay Liebowitz, ―Big Data and Business Analytics‖ Auerbach Publications, CRC press (2013)

REFERENCES

5. Anand Rajaraman and Jef rey David Ulman, -Mining of Massive Datasets‖, Cambridge University Press, 2012.
6. Bill Franks, -Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, John Wiley & sons, 2012.
7. Glen J. Myat, -Making Sense of Data‖, John Wiley & Sons, 2007
8. Pete Warden, ―Big Data Glossary‖, O‘Reily, 2011.

MBA IV SEMESTER

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20MB4L19 ENTERPRISE RESOURCE PLANNING

COURSE OBJECTIVES

COB 1: To help in understanding basic concepts in ERP.
COB 2: To help in understanding the importance of ERP.
COB 3: To help in analyzing the effects of ERP on business.

COURSE OUTCOMES

At the end of this course students will be able to:

CO 1: Describe the meaning of ERP.
CO 2: Explain the importance of ERP Implementation.
CO 3: Distinguish Pre ERP implementation and post ERP implementation.
CO 4: Compare ERP System Options and Selection Methods.
CO 5: Research on ERP present and future.

UNIT- I

Introduction to ERP: Overview of ERP – Introduction and Evaluation –advanced ERP-SCM and CRM systems and related technologies – ERP life cycle ERP implementation Life cycle- SDLC and ERP life cycle.

UNIT-II

ERP Implementation: reasons for ERP failure. pre – implementation Tasks – Implementation methodologies – Process definition - Dealing with employee resistance Training and Education – Project management and monitoring Success and failure factors of an ERP implementation.

UNIT-III

Post ERP implementation: Change Management – post implementation review, support, maintenance and security of ERP. Different business modules of an ERP package. ERP market place and market place dynamics.

UNIT-IV

ERP System Options and Selection Methods: Optimal Means of Developing an ERP, Measurement of Project Impact, IT Selection and Project Approval, ERP proposal Evaluation, Project Evaluation Techniques, Testing.

UNIT--V

ERP present and future: Turbo charge the ERP system- EAI – ERP. Internet and WWW- Future Directions and trends in ERP – Future Directions in ERP: New Markets, New Technologies, Faster Implementation Methodologies, New Business Segments, Trends in Security.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Singla: ―Enterprise Resource Planning‖, Cengage Learning, New Delhi, 2013.
2. Alexleon: ―Enterprise Resource Planning‖, TMH, New Delhi, 2011.
3. Mahadeo Jaiswal, Ganesh Vanapalli: ―Enterprise Resource Planning‖, MacMillon, New Delhi, 2013.

REFERENCES

4. N.Venkateswaran: ―Enterprise Resource Planning‖, SCITECH Publiscation, New Delhi, 2009.
5. S.Kesharwani, SBodduluri, M Ashok Kumar: ―Enterprise Resource Planning‖, Paramount Publishing House, New Delhi, 2012.

MBA IV SEMESTER

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20MB4L20 CYBER LAWS & SECURITY

COURSE OBJECTIVES

COB 1: To help in understanding basic concepts in cyber security.
COB 2: To help in understanding the importance of Secure System Planning and Administration
COB 3: To help in analyzing the effects of Secure System Planning and administration.

COURSE OUTCOMES

At the end of this course students will be able to:

CO 1: Describe the meaning and concepts of cyber security.
CO 2: Explain the importance of Secure System Planning and administration.
CO 3: Distinguish Information security policies and procedures in organizations.
CO 4: Compare and contrast the practical applications of Information security Systems.
CO 5: Research on Organizational and Human Security.

UNIT-I

Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT-II

Secure System Planning and administration: Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.

UNIT-III

Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy-developing standards.

UNIT-IV

Information security: fundamentals-Employee responsibilities- information classification Information handling- Tools of information security- Information processing-secure program administration.

UNIT-V

Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)‖, 2nd Edition, O' Reilly Media, 2006.
2. Thomas R. Peltier, -Information Security policies and procedures: A Practitioner's Reference‖, 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, -Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions‖, IGI Global, 2009.
4. Thomas R Peltier, JustiN Peltier and John blackley, Information Security Fundamentals‖, 2nd Edition, Prentice Hall, 1996.
5. Jonathan Rosenoer, -Cyber law: the Law of the Internet‖, Springer-verlag, 1997.

MBA IV SEMESTER

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20MB4T21 INFORMATION SYSTEMS AUDIT

COURSE OBJECTIVES

COB 1: To help in understanding basic concepts in Information Systems Audit.
COB 2: To help in understanding the importance of Information and systems audit.
COB 3: To help in analyzing the effects of Information Systems and Audit.

COURSE OUTCOMES

At the end of this course students will be able to:

CO 1: Describe the meaning and concepts of Information System Auditing.
CO 2: Explain the importance of Management Control Framework.
CO 3: Distinguish Management Control Framework required for establishing effective controls.
CO 4: Compare and contrast Evidence Evaluation systems.
CO 5: Research corporate governance issues in Indian context.

UNIT-I

Overview of Information System Auditing: Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit.

UNIT-II

The Management Control Framework-I: Introduction, Evaluation the Planning Function, Leading Function and Controlling Function, Systems Development - Management Controls, Approaches to Auditing Systems Development , Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

UNIT-III

The Management Control Framework-II: Security Management Controls, Operations Management Controls Quality Assurance Management Controls- Case Studies.

UNIT-IV

Evidence Collection: Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools- Case Studies.

UNIT-V

Evidence Evaluation: Evaluating Asset Safeguarding and Data Integrity, Evaluating System Effectiveness, Evaluating System Efficiency. Information Systems Audit and Management: Managing the Information Systems Audit Function,

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Ron Weber: -Information Systems Control and Audit‖, Pearson Education, 2013.
2. D P Dube: Information System Audit and Assurance, TMH, New Delhi, 2008.

MBA IV SEMESTER

L	T	P	C
4	0	0	3

20MB4T22 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

UNIT I

What is Artificial Intelligence (AI)-Definitions, The Foundations of AI, The History of AI, Agents and Environments, The Concept of Rationality, The Nature of Environments, The Structure of Agents, Problem Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies: Breadth First, Depth First, Depth Limited; Informed Search Strategies: Greedy Best First, A*Algorithms

UNIT II

Convolution Neural Networks - Image classification -- Text classification -- Image classification and hyper-parameter tuning -- Emerging NN architectures -- Recurrent Neural Networks -- Building recurrent Neural Networks-- Long Short-Term Memory -- Time Series Forecasting. - Deep Learning -- Auto-encoders and unsupervised learning -- Stacked auto- encoders and semi-supervised learning-- Regularization - Dropout and Batch normalization.

UNIT III

Foundations for Machine Learning(ML)- ML Techniques overview -- Validation Techniques (Cross-Validations)-- Feature Reduction/Dimensionality reduction -- Principal components analysis (Eigen values, Eigen vectors, Orthogonality). - Clustering -- Distance measures -- Different clustering methods (Distance, Density, Hierarchical) -- Iterative distance-based clustering-- Dealing with continuous,--categorical values in K-Means--Constructing a hierarchical cluster-- K-Medoids-- k-Mode and density-based clustering -- Measures of quality of clustering

UNIT IV

Classification Naïve Bayes Classifier -- Model Assumptions--Probability eestimation -- Required data processing -- M-estimates-- Feature selection--Mutual information -- Classifier K-Nearest Neighbors -- Computational geometry-- Voronoi Diagrams-- Delaunay Triangulations -- K- Nearest Neighbor algorithm-- Wilson editing and triangulations -- Aspects to consider while designing K-Nearest Neighbor Support Vector Machines --Linear learning machines and Kernel space--Making Kernels and working in feature space-- SVM for classification and regression problems. Decision Trees -- ID4-- C4.5-- CART ---Ensembles methods -- Bagging & boosting and its impact on bias and variance -- C5.0 boosting -- Random forest -- Gradient Boosting Machines and XGBoost.

UNIT V

Association Rule Mining- The applications of Association Rule Mining: Market Basket-- Recommendation Engines, etc.-- A mathematical model for association analysis-- Large item sets-- Association Rules -- Apriori-- Constructs large item sets with mini sup by iterations-- Interestingness of discovered association rules-- Application examples-- Association analysis vs. classification -- FP-trees. - Machine Learning Applications across Industries---Healthcare— Retail--Financial Services—Manufacturing—Hospitality--Cloud

Based ML Offerings--Top 10 AI Startups---Flashcards (Tips, Tricks, Definitions)

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Artificial Intelligence: A Modern Approach. Stuart Russell, Peter Norvig, Pearson Education 2nd Edition.
2. Expert Systems: Principles and Programming. Joseph C Giarratano, Gary D Riley Thomson Publication, 4th Edition.

REFERENCES

1. Elaine Rich and Kevin Knight: Artificial Intelligence, Tata McGraw Hill.
2. Dan W.Patterson, Introduction to Artificial Intelligence and Expert Systems, PrenticeHall of India.
3. David W Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill

ENTREPRENEURSHIP MANAGEMENT

MBA III SEMESTER	**L**	**T**	**P**	**C**
	4	**0**	**0**	**3**

20MB3T23 INDIAN MODELS IN ENTREPRENEURSHIP

UNIT-I

Introduction: Concept and Characteristics of Entrepreneurship. Theories of Entrepreneurship. Process of Entrepreneurship. Entrepreneurship Environment. Barriers to Entrepreneurship. Entrepreneurship and Innovation-Innovation and Creativity- Innovation in Current Environment – Types of Innovation- Entrepreneurship and Economic Development. Corporate Entrepreneurship – Concept and Types.

UNIT-II
Entrepreneur: Concept, Characteristics Types, Roles and Functions of Entrepreneurs. Qualities of a Successful Entrepreneur, Ethical and Social Responsibilities of Entrepreneurs. Entrepreneur Vs. Manager. Entrepreneur Vs. Entrepreneurship. Entrepreneurial Mobility. Entrepreneurial Culture. Entrepreneurial Motivation.

UNIT-III
Entrepreneurship Development Programmes (EDP): Need for and Significance of EDP. Objectives of EDP. Phases of EDP. Course Contents of and Curriculum for EDP. EDP at International Levels. EDP Programmes in India. Small and Medium Enterprises – Government Policies for Micro, Small and Medium Enterprises (MSMEs), Institutional Support System for MSMEs in India. Role of DICs, SFCs, SIDBI, EDI etc. Women Entrepreneurship-Rural Entrepreneurship.

UNIT-IV
New Venture Promotion: Identification of Business Opportunities- Choice of Appropriate Form of Business Organization. Step by step approach for starting a new venture- Determining the Size of Operation. Plant Location Decision- Choice of Technology- Sources of Raising Capital.

UNIT-V
Project Management: Concept, Characteristics, Components and Significance of Project Management-Role of Project Managers - Stages of Project Management-Components of Project Management. Project Life Cycle. Project Identification and Selection. Project Formulation and Appraisal.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. David H. Holt : Entrepreneurship – New Venture Creation (Prentice Hall of India,

New Delhi)
2. Marc. J. Dollinger : Entrepreneurship – Strategies & Resources (Pearson Education, New Delhi)
3. Peter F. Drucker : Innovation and Entrepreneurship (William Heinemann Ltd., Landon)
4. M.B. Shukla : Entrepreneurship and Small Business Management (Kitab Mahal, Allahabad)

REFERENCES

5. S.S. Khanaka : Entrepreneurial Development (S. Chand & Company Ltd., New Delhi)
6. Vasant Desai : Dynamics of Entrepreneurial Development & Management (Himalaya Publishing House, Bombay)
7. B.K. Singh : Entrepreneurship (Wisdom Books)

MBA IV SEMESTER

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4	0	0	3

20MB3T24 SOCIAL ENTREPRENEURSHIP

UNIT I

Need and importance of Third Sector in development. Typologies of third sector - Voluntary, NGO, NPO, CBO, CSO, Growth of third sector in India – Performance and environment of third sector. Third sector relationship to state and civil society

UNIT II

Concept, Definition, Importance – Role of a social entrepreneurship –History of Social Entrepreneurship- Social entrepreneurship Vs business entrepreneurship –Shift to Social Entrepreneurship- social entrepreneurs and social change –qualities and traits of social entrepreneurs.

UNIT III

Concept, Definition, Importance of Social enterprises – Social Business-Principles and Social Innovation-similarities and differences between social enterprises and non-profits – types of social enterprises – concept of Triple Bottom Line, Bottom of the Pyramid, Sustainopreneurship-Corporate Social Responsibility– Boundaries of Social Entrepreneurship. Select case studies of Indian Social Enterprises.

UNIT IV

Global & National environment to promote social enterprises and social entrepreneurship. Financial Management of social enterprises – venture capital for social enterprises – Corporate, Community and government support for social enterprises

UNIT V

Application of marketing principles in welfare and development field – social marketing. Marketing of Social Services – Case studies related to Social and service marketing in the field of Health, Education, Environment protection, Energy consumption and Human rights.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Alex Nicholls, (2006), Social Entrepreneurship: New Models of Sustainable Social Change, New York: Oxford University Press.
2. David Bornstein, (2007). How to Change the World: Social Entrepreneurs and the Power of New Ideas, New York: Oxford University Press.
3. Fred Setterberg, Kary Schulman (1985), Beyond Profit: Complete Guide to Managing the Non Profit Organizations, New York: Harper & Row.

REFERENCES

4. Gregory Dees, Jed Emerson, Peter Economy (2002), Enterprising Non Profits – A Toolkit for Social Entrepreneurs, New York: John Wiley and Sons.
5. Peter Drucker (1990), Managing the Non Profits Organizations: Practices and Principles, New York: HarperCollins.

MBA III SEMESTER

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20MB3T25 BUSINESS PLAN PREPARATION FOR SMALL BUSINESS

COURSE OBJECTIVE

To explain relevance of business plans while taking business decisions for small business.

UNIT - I

Business Plan - Meaning- The why of business plan - Basic parameters - Timing of decision undertaken Project parameters - the common considerations - Factors of successful business - capital management- financial control -anticipating change and adaptability.

UNIT – II

Business plan process - sources of information - Internet, government sources and statistics - offline research resources - library - SBDC'S -Trade and industries associations - sources of market research - evaluating data- benefits of market study - coverage of market study - information sources.

UNIT - III

Business plan components - The Executive summary - company description - Industry analysis and trends - Target market - Competition - strategic position and risk assessment - Marketing plan and sales strategy - operations - Technology plan - management and organization.

UNIT – IV

Starting the Venture - Generating business idea – Source of new ideas - Methods of generating ideas - Steps in setting up a small business enterprise,

UNIT V:

Concept of Project Appraisal - Environmental scanning - Competitor and industry analysis - Feasibility study – Market feasibility, Technical / operational feasibility - Financial Feasibility - Managerial competence. Functional plans - Marketing plan – Financial plan.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Entrepreneurship (6th Edition) – Robert D Hisrich, Tata McGraw Hill
2. Entrepreneurship: A Contemporary Approach – Kuratko, Thomson Learning Books
3. Small Scale Industries and Entrepreneurship (2003) – Vasant Desai, Himalaya Publishing House
4. Entrepreneurial Development – S.S. Khanka, S. Chand & Co

MBA III SEMESTER

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20MB3T26 ENTREPRENEURIAL MARKETING

COURSE OBJECTIVE

To explain start-ups, early growth stage and more mature companies have used entrepreneurial marketing as an essential competitive weapon to grow their business.

UNIT – I

Entrepreneurial marketing and Venture Opportunities: Introduction – Definitions - Methods, Channel of Marketing - Marketing Institutions and Assistance for Entrepreneurs - Customer and competitor analysis.

UNIT – II

New Tools of Entrepreneurial Marketing: Introduction - Demand-based Pricing - Entrepreneurial market opportunity analysis - Entrepreneurial marketing strategies - The entrepreneurial marketing plan – Objectives and importance of entrepreneurial marketing plan.

UNIT - III

Entrepreneurial pricing and distribution – Pricing strategies for distribution companies in India - Entrepreneurial promotion - Entrepreneurial products and services development

UNIT – IV

Entrepreneurial Tools to establish a Competitive Advantage: Branding, Pricing, Positioning, and Targeting – Entrepreneurial Advertising – Entrepreneurial sales promotion

UNIT V:

Entrepreneurial Social Marketing: Meaning – Application - Advantages and limitations – Experimental Marketing - Sales growth strategies.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Entrepreneurship (6th Edition) – Robert D Hisrich, Tata McGraw Hill
2. Entrepreneurship: A Contemporary Approach – Kuratko, Thomson Learning Books
3. Small Scale Industries and Entrepreneurship (2003) – Vasant Desai, Himalaya Publishing House
4. Entrepreneurial Development – S.S. Khanka, S. Chand & Co

MBA III SEMESTER

L	T	P	C
4	0	0	3

20MB3T27 FAMILY BUSINESS MANAGEMENT

COURSE OBJECTIVE

To understand the importance of family-owned businesses for achieving Competitive advantage in the market place.

LEARNING OUTCOME

Students will be able to understand
a) Perspectives in Family Business
b) Ownership Challenge and Family Governance
c) Successor Development strategies
d) Strategic Planning and Trans-generational Entrepreneurship
e) New Leaders of the Evolution and Change.

Unit – I

Introduction to Family Business: Family Business as a unique synthesis- Succession and Continuity: The three-generation rule- Building Family business that last- The systems theory model of Family Business - Agency Theory of Family business - The stewardship perspective of family business - Competitive Challenges and Competitive advantages of family businesses- The role of Genograms and family messages to understand the family system. Family emotional intelligence - The ECI-U Model.

Unit – II

Ownership Challenges and Family Governance: Shareholder Priorities – Managers vs Owners - Responsibilities of shareholders to the company - Effective Governance of the shareholder - firm relationship – Family Governance: Structure, Challenges to family governance, managing the challenges of succession. Enterprise Sustainability: Twelve elements of strategic –fit and its implications on family firms.

Unit – III

Successor Development: Characteristics of next-generation leaders- Next-generation attributes, interests and abilities for responsible leadership- Next-generation personalities-managing interdependence- CEO as an architect of succession and continuity - Types of CEO Spouse and the transfer of power.

Unit – IV

Strategic Planning and Trans-generational Entrepreneurship: Life cycle stages influencing family business strategy - Turning core competencies into competitive advantage – The unique vision of family-controlled businesses - Strategic regeneration-The Business Rejuvenation matrix - Intrapreneurship.

Unit – V

The Future of Family Business: New Leaders of the Evolution - Three states of evolution Continuity and culture - changing the culture - The change formula - Organization Development approaches to change - Commitment planning - Organic competencies and business's future - Thriving through competition - Institutionalizing the change.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Ernesto J. Poza, Mary S. Daughterty, Family Business, 4e, Cengage Learning, 2015.
2. Frank Hoy, Pramodita Sharma, Entrepreneurial Family Firms, Prentice Hall, 2010
3. SudiptDutta, Family Business in India, Sage Publications, 1997.
4. Laura Hougaz, Entrepreneurs in Family Business Dynasties: Stories of Italian-Australian

REFERENCE

5. Family Businesses over 100 years, Springer, 2015.
6. John L. Ward, Keeping the Family Business Healthy: How to Plan for Continuing Growth,
7. Profitability and Family Leadership, Palgrave Macmillan, 2011.
8. M. Nordqvist, T. Zellweger, Transgenerational Entrepreneurship: Exploring Growth and
9. Performance in Family Firms Across Generations, Edward and Elgar Publishing Limited, 2010.

ENTREPRENEURSHIP MANAGEMENT

MBA IV SEMESTER	L	T	P	C
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20MB4T23 MARKETING FOR SMALL BUSINESS

Unit I

Introduction to Marketing for small business: Nature and Characteristics – Distinction between corporate marketing and marketing for small business.

Small Business Marketing: Concept and Scope – Nature – Characteristics, Taxonomy – Composition of Small Business Market – small business Requirements – Consumer Durables and Non-Durables – Problems of Small Business Marketing – Attractiveness of Market – Factors affecting for Small business Marketing – Value Addition to Small Business Marketing - Characteristics of Successful Small Businessmen – Different Stages of Small business – Crisis Management in Business.

Unit II

Small Business Market Environment: Factors in Small Business Market Environment: Social, Economic, Ethical, Political, Physical, Technological, and Demographic – Occupational Pattern- Income Generation – Expenditure Pattern – Small Business Market Infrastructure - Dynamics of Small Business Concepts and Definitions of Small Scale Industries (SSIs) – Role of SSIs – Government Policy and Development of SSIs – Growth and Performance – SSI Sector and Committee Report – Reservation of items for SSI.

Unit III

Small Business Marketing Channels: Old Set-up – New Players – New Approaches – Marketing and Distribution Trends, New Dynamics – Marketing Channels for Food grains: Oil Seeds – Egg – Live Poultry – Social Marketing - Opportunity for Retail Trading.

Unit IV

Small Business Marketing Promotional Strategies: Small Business Market Segmentation – Targeting – Selection of Segments – Coverage of Segments – Positioning – Product, Pricing, Distribution and Promotional Strategies - Global Opportunities for Small Business Small Enterprises in International Business – Export Documents and Procedures for Small Enterprises-E-commerce and Small Enterprises.

Unit V

Marketing of Small Business Inputs and Outputs: Small Business Inputs: Market Mechanism of inputs for agriculture and Allied industries - Small Business Outputs: Marketing of agricultural produces – concepts of marketable and marketed surplus – market mechanism: unregulated and regulated – Marketing of Small Business industrial products – Mechanism, opportunities and challenges.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Shukla M.B. Entrepreneurship and Small Business Management, Kitab Mahal, 2003, Agra.
2. Ashis Gupta Indian Entrepreneurial Culture, Wishwa Prakashan Ltd., Surrey, UK., 1994.
3. Colombo Plan Entrepreneurship Development, Staff College Tata McGraw-Hill, New Delhi, 1998 for Technician Education.
4. Malli D.D. Training for Entrepreneurship and Self-Employment. Mittal, New Delhi, 1999

REFERENCES

5. Khanka S.S. Entrepreneurial Development, S Chand & Co., New Delhi
6. Bedi R.V. and Bedi N.V., Rural Marketing, Himalaya, Mumbai, 2006
7. Datt, Ruddar and Sundharam K.P.M., Indian Economy, S.Chand, New Delhi, 2006.
8. Krishnamacharyulu C.S.G. and Lalitha Ramakrishnan, Rural Marketing: Texts and Cases, Pearson Education, New Delhi, 2006.
9. Barrow C. The Essence of Small Business, Prentice Hall of India, New Delhi, 1997.

MBA IV SEMESTER

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20MB4T24 FINANCE AND ACCOUNTING FOR SMALL BUSINESS

UNIT – I

Accounts - Accounting Process - Accounting Concepts & Conventions - Accounting equation - Basic Accounting Procedure - Single Entry System : an admixture - Double Entry System - Accounting Elements - Classification of Accounts - Golden Rules - Journal - Classification of Journal - Ledger : Principal Books of Accounts - Cash Book - Vouchers-The documents to the transactions - Trial Balance - Depreciation - Preparation of Final Accounts and Balance Sheet - Techniques of Preparation of Final Accounts -The Balance Sheet

UNIT – II

Finance: Understanding Balance Sheet – It's Use - Profit and Loss Account (P/L A/c) - Understanding Financial Statement - Ratio Analysis - Cash Flow Statements - Cash Budget - Working Capital : Determination & Calculation - Operating Cycle - Computation of Working Capital - Framework for Regulation of Bank Credit - Long-Term Source of Finance - Retained Earnings - Equity Capital / Equity Share - Debenture - Preference Shares.

Unit III

Costing: Introduction - Classification Cost - Use of Cost Data - Marginal Costing - Cost-Volume Profit Relationship - Mathematical Relationship between Cost-Volume Profit - Margin of Safety - BEP Analysis : Graphical Analysis - Use of Marginal costing in decision making- pricing decision, make or buy etc.

Unit IV

Taxation: Income Tax - Definitions - Residential Status - How to Compute Total Income - Profit and Gains of Business or Profession - Deduction Under Chapter VIA - Central Sales Tax Act, 1956 - Preliminary - Formulation of Principles for Determining when a Sale or Purchase of Goods Taken Place in the Course of Inter-state Trade or Commerce or Outside a State or in the Course of Import or Export - Inter-State Sales Tax - Goods of Special Importance in Inter-State Trade or Commerce - Liability in Special Cases - Central Excises Act, 1944 - Preliminary - Levy and Collection of Duty -Powers and Duties of Officers and Landholders - Transport by Sea - Adjudication of Confiscations and Penalties - Appeals - Presumption as to Documents - Supplemental Provisions.

Unit V

Goods and Services Tax (GST): Concept and status – Genesis - GST and Centre-State Financial Relations - Constitution (One Hundred and First) Amendment Act, 2016 - Goods and Services Tax Council (GSTC) - Salient Features of GST - Benefits of GST - Goods and Services Tax Network – GST Registration process of business enterprises – GST HSN – SAC Cods and tax rates.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Dhanesh K Khatri, Financial Accounting, Mc Graw Hill.
2. Asish K. Bhattacharyya, Financial Accounting for Business Managers, 3rd Edition, PHI, Eastern Economy Edition.
3. Dr. V K Goyal, Financial Accounting, 3rd Edition, EB (Excel Books).
4. S N Maheswari, Suneel K Maheshwari and Sharad K Maheshwari, Financial Accounting, 5th Edition, Vikas Publications.

REFERENCES

5. Horngren, Sundem, Stratton, Burgstahler and Schatzberg, Introduction to Management Accounting, 14th Edition, Pearson Hall.
6. Charities An Exhaustive Treatise for Tax and Other by S Rajaratnam , M. Natarajan , C.P. Thangaraj
7. Laws of Trade Tax Central Sales Tax and Tax on Ent.by O S Vatsa
8. Trade Tax, Central Sales Tax & Tax on Entry of Goo.by Arvind Agarwal , Adarsh K Gupta GST official website: https://www.gst.gov.in

MBA IV SEMESTER

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20MB4T25 TECHNOLOGY APPRECIATION AND INTELLECTUAL PROPERTY RIGHTS

UNIT I

Introduction: Definitions, Role and importance , Technology developments, implications of Technology Management, Technology change, TLC, Diffusion and Growth of Technologies - Technological Transformation alternatives, Technology Policy and Planning, Technology development-Options & Strategies, Socio-Economic planning, production functions & Technological Change, Macro effects of Technology change.

UNIT II

Technology Transfer: Models, Modes, Technology search strategy, Dimensions of Technology Transfer, Features & Routes of Technology Transfer, Technology absorption capabilities, Pricing of Technology Transfer agreements, Code of conduct for Technology transfer , Government initiative, Technology transfer and absorption process at unit level.

Unit III

Technology cycles: Innovation streams, Managing through cycles of technological change - Planned innovation, planned innovation systems, Market driven innovation: Commercialization of Intellectual Property: Traditional IP and Evolving IP - Assignment – Licensing – Cross License – Patent Pool – Negotiations – Defensive Publications – Technical Disclosures – Patent Pooling – Patent Trolling - Brand Management- Brand and Pricing Strategies – Patent Mining – Patent Landscaping and Patent Mapping

Unit IV

Strategic Management of Intellectual Property: Defensive & Offensive Strategies – Intellectual Asset Management - Intellectual Property Audit – Identification & Grouping of Intangible Assets into Bundles - Intangible Asset Management Plan – Value Maximization Strategies – Value Extraction Strategies – Licensing Process and Management

Unit V

Valuation of Intellectual Property: Need for IP Valuation – Approaches of IP Valuation – Cost Approach – Income Approach – Market Approach – Methods of IP Valuation – "25% Rule" Method - Industry Standards Methods - Ranking Method - Surrogate Methods - Disaggregation Methods - Monte Carlo Method - Real Options Methods - The CAV Method - Market Value Method -Collateralization of IPA

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Sunita K. Sreedhararn , An Introduction to Intellectual Asset Management.
2. Patrick H. Sullivan, Profiting from Intellectual Capital: Extracting Value from Innovation 3. Tulika Rastogi, IP Audit: Your Way to Healthy Organisation
3. Gordon V. Smith and Russell L. Parr, Valuation of Intellectual Property and Intangible Assets, 3rd Edition
4. Bruce Berman, From Assets to Profits: Competing for IP Value and Return (Intellectual Property-General, Law, Accounting & Finance, Management, Licensing, Special Topics).

REFERENCES

5. Loganathan, E.T. -IPR‖ (IPRS), TPIPS Agreement and Indian Laws.
6. Dasgupta. S: Technology and Creativity & Creativity, Oxford University Press, New York, 1996.
7. Proctor. T: The Essence of Management Creativity, Prentice - Hall, New Delhi, 1997.
8. Richards. T: Creativity and Problem Solving Network, Gower, Hampshire, 1997.
9. Ceserani. J & Greatwood. P: Innovation & Creativity, Kogan Page, London, 1995.
10. Ziman. J: Technological Innovation as an Evolutionary Process, Cambridge University Press, Cambridge, 2000

MBA IV SEMESTER

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20MB4T26 INNOVATION TECHNOLOGY MANAGEMENT

Unit – I

Analyzing the Current Business Scenario: Innovation and Creativity - An Introduction, Innovation in Current Environment, Types of Innovation, School of Innovation. Challenges of Innovation, Steps of Innovation Management, Idea Management System, Divergent Vs Convergent Thinking, Levers of Idea Management. Experimentation in Innovation Management, Idea Championship, Participation for Innovation, Co-creation for Innovation, Proto typing to Incubation.

Unit – II

Marketing of Innovation: Technology Innovation Process, Technological Innovation Management Planning, Technological Innovation Management Strategies, Technology Forecasting.

Unit – III

Introduction to Technology Management: Concept and Meaning of Technology and Technology Management- Technology; Technology management, Evolution and Growth of Technology, Role and Significance of Technology Management, Impact of Technology on Society and Business- Technology and competition; Key issues in managing technological innovation, Forms of Technology- Process technology; Product technology

Unit –IV

Technology Acquisition*:* Technology Acquisition, Alternatives for Acquiring New Technologies, Reasons Compelling a Company for Obtaining a New Technology, Management of Acquired Technology, Measures of Scale and Mechanisms for Acquiring Technologies- Economy of scale or Scale economy; Levels of scale; The measurement of scale; Factors affecting the choice of scale

Unit - V

Technology Forecasting*:* Concept of Technology Forecasting- Characteristics of technology forecasting ; Technology forecast method; Principles of technology forecasting, Technology Forecasting Process, Need and Role of Technology Forecasting, Forecasting Methods and Techniques, Planning and Forecasting, Technology Strategy and Competitiveness: Technology Strategy-Technology strategy and management; Elements of an accessible technology strategy, Innovation Management, Competitive Advantage- Components of competitive advantage; Creating competitive advantage using value chain, Technology Management Evaluation or Assessment.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Industry, Innovation and Infrastructure: Leal Filho, W. (Ed), Azul, A. M. (Ed), Brandli, L. (Ed), Lange Salvia, A. (Ed), Wall, T. (Ed) *(2021)*
2. Innovation Management in the Intelligent World: Daim, T. U. (Ed), Meissner, D. (Ed) *(2021)*
3. *Technological Innovation and International Competitiveness for Business Growth: Ferreira, J. J. M. (Ed), Teixeira, S. J. (Ed), Rammal, H. G. (Ed)* (2020)

REFERENCES

4. Entrepreneurship, Technology Commercialization, and Innovation Policy in Africa: Daniels, C. U. (Ed), Dosso, M. S. (Ed), Amadi-Echendu, J. (Ed) *(2020)*
5. *Business innovation with new ICT in the Asia-Pacific: Case studies: Kosaka, M. (Ed), Wu, J. (Ed), Xing, K. (Ed), Zhang, S. (Ed)* (2021)

MBA IV SEMESTER

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4	0	0	3

20MB4T27 VENTURE VALUATION AND ACCOUNTING

Unit I

Joint Ventures: Concept and Meaning of Joint Ventures, Features, Need, growth and Types of Joint Ventures, Structures, process and Legal aspects – Advantages and Problems faced in Joint Ventures, Prospects of Joint Ventures and Strategic Alliance - Relevant case study of successful and failed joint ventures.

Unit II

Mergers and Acquisitions: Introduction to mergers, types of mergers, theories of mergers & acquisitions; Cross-border mergers and acquisitions, issues and challenges in cross border M&A. Handling cross-culture and taxations issues in cross-brder M&A. Analysis of Post-Merger Performance. Demerger, types of demerger, reverse merger, buyback of shares, leverage buy-out strategy, merger strategy - growth, synergy, operating synergy, financial synergy, diversification. Takeover and its types, takeover strategy, takeover bids, legal framework for mergers and acquisitions, leverages and buyouts.

Unit III

Deal Valuation and Evaluation: Factors affecting valuation basics, methods of valuation, cash flow approaches, economic value added (EVA), sensitivity analysis, valuation under takeover regulation, valuation for slump sale, cost-benefit analysis and swap ratio determination

Unit IV

Post-Merger Evaluation: Financial Evaluation of Mergers & Acquisitions, Impact on shareholders Wealth; Methods of payment and financing options in mergers & acquisitions, financing decision, Merger, Acquisition and Competition law 2002, SEBI (Securities & Exchange Board of India) Takeover Code 2011 and criteria for negotiating friendly takeover.

Unit V

Consignment Accounts: Important terms; Accounting records; Valuation of unsold stock; Conversion of consignment into branch Joint Venture Accounts: Meaning of joint venture; Joint venture and partnership; Accounting records Branch Accounts: Partnership Accounts Essential characteristics of partnership; Partnership Deed; Final Accounts; Adjustment after closing the accounts; Fixed and fluctuating capital; Goodwill; Joint Life Policy; Change in Profit Sharing Ratio Reconstitution of a partnership firm- Admission of a partner, Retirement of a partner‘ Death of a partner; Amalgamation of partnership firms; Dissolution of a partnership firm;- Modes of dissolution of a firm; Accounting entries; Insolvency of Partners.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS

1. Gupta. R.L.and Radhaswamy. M: Financial Accounting; Sultan Chand and Sons, New Delhi.
2. Monga J.R., Ahuja Girish, and Sehgal Ashok: Financial Accounting; Mayur Paper Nokia.
3. Shukla. M.C., Grewal T.S., and Gupta, S.C.: Advanced Accounts: S. Chand & Co. New Delhi.
4. .Weston, Fred; Chung, Kwang S. &Siu, Jon A.: Takeovers, Restructuring and Corporate Governance, (2nd ed.). Pearson Education

REFERENCES

5. Gupta, Manju (2010): Contemporary Issues in Mergers and Acquisitions. Himalaya Publishing House.
6. Sundarsanam (2006); Creating Value from Mergers and Acquisitions, (1st ed.) Pearson Education.
7. Ramanujan. S. (1999); Mergers: The New Dimensions for Corporate Restructuring, McGraw Hill
8. Narayankar, Ravi, (2013): Merger and Acquisitions Corporate Restructuring, Strategy

COURSE STRUCTURE

MCA I SEMESTER

S.No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MC1T01	BS&H	Business Communication	3	0	0	3
2	20MC1T02	BS&H	Mathematical and Statistical Foundations	3	0	0	3
3	20MC1T03	PC	Computer Organization	3	0	0	3
4	20MC1T04	PC	Data Structures Using C	3	0	0	3
5	20MC1T05	PC	Data Base Management Systems	3	0	0	3
6	20MC1L06	BS&H	Business Communication Lab	0	0	3	1.5
7	20MC1L07	PC	Data Structures Lab	0	0	3	1.5
8	20MC1L08	PC	Data Base Management Systems Lab	0	0	3	1.5
9	20MC1M09	MC	Project using Design Thinking	0	0	1	0.5
			Total			10	20

MCA II SEMESTER

S.No	Course Code	Course Category	Course Title	L	T	P	Credits
1	20MC2T01	PC	Operating Systems	3	0	0	3
2	20MC2T02	PC	Computer Networks	3	0	0	3
3	20MC2T03	PC	Object Oriented Programming	3	0	0	3
4	20MC2T04	PC	Software Engineering	3	0	0	3
5	20MC2T05/ 20MC2T06/ 20MC2T07	PE	**Elective-I** No SQL Databases/ Design and Analysis of Algorithms/ Mobile Application Development	3	0	0	3
6	20MC2L08	PC	Operating Systems Lab	0	0	3	1.5
7	20MC2L09	PC	Computer Networks Lab	0	0	3	1.5
8	20MC2L10	PC	Java Programming Lab	0	0	3	1.5
9	20MC2M11	MC	Python Programming (to be taken through MOOCs)	0	0	0	0.5
			Total	15	0	10	20

MCA III SEMESTER

S.No	Course Code	Course Category	Course Tile	L	T	P	Credits
1	20MC3T01	PC	Machine Learning with Python	3	0	0	3
2	20MC3T02	PC	Big Data Analytics	3	0	0	3
3	20MC3T03	PC	Web Technologies	3	0	0	3
4	20MC3T04	PC	Cryptography and Network Security	3	0	0	3
5	20MC3T05/ 20MC3T06/ 20MC3T07/ 20MC3T08	PE	**Elective-II** Software Project Management Cloud Computing Cyber Security Advanced Data Bases	3	0	0	3
6	20MC3L09	PC	Machine Learning with Python Lab	0	0	3	1.5
7	20MC3L10	PC	Big Data Analytics Lab	0	0	3	1.5
8	20MC3L11	PC	Web Technologies Lab	0	0	4	2
9	20MC2P12	PR	Internship / Industry Oriented Mini Project/ Skill Development Course (Minimum 6-weeks)	0	0	0	2
			Total	15	0	10	22

MCA IV SEMESTER

S.No	Course Code		Course Title	L	T	P	Credits
1	20MC4T01/ 20MC4T02/ 20MC4T03	PE	**Elective-III *** Digital Marketing/ Human Resource Management/ Ad-hoc and Sensor Networks/ MOOCs-1(NPTEL/SWAYAM) Full Stack Technologies Any Recommended Course	3	0	0	3
2	20MC4T04/ 20MC4T05/ 20MC4T06 20MC4T07	PE	Elective-IV * Block Chain Technologies/ Software Testing Methodologies/ E Commerce MOOCs-2(NPTEL/SWAYAM) -Data Science -Any Recommended Course	3	0	0	3
3	20MC4P08	PR	Project Work/ Dissertation	0	0	0	12
			Total	6	0	0	18

***Students going for Industrial Project/Thesis will complete these courses through MOOCs (even in earlier semester)**

MCA I Semester

L	T	P	C
3	0	0	3

20MC1T01 BUSINESS COMMUNICATION

Course Objectives:

To acquaint the students with fundamentals of communication, help them honing oral, written and non- verbal communication skills and to transform them as effective communicators.

Course Outcomes:

- Understand various components of communication skills besides listening skills.
- Learn nuances of organizational communication, Interpersonal and Intra Personal communication
- Demonstrate the Non Verbal communication strategies for effective usage during interview process
- Demonstrate writing skills
- Use presentation skills in real time environments

SYLLABUS

UNIT I:

Purpose and process of communication: Objectives of Communication-Process of Communication - Types of communication; noise, listening skills, Types of listening, essentials of good listening and tips.

UNIT II:

Managing Organizational Communication: Formal and Informal Communication-Interpersonal and Intrapersonal communication- Role of Emotion in Interpersonal Communication- Barriers to Interpersonal Communication- Exchange Theory- Gateways for Effective Interpersonal Communication.

UNIT III:

Non-verbal communication and Body Language: Kinesics, Proxemics, Paralanguage, Haptics, handshakes, appropriate body language and mannerisms for interviews: business etiquettes- across different cultures.

UNIT IV:

Written communication: mechanics of writing, report writing- business correspondence- business letter format- Meetings and managing meetings- Resume writing- Formats and Skills.

UNIT V:

Presentation skills: prerequisites of effective presentation, format of presentation; Assertiveness – strategies of assertive behavior; Communication skills for group discussion and interviews, Interview Techniques.

Note: Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Reference Books:

1) Mallika Nawal: "Business Communication", Cengage Learning, New Delhi, 2012.
2) Edwin A. Gerloff, Jerry C. Wofford, Robert Cummins Organisational Communication: The key stone to managerial effectiveness.
3) Meenakshi Rama: "*Business Communication*", Oxford University Press, New Delhi
4) C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai
5) Paul Turner: "*Organisational Communication*", JAICO Publishing House, New Delhi.
6) Sathya Swaroop Debasish, Bhagaban Das" "*Business Communication*", PHI Private Limited, New Delhi, 2009.
7) R.K.Madhukar: "Business Communication", Vikas Publishing House, New Delhi, 2012.
8) Kelly M Quintanilla, Shawn T. Wahl:"Business and Professional Communication", SAGE, New Delhi, 2012.
9) Sangita Mehta, Neety Kaushish: "Business Communication", University Science Press, New Delhi, 2010.
10) Anjali Ghanekar:"Business Communication Skills", Everest Publishing House, New Delhi, 2011

MCA I SEMESTER

L	T	P	C
3	0	0	3

20MC1T02 MATHEMATICAL AND STATISTICAL FOUNDATIONS

Course Objectives: This course is aimed at enabling the students to

- Understand the mathematical fundamentals that is prerequisites for variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems bio informatics, Machine learning.
- Develop the understanding of the mathematical and logical basis to many modern techniques in computer science technology like machine learning, programming language design, and concurrency.
- Study various sampling and classification problems.

Course Outcomes:

- Apply the basic rules and theorems of probability theory.
- Analyze sampling, means, proportions, variances and estimate the maximum likelihood based on population parameters.
- Formulate sample means, variances and proportions and draw conclusions based on the results of statistical tests.
- Design various ciphers using number theory.
- Apply graph theory for real time problems like network routing problem.

UNIT I:

Basic Probability and Random Variables: Random Experiments, Sample Spaces Events, the Concept of Probability the Axioms of Probability, Some Important Theorems on Probability Assignment of Probabilities, Conditional Probability Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables

UNIT II:

Sampling and Estimation Theory: Population and Sample, Statistical Inference Sampling With and Without Replacement Random Samples, Random Numbers Population Parameters Sample Statistics Sampling Distributions, The Sample mean, sampling distribution of means, sampling distribution of Proportions.. Unbiased Estimates and Efficient Estimates Point Estimates and Interval Estimates.

UNIT III:

Tests of Hypothesis and Significance: Statistical Decisions Statistical Hypotheses. Null Hypotheses, Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests Involving the Normal Distribution One-Tailed and Two-Tailed Tests, P Value, Special Tests of Significance for Large Samples, Special Tests of Significance for Small Samples.

UNIT IV:

Algebraic Structures and Number Theory: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

UNIT V:

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Coloring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Reference Books:

1) Foundation Mathematics for Computer Science, 1st Edition, John Vince,Springer,2015
2) Probability & Statistics, 3rd Edition, Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers,2018

3) Probability and Statistics with Reliability,2nd Edition, K. Trivedi, Wiley,2011

4) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, H. Rosen, Tata McGraw Hill, 2003

5) Probability and Computing: Randomized Algorithms and Probabilistic Analysis,1st Edition, M. Mitzenmacher and E.Upfal,2005

6) Applied Combinatorics, 6thEdition, Alan Tucker,Wiley,2012

MCA I SEMESTER	**L**	**T**	**P**	**C**
	3	1	0	4

20MC1T03 COMPUTER ORGANIZATION

Course Objectives:

The purpose of the course is to introduce principles of computer organization and the basic architectural concepts. In depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

Course Outcomes:

- Understand the design of the functional units of a digital computer system.
- Recognize and manipulate representations of numbers stored in digital computers
- Understand the Design of combinational and sequential circuits
- Understand the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components
- Solve elementary problems by assembly language programming

UNIT I:

Digital Components and Data Representation: Introduction, Numbering Systems, Decimal to inary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCII Code

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

UNIT II:

Combinational Circuits: Boolean expressions and their minimization using algebraic identities; Karnaugh map representation and minimization of Boolean functions using K- map; Two-level realizations using gates -- AND-OR, OR-AND, NAND-NAND and NOR- NOR structures.

Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Integrated NAND-NOR Gates, Multifunction gates, Multi-bit adder, Multiplexers, De-multiplexers, Decoders

UNIT III:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT IV:

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Reference Books:

1. Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson Education.
2. Computer System Architecture, 3rd ed., M.Morris Mano,PHI
3. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI,2006
4. Computer Organization, 5th ed., Hamacher, Vranesic andZaky,TMH,2002
5. Computer Organization & Architecture: Designing for Performance, 7th ed., William Stallings, PHI,2006

MCA I SEMESTER

L	T	P	C
3	0	0	3

20MC1T04 DATA STRUCTURES USING C

Course Objectives:

The objective of this course is to explore basic data structures such as stacks and queues, introduce a variety of data structures such as hash tables, search trees, tries, heaps, graphs, sorting and pattern matching algorithms.

Course Outcomes

- Implement basic programs by using C concepts.
- Understand the concepts of pointers and file handling concepts in C.
- Apply data structures that efficiently model the information in a problem
- Assess efficiency trade-offs among different data structure implementations or combinations
- Implement and know the application of algorithms for sorting and pattern matching.

UNIT I:

Introduction to C: Constants and variables, Operators and Expressions, Managing Input and Output operators, Decision making-branching and looping, Arrays,

UNIT II:

Functions, Structures and Unions, Pointers, File handling in C.

UNIT III:

Data structure: Definition, types of data structures Recursion Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion. Preliminaries of algorithms, analysis and complexity .**Linear list** – singly linked list, Double linked list and circular linked list - implementation, insertion, deletion and searching operations on linear list.

UNIT IV:

Stacks-Operations, array and linked representations of stacks, stack applications, **Queues**-operations, array and linked representations. **Hash Table Representation:** hash functions, collision resolution- separate chaining, open addressing-linear probing, quadratic probing, double hashing and rehashing, extendible hashing.

UNIT V:

Sorting Techniques: Insertion sort, selection sort, exchange-bubble sort, quick sort and merge sort Algorithms. **Trees:** Binary Trees, terminology, representation and traversals- pre, post & in order traversals. **Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion

Reference Books:

1) Data Structures and Algorithm Analysis in C, 2nd ed, Mark AllenWeiss
2) Data Structures: A Pseudo code Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.
3) Let Us C: Authentic Guide to C Programming Language,17th ed., Yashavant Kanetkar, BPB Publications.
4) Data Structures Using C. 2nd Edition, Reema Thareja, Oxford
5) Programming in ANSI C, 5thed, E. Balaguru swamy, TMH

MCA I SEMESTER	**L**	**T**	**P**	**C**
	3	0	0	3

20MC1T05 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

To enable students to understand and use relational Database system. Conceptual design using ERD, functional dependencies and Normalization and relational algebra are covered in detail. Students learn how to design and create a good database and use various SQL operations.

Course Outcomes:

1. Understand database and different database models
2. Design Entity Relationship models and convert to relational Model
3. Design and implement queries using Structured Query Language
4. Design database schema and apply normalization.
5. Understand and apply transaction management and Concurrency control.

UNIT I:

Introduction to Databases: Introduction, An Example, Characteristics of the Database Approach, Actors on Scene, Workers behind the scene, Advantages of Using the DBMS Approach, brief History of Database Applications, When Not to Use a DBMS

Overview of Database Languages and Architectures: Data Models, Schemas and Instances, Three- Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architecture for DBMSs, Classification of Database Management Systems

UNIT II:

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Conceptual Design for Large Enterprises

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/Altering Tables and Views

UNIT III:

Relational Algebra: Selection and Projection, Set Operations, Renaming, Joins, Division, More Examples of Algebra Queries.

SQL: Queries, Constraints, Triggers: The Form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases.

UNIT IV:

Introduction to Normalization Using Functional and Multivalued Dependencies: Informal Design Guidelines for Relation Schema, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multi valued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

UNIT V:

Transaction Management and Concurrency Control: Transaction Concept, A Simple Transaction Model, Storage Structure, ACID Properties, Serializability, Transaction Isolation Levels, Concurrency Control, Lock-Based Protocols, Validation-Based Protocols **[Text Book-2]**

Note: For Practical Examples Please Go Through Reference 1

Reference Books:

1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, McGraw-Hill
2) Database System Concepts, 6/e, Abraham Silberschatz,Henry F.Korth, S.Sudarshan, McGraw- Hill
3) Database Systems, 6/e Ramez Elmasri, Shamkant B. Navathe, Pearson
4) Database Systems, 9/e, Carlos Coronel, Steven Morris, Peter Rob, Cengage
5) Introduction to Database Systems, 8/e, C J Date, Pearson

MCA I SEMESTER

L	T	P	C
0	0	3	1.5

20MC1L06 BUSINES COMMUNICATION LAB

Course Objectives:

To acquaint the students with fundamentals of communication, help them honing oral, written and non- verbal communication skills and to transform them as effective communicators.

Course Outcomes:

- Understand various components of communication skills besides listening skills.
- Learn nuances of organizational communication, Interpersonal and Intra Personal communication
- Demonstrate the Non Verbal communication strategies for effective usage during interview process
- Demonstrate writing skills
- Use presentation skills in real time environments

Task 1:

- Role plays

Task 2:

- JAM

Task 3:

- Group Discussion

Task 4:

- Debate

Task 5:

- Presentation Skills

Task 6:

- Interview Process

MCA I SEMESTER	L	T	P	C
	0	0	3	1.5

20MC1L07 DATA STRUCTURES LAB

Course Objectives: This Course will enable students to

- Design and implement various data structures.
- Implement operations like searching, insertion, and deletion, traversing mechanism
- Develop applications using data structure algorithms.

Course Outcomes (COs):

- Implement various basic data structures and its operations.
- Apply sorting and searching algorithms to given numbers
- Implement various tree operations.
- Implement various graphs algorithms.
- Develop applications using various data structures.

Experiment 1:

a) Write a program in C to display the n terms of even natural number and their sum.
b) Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 +1/4 + 1/5 ... 1/n terms.
c) Write a C program to check whether a given number is an Armstrong number or not.
d) Write a C program to calculate the factorial of a given number.

Experiment 2:

a) Write a program in C for multiplication of two square Matrices.
b) Write a program in C to find transpose of a given matrix.

Experiment 3:

a) Write a program in C to check whether a number is a prime number or not using the function.
b) Write recursive program which computes the n^{th} Fibonacci number, for appropriate values of n.
c) Write a program in C to add numbers using call by reference.

Experiment 4:

a) Write a program in C to append multiple lines at the end of a text file.

b) Write a program in C to copy a file in another name.

Experiment 5:

Write recursive program for the following

a) Write recursive and non recursive C program for calculation of Factorial of an integer.

b) Write recursive and non recursive C program for calculation of GCD (n, m)

c) Write recursive and non recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

Experiment 6:

a) Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Experiment 7:

a) Write C program that implement stack (its operations) using arrays.

b) Write C program that implement stack (its operations) using Linked list.

Experiment 8:

a) Write a C program that uses Stack operations to convert infix expression into postfix expression.

a) Write C program that implement Queue (its operations) using arrays.

b) Write C program that implement Queue (its operations) using linked lists.

Experiment 9:

Write a C program that uses functions to create a singly linked list and perform various operations on it.

Experiment 10:

Write a C program to store a polynomial expression in memory using linked list and perform polynomial addition.

Experiment 11:

a) Write a recursive C program for traversing a binary tree in preorder, in order and post order.

b) Write an on recursive C program for traversing abinary tree in preorder, in order and post order.

Experiment 12:

a) Write a C program to implement Prims' algorithm.

b) Write a C program to implement Kruskal's algorithm.

Experiment 13:

Implementation of Hash table using double hashing as collision resolution function.

Experiment 14:

Implementation of Binary Search trees- Insertion and deletion.

Experiment 15:

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order.

c) Write C program that implement merge sort, to sort a given list of integers in ascending order

MCA I SEMESTER	**L**	**T**	**P**	**C**
	0	0	3	1.5

20MC1L08 DATA BASE MANAGEMENT SYSTEMS LAB

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Experiments:

1) Execute all DDL, DML and DCL commands on sample tables.
2) Implementation of different types of operators and built-in functions with suitable examples
3) Implementation of different types of joins with suitable examples
4) Create views, partitions, Sequence, Indexes and locks for a particular DB
5) Implement different types of constraints on relations.
6) Implementation of sub queries and nested queries.
7) Implement Queries on Group By & Having Clauses, ALIAS, Sequence By, Order By
8) Control Structure
   a) Write a PL/SQL block for Addition of Two Numbers
   b) Write a PL/SQL block for IF, IF and else condition
   c) Write a PL/SQL block for implementation of loops
   d) Write a PL/SQL block for greatest of three numbers using IF and ELSEIF
9) Exception Handling- Implement the following with respect to exception handling. Raising Exceptions, User Defined Exceptions, Pre-Defined Exceptions
10) Write PL/SQL block for an application using exception handling *Procedures*

a) Write a PL/SQL Procedure using Positional Parameters
b) Write a PL/SQL Procedure using notational parameters
c) Write a PL/SQL Procedure for GCD Numbers
d) Write a PL/SQL Procedures for cursor implementation (explicit and implicit cursors)

11) Functions:
a) Write a PL/SQL block to implement factorial using functions
b) Write a PL/SQL function to search an address from the given database

12) WriteaDBMSprogramtopreparePl/SQLreportsforanapplicationusingfunctions.

13) Triggers:
a) Write a Trigger to pop-up the DML operations
b) Write a Trigger to check the age valid or not Using Message Alert.
c) Create a Trigger to Raise appropriate error code and error message.
d) Create a Trigger on a table so that it will update another table while inserting values

14) Write PL/SQL block for an application using cursors and all types of triggers.

15) Write a PL/SQL block for transaction operations of a typical application using package

Text Books:

1) Oracle: The Complete Reference by Oracle Press
2) Nilesh Shah, "Database Systems Using Oracle", PHI,2007
3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education,2007

MCA I SEMESTER

L	T	P	C
0	0	1	0.5

20MC1M09 PROJECT USING DESIGN THINKING

Course Objectives:

- Build mindsets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating ill defined problems.
- Undergo several design challenges and work towards the final design challenge

Apply Design Thinking on the following Streams to

- Project Stream1: Electronics, Robotics, IOT and Sensors
- Project Stream2: Computer Science and IT Applications
- Project Stream 3: Mechanical and Electrical tools
- Project Stream 4: Eco-friendly solutions for waste management, infrastructure, safety, lternative energy sources, Agriculture, Environmental science and other fields of engineering.

How to Pursue the Project Work?

- The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human-centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
- The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

Tasks to be done:

Task 1: Everyone is a Designer

- Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast

- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through a simple design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems

- Start Design Challenge and learn about teams & problems through this
- Foster team collaboration, find inspiration from the environment and learn how to identify problems

Task 4: Empathizing

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 5: Ideating

- Continue Design Challenge and learn how to brain storm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Task 6: Prototyping

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 7: Testing

- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity Card

Task 8 :

- Final Report Submission and Presentation

References:

1. Tom Kelly, The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm (Profile Books,2002)
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (HarperBusiness,2009)
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing,2017)

Other Useful Design Thinking Frameworks and Methodologies:

- Human-Centered Design Toolkit (IDEO);https://www.ideo.com/post/design-kit
- Design Thinking Boot Camp Bootleg (Stanford D-School);https://dschool.stanford.edu/resources/the-bootcamp-bootleg
- Collective Action Toolkit (frog design) ; https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf
- Design Thinking for Educators (IDEO);https://designthinkingforeducators.com/

MCA II SEMESTER	L	T	P	C
	3	0	0	3

20MC2T01 OPERATING SYSTEMS

Course Objectives:

This Course will enable students to implement CPU scheduling algorithms, Disk scheduling algorithms

COURSE OUTCOMES:

- Understand the functionalities of an operating system and Evaluate different CPU scheduling algorithms.
- Apply synchronization to cooperating processes and handle the deadlocks
- Learn various management techniques for efficient utilization of system memory.
- Understand and analyze theory and implementation offiles and Evaluate different disk scheduling algorithms.
- Analyze the functionalities in various operating systems.

SYLLABUS:

UNIT I

Introduction to Operating System Concept: Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types.

Process Management– Process concept, the process, Process State Diagram, Process control block, Process

Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Inter process Communication, Scheduling- Basic Concepts, Scheduling Criteria, and Scheduling Algorithms.

UNIT-II:

Concurrency: Process Synchronization, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples

Principles of deadlock– System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock

UNIT-III:

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation

Virtual Memory Management: Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing

UNIT-IV:

File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation- File system structure, allocation methods, free-space management

UNIT V:

Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers.

Linux System: Components of LINUX, Inter process Communication, Synchronization, Interrupt,

Exception and System Call.

REFERENCES:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.

2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.

3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016.

4. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.

5. Operating Systems: A Concept- Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw- Hill Education, 2007.

MCA II SEMESTER

L	T	P	C
3	0	0	3

20MC2T02 COMPUTER NETWORKS

Course Objectives:

At the end of the course, the students will be able to:

- Understands the fundamental concepts of computer networking and OSI Reference model.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Learn and understand the advanced networking concepts, preparing the student for entry advanced courses in computer networking.
- Develop and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcomes (COs): At the end of the course, student will be able to

- Understand the network architecture, TCP/IP and OSI reference models
- Demonstrate the data link protocols, multi-channel access protocols and IEEE 802 standards for LAN
- Describe routing and congestion in network layer with routing algorithms and classify IPV 4 addressing scheme
- Understand the elements and protocols of transport layer
- Understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

UNITI:

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models.

Physical Layer –Introduction to physical layer-Data and Signals, Periodic analog signals, digital signals, transmission impairment, Data rate limits, performance - Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and Unguided media: Wireless- Radio waves, microwaves, infrared.

UNIT II:

The Data Link Layer - Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction– Error- Correcting Codes– Error Detecting Codes. **Elementary Data Link Protocols-** A Utopian Simplex Protocol-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols- A One Bit Sliding Window Protocol –A Protocol Using Go –Back –N - A Protocol Using Selective Repeat.

UNIT III:

The Medium Access Control Sub layer-The Channel Allocation Problem-Static Channel Allocation- Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-Pure aloha- slotted aloha-Carrier Sense Multiple Access Protocols-Collision-Free Protocols-Limited Contention Protocols. **Wireless LAN Protocols-** Ethernet-Classic Ethernet Physical Layer-Classic Ethernet MAC Sub-layer Protocol-Ethernet Performance-Fast Ethernet- Wireless LANs-The 802.11 Architecture and Protocol Stack.

UNIT IV:

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical. **Congestion Control algorithms-** General principles of congestion control, Congestion prevention polices, **Internet Working:** How networks differ- How networks can be connected- Tunneling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-, IP addresses-, Subnets-IP Version 6-The main IPV6 header-Internet control protocols- ICMP-ARP- DHCP.

UNIT V:

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services- TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control. **Application Layer–-**World Wide Web: HTTP, FTP- Two connections-control connection- Data connection - security of FTP-Electronic mail - Architecture- web based mail- email security-

TELENET-local versus remote Logging. **Domain Name System:** Name Space, DNS in Internet, - Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers.

Reference Books:

1) Computer Networks: Andrew S Tanenbaum David J. Wetherall, 5/e, Pearson
2) Data communications andnetworking:BehrouzForouzan,5/e, McGraw Hill
3) Computer Networks –A System Approach, Peterson, Bruce Davie, 2/e, Harcourt Asia
4) Compute communications and networking technologies, Gallo, Hancock, Cengage
5) An Engineering approach to compute networking, Kesha, Pearson

MCA II SEMESTER

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20MC2T03 OBJECT ORIENTED PROGRAMMING

Course Objectives:

- To understand the basic concepts of object oriented programming concepts.
- To introduce the principles of inheritance and polymorphism and demonstrate how they are related to the design of abstract classes
- To understand the implementation of packages and interfaces
- To introduce the concept of multithreading and exception handling
- To learn and understand the design of Graphical User Interface using applets and swing controls

Course Outcomes (COs): At the end of the course, student will be able to

- Understand the OOP concepts
- Apply OOP concepts to solve real world problems
- Demonstrate the exception handing, multithread applications with synchronization
- Design the GUI based applications using AWT and Swings
- Apply the Collection Frame work

UNIT I:

Basics of Object Oriented Programming (OOP): Need for OO paradigm , A way of viewing world- Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of OOP concepts, coping with complexity, abstraction mechanisms.

Java Basics: Data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects- concepts of classes, objects, constructors methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.

UNIT II:

Inheritance: Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism, abstract classes.

Packages and Interfaces: Defining, Creating and Accessing a package, Understanding CLASSPATH, Importing packages, differences between classes and interfaces, defining an interface, Implementing interface, applying interfaces variables in interface and extending interfaces.

UNIT III:

Exception handling and Multithreading: Concepts of exception handling, benefits of exception handling, Termination or presumptive models, exception hierarchy, usage of try, catch, throws and finally, built – in exceptions, creating own exception sub-classes. Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

UNIT IV:

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy , user- interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, list panes- scroll pane, dialogs, menu bar, graphics, layout manager- layout manager types- boarder, grid, flow, card and grid bag.

UNIT V:

Applets: Concepts of Applets, differences between applets and applications, life cycle of an apple, types of applets, creating applets, passing parameters to applets, **Swings:** Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons -The J Button class, Check boxes, Radio Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees and Tables.

Reference Books:

1) Java-The complete reference,7/e, Herbert Schildt, TMH
2) JAVA: How to program, 8/e, Dietal, Dietal, PHI
3) Introduction of programming with JAVA, S. Dean, TMH
4) Introduction to Java programming, 6/e, Y. Daniel Liang, Pearson
6) Big Java2, 3/e, Cay. S. Horstmann, Wiley

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MCA II SEMESTER	3	0	0	3

20MC2T04 Software Engineering

COURSE OBJECTIVES:

1) To grasp generic models to structure the software development process.
2) To understand core concepts of requirements engineering and requirements specification.
3) To recognize different notion of complexity at both the module and system level.
4) To be aware of some widely known design methods.
5) To understand the role and contents of testing activities in different life cycle phases.

COURSE OUTCOMES:

1) Understand the perspective of various software process models
2) Understand the Requirements Engineering Process and compile an SRS
3) Analyze the requirements and perform a Design
4) Apply testing principles on software project and understand the maintenance concepts.
5) Identify risks; manage the change to assure quality in software projects

SYLLABUS

UNIT-I

The Evolving Role of Software – Software – The changing Nature of Software – Legacy software — A
generic view of process– A layered Technology – A Process Framework – The Capability Maturity Model Integration (CMMI) – Process Assessment –Personal and Team Process Models – Product and Process – Process Models – The Waterfall Model – Incremental Process Models – Incremental Model – The RAD Model – Evolutionary Process Models – Prototyping – The Spiral Model – The Concurrent Development Model – Specialized Process Models – The Unified Process.

UNIT-II

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Designing the architecture. Assessment: Impact of Requirement Engineering in their problem. Decision Tables, SRS Document, IEEE Standards for SRS, Design: Architectural design, component level design, user interface design.

UNIT-III

Requirements Analysis – Analysis Modeling Approaches: Design Engineering – Design Process –Design Quality - Design Model - User Interface Design Design: Modeling with UML, Use case Diagrams, Class Diagrams, Object Diagrams, Sequence Diagrams, Collaboration Diagrams, Component Diagrams, Deployment Diagrams Coding standards, Coding Guidelines, Modern Programming Language features, Documentation Guidelines

UNIT-IV

Implementation and Testing: Quality concepts, Review techniques, Software Quality Assurance (SQA):
Verification and Validation, SQA Plans, Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom- Up Testing, Software Testing Strategies - Strategies: Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Testing conventional applications, Testing object oriented applications, and Testing Web applications.

UNIT-V

Project Management Concepts, Process and Project Metrics, Estimation for Software projects, Software Cost Estimation, Project Scheduling, Risk Management, Maintenance and Reengineering. Assessment: Preparation of Risk mitigation plan.

REFERENCES:

1. “Fundamentals of Software Engineering”, Rajib Mall, PHI Publication, 3rdedition.(Units 1,2,5)
2. Software Engineering, A Precise approach, Pankaj Jalote, Wiley.(Units 3,4)
3. Software Engineering, concepts and practices, Ugrasen Suman, Cengage learning(Units 3,5)
4. Roger S. Pressman, ―Software Engineering: A Practitioner‘s Approach‖, McGraw Hill International edition, Seventh edition.
6. Stephan Schach, ―Software Engineering‖, Tata McGraw Hill.
7. Ian Sommerville, Software Engineering, 9th Edition, Pearson Publishers.

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20MC2T05 No SQL DATABASES

Course Objectives:

The objective of the course is to:

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column oriented and Graph)
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases
- Explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases
- Ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes:

After the completion of the course, student will be able to do the following

- Identify the type of NoSQL database to implement based on business requirements (key-value, document, full text, graph,etc.)
- Apply NoSQL data modeling from application specific queries
- Understand NoSQL Storage Architecture
- Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing
- Apply indexing and ordering of data sets

UNIT I:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

UNIT II:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

UNIT III:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

UNIT IV:

NoSQL Stores: Similarities Between Sql And Mongodb Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

UNIT V

Indexing and Ordering Data Sets : Essential Concepts Behind A Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Reference Books:

1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional,2012.
2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications,2013.
3) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN:978-0-470-94224-6
4) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

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MCA II SEMESTER	3	0	0	3

20MC2T06 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes:

- Describe asymptotic notation used for denoting performance of algorithms
- Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non- recursive algorithms
- Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches
- Apply graph search algorithms to real world problems
- Demonstrate an understanding of NP- Completeness theory and lower bound theory

UNIT I:

Introduction: Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, probabilistic analysis, Amortized analysis. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and bi- connected components.

UNIT II:

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication. Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III:

Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

UNIT IV:

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT V:

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branchand Bound solution, FIFO Branch and Bound solution. NP- Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem.

Reference Books:

1) Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press
2) The Algorithm Design Manual, 2nd edition, Steven S. Skiena, Springer
3) Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivestand C. Stein, PHI Pvt. Ltd
4) Introduction to the Design and Analysis of Algorithms, An any Levi tin, PEA
5) Design and Analysis of Algorithms, Pearson Education, Parag Himanshu Dave, Himansu Bala chandra Dave
6) Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T. Lee, S.S.Tseng, R.C. Chang and T. Tsai, McGraw Hill.
7) Design and Analysis of algorithms, Pears on education, Aho, Ullman and Hopcroft

MCA II SEMESTER	L	T	P	C
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MOBILE APPLICATION DEVELOPMENT (20MC2T07**)**

Course Objectives:

- To demonstrate the introduction and characteristics of mobile applications
- Frame works. Managing application data and User- interface design for mobile applications
- Integrating networking, the OS and hardware into mobile-applications
- Addressing enterprise requirements in mobile applications – performance, scalability, modifiability, availability and security
- Testing methodologies for mobile applications**–** Publishing, deployment, maintenance and management. To demonstrate their skills of using Android software development tools
- To demonstrate their ability to deploy software to mobile devices

Course Outcomes:

- Install and configure Android application development tools
- Design and develop user Interfaces for the Android platform
- Understand the aspects of state information across important operating system events
- Apply Java programming concepts to Android application development
- Understand Testing methodologies for mobile applications

UNIT I:

Introduction to mobile devices: Introduction to Mobile Computing, Introduction to Android Development Environment, Mobile devices vs. desktop devices, ARM and Intel architectures, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play, Windows Store.

Development environments: XCode, Eclipse, VS2012, PhoneGAP, etc.; Native vs. web applications. **Factors in Developing Mobile Applications:** Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User.

UNIT II:

Android User Interface: Measurements – Device and pixel density independent measuring units User Interface(UI)Components– Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

UNIT III:

Back Ground Running Process, Networking and Telephony Services: Services: Introduction to services local service, remote service and binding the service, the communication between service and activity, Intent Service.

Multi Threading: Handlers, Async Task.

Broad cast receivers: Local Broadcast Manager, Dynamic broadcast receiver, System Broadcast. Pending Intent, Notifications.

UNIT IV:

Android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

Android network programming: Http URL Connection, Connecting to REST -based and SOAP based Web services.

UNIT V:

Advanced Topics: Power Management: Wake locks and assertions, Low-level OS support, Writing power-smart applications.

Augmented Reality via GPS and other sensors: GPS, Accelerometer, Camera.

Mobile device security in depth: Mobile malware, Device protections, iOS "Jailbreaking", Android "rooting" and Windows' "defenestration"; Security and Hacking: Active Transactions, More on Security, Hacking Android.

Reference Books:

1) Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 2nd edition, 2015.
2) Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) ,2012
3) Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
4) Dawn Griffiths, David Griffiths,*"Head First: Android Development" ,OReilly2015,ISBN*:

9781449362188

5) Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
6) Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox),2013
7) Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with RxJava, O'Reilly Media, 2016.
8) Brian Fling, Mobile Design and Development, O'Reilly Media, Inc., 2009.

MCA II SEMESTER	L	T	P	C
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20MC2L08 OPERATING SYSTEMS LAB

Course Objectives:

This Course will enable students to implement CPU scheduling algorithms, Disk scheduling algorithms, Execute different types of Linux commands and Write shell scripts

Course Outcomes (COs): At the end of the course, student will be able to

- Implement various CPU scheduling algorithms and compare results
- Implement various disk scheduling algorithms and compare results
- Implement page replace algorithms
- Implement various memory management techniques.
- Execute basic Linux commands

List of Experiments:

UNIX Lab- Introduction to UNIX

1. Study of Unix/Linux general purpose utility commands
2. Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
3. Study of UNIX/LINUX File System (tree structure).
4. C program to emulate the UNIX ls –lcommand
5. C program that illustrates how to execute two commands concurrently with a command pipe. Ex: -ls –l | sort
6. Multi programming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls

Operating Systems Lab

1. Simulate the Following CPU Scheduling Algorithms
   A) FCFS B) SJF C) Priority D) Round Robin
2. Multiprogramming-Memory Management-Implementation of fork(),wait(), exec() and exit()
3. Write a program to implement first fit, best fit and worst fit algorithm for memory management.

4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Prevention.
6. Simulate The Following Page Replacement Algorithms.
   a) FIFO b)LRU c)LFU
7. Simulate the Following File Allocation Strategies
   A) Sequenced b) Indexed c)Linked

Linux Lab

1. Write a Shell program to check whether given number is prime or not.
2. Write a shell script which will display Fibonacci series up to the given range.
3. Write a shell script to check whether the given number is Armstrong or not.
4. Write a shell script to the calculate the value of
5. Write a shell script to accept student number, name, marks in 5subjects.
6. Find total, average and grade using the following rules: Avg>=80 then grade A Avg<80&&Avg>=70 then gradeB Avg<70&&Avg>=60 then gradeC Avg<60&&Avg>=50 then gradeD Avg<50&&Avg>=40 then gradeE
7. Write a shell script to find minimum and maximum elements in the given list of elements.
8. Write a shell program to check whether the given string is palindrome or not.
9. Write an awk program to print sum, avg of students marks list
10. Write a shell script to compute no. of character sand words in each line of given file
11. Write a shell script to check whether the given input is a number or a string Note: Fundamentals of UNIX and Linux to be taught in the lab.

MCA II SEMESTER

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20MC2L09 COMPUTER NETWORKS LAB

Course Objectives:

At the end of the course, the students will be able to:

- Understands the fundamental concepts of computer networking and OSI Reference model.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Learn and understand the advanced networking concepts, preparing the student for entry advanced courses in computer networking.
- Develop and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcomes (COs):

- Demonstrate Data link Protocols.
- Describe routing and congestion in network layer with routing algorithms and classify IPV 4 addressing scheme
- Implement and protocols of transport layer

PART – A

1) Implement the data link layer farming methods such as character stuffing and bit stuffing.
2) Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRCCCIP.
3) Implement Dijkstra‘s algorithm to compute the Shortest path through a graph.
4) Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
5) Take an example subnet of hosts. Obtain broadcast tree for it.

PART – B

1) Design TCP iterative Client and server application to reverse the given input sentence
2) Design TCP client and server application to transfer file

3) Design a TCP concurrent server to convert a given text into upper case using multiplexing system call “select”
4) Design a TCP concurrent server to echo given set of sentences using poll functions
5) Design UDP Client and server application to reverse the given input sentence
6) Design UDP Client server to transfer a file
7) Design using poll client server application to multiplex TCP and UDP requests for converting a given text into uppercase.
8) Design a RPC application to add and subtract a given pair of integers

MCA II SEMESTER

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20MC2L10 JAVA PROGRAMMING LAB

Course Objectives:

- To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
- To understand importance of Multi-threading & different exception handling mechanisms.
- To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.
- To understand Java Swings for designing GUI applications based on MVC architecture

Course Outcomes (COs):

- Apply OOP concepts to solve real world problems
- Implement different forms of inheritance
- Create packages and to reuse them.
- Implement multi threaded programs using synchronization concepts
- Create user defined exceptions
- Design GUI applications using AWT and SWINGS.

List of Experiments:

1) The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1. Every subsequent value is the sum of the 2 values preceding it. Write a Java Program that uses both recursive and non recursive functions to print the nth value of the Fibonacci sequence.
2) Write a Java Program that prompts the user for an integer and then prints out all the prime numbers up to that Integer.
3) Write a Java Program that checks whether a given string is a palindrome or not. Ex. MALAYALAM is a palindrome.
4) Write a Java Program for sorting a given list of names in ascending order.
5) Write a Java Program that illustrates how runtime polymorph his misachieved.
6) Write a Java Program to create and demonstrate packages.

7) Write a Java Program, using String Tokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.
8) Write a Java Program that reads on file name form the user then displays information about whether the file exists, whether the file is readable/ writable, the type of file and the length of the file in bytes and display the content of the using File Input Stream class.
9) Write a Java Program that displays the number of characters, lines and word sin text / text file.
10) Write an Applet that displays the content of a file.
11) Write a Java Program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +-*?% operations. Add a text field to display the result.
12) Write a Java Program for handling mouse events.
13) Write a Java Program demonstrating the life cycle of a thread.
14) Write a Java Program that lets users create Pie charts. Design your own user interface (with Swings &AWT).
15) Write a Java Program to implement a Queue, using user defined Exception Handling (also make use of throw, throws).

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20MC3T01 MACHINE LEARNING WITH PYTHON

Course Objectives:

From the course the student will learn

- To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- Explore supervised and unsupervised learning paradigms of machine learning.
- To explore Deep learning technique and various feature extraction strategies.

Course Outcomes :

- Illustrate and comprehend the basics of Machine Learning with Python
- Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions
- Demonstrate the algorithms of Unsupervised Learning and be able to understand the clustering algorithms
- Evaluate the concepts of binning, pipeline Interfaces with examples
- Apply the sentiment analysis for various case studies

UNIT I:

Introduction to Machine Learning with Python: Introduction to Machine Learning, basic terminology, Types of Machine Learning and Applications, Using Python for Machine Learning: Installing Python and packages from the Python Package Index, Introduction to NumPy, SciPy, matplotlib and scikit-learn, Tiny application of Machine Learning.

UNIT II:

Supervised Learning: Types of Supervised Learning, Supervised Machine Learning Algorithms: k- Nearest Neighbors, Regression Models, Naïve Bayes Classifiers, Decision Trees, Ensembles of Decision Trees, Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers.

UNIT III:

Building good training datasets: Dealing with missing data, Handling categorical data, partitioning a data set into separate training and test datasets, bringing features onto the same scale, selecting meaningful features, assessing feature importance with random forests. **Compressing data via dimensionality reduction**: Unsupervised dimensionality reduction via PCA, Supervised data compression via linear discriminant analysis

UNIT IV:

Learning best Practices for Model Evaluation and Hyper parameter tuning: streamlining workflows with pipelines, using k-fold cross validation to assess model performance, debugging algorithms with learning and validation curves, fine tuning machine learning models via grid search, looking at different performance evaluation metrics. **Combining different models for Ensemble learning:** learning with ensembles, combining classifiers via majority vote, bagging-building an ensemble of classifiers from bootstrap samples, leveraging weak learners via adaptive boosting

UNITV:

Working with Text Data (Data Visualization): Types of Data Represented as Strings, Example Application: Sentiment Analysis of Movie Reviews, Representing Text Data as a Bag of Words, Stop Words, Rescaling the Data with tf-idf, Investigating Model Coefficients, Approaching a Machine Learning Problem, Testing Production Systems, Ranking, Recommender Systems and Other kinds of Learning.

Reference Books:

1) Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Muller & Sarah Guido, Orielly Publications, 2019.
2) Python Machine Learning, Sebastian Raschka & Vahid Mirjalili, 3rd Edition, 2019.
3) Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley, 1stEdition, 2019
4) Machine Learning, Tom M. Mitchell, Mc Graw-Hill Publication,2017
5) Building Machine Learning Systems with Python, Luis Pedro Coelho, Willi Richert, 2nd Edition, 2015.
6) Programming and Problem Solving with Python, Ashok Namdev Kamthane, Amit Ashok Kamthane, TMH, 2019.

MCA III SEMESTER

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20MC3T02 Big Data Analytics

COURSE OBJECTIVES:

1) Optimize business decisions and create competitive advantage with Big Data analytics
2) Introducing Java concepts required for developing map reduce programs
3) Derive business benefit from unstructured data
4) Imparting the architectural concepts of Hadoop and introducing map reduce paradigm

COURSE OUTCOMES:

1) Understand methods for data summarization, query, and analysis.
2) Apply data modelling techniques to large data sets
3) Creating applications for Big Data analytics
4) Building a complete business data analytic solution.
5) Understand programming tools PIG & HIVE in Hadoop eco-system.

SYLLABUS

UNIT-I

Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT-II

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Name node, Data node, Secondary Name node, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-III

Writing Map Reduce Programs: A Weather Dataset, Understanding Hadoop API for Map Reduce Framework (Old and New), Basic programs of Hadoop Map Reduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner.

UNIT-IV

Hadoop I/O: The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators

UNIT-V

Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

REFERENCE BOOKS:

1) Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2) Hadoop: The Definitive Guide by Tom White, 3 Edition, O'reilly
3) Hadoop in Action by Chuck Lam, MANNING Publ.9
4) Hadoop for Dummies by Dirk deRoos, Paul C. Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael
Coss
5) Hadoop in Practice by Alex Holmes, MANNING Publ.
5) Hadoop Map Reduce Cookbook, Srinath Perera, Thilina Gunarathne

MCA III SEMESTER

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20MC3T03 WEB TECHNOLOGIES

Course Objectives:

- To Learn PHP language for server side scripting
- To introduce XML and processing of XML Data with Java
- To introduce Server side programming with Java Servlets and JSP
- To introduce Client side scripting with Java Script.

Course Outcomes:

- Analyze a web page and identify its elements and attributes.
- To acquire knowledge of xml fundamentals and usage of xml technology in electronic data interchange
- Build dynamic web pages using JavaScript (client side programming).
- To design and develop web based enterprise systems for the enterprises using technologies like jsp, servlet.
- Build web applications using PHP

Unit I:

Web Basics- Introduction, Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser. **HTML- Introduction**, History of HTML, Structure of HTML Document: Text Basics, Structure of HTML Document: Images and Multimedia, Links and webs, Document Layout, Creating Forms, Frames and Tables, Cascading style sheets.

Unit II:

XML Introduction- Introduction of XML, , Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

Unit III:

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

Unit IV:

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP. Client-side Scripting: Introduction to JavaScript, JavaScript language – declaring variables, scope of variables, functions. event handlers (onClick, onSubmit etc.), Document Object Model, Form validation.

Unit V:

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

Reference Books:

1) Web Technologies, Uttam K Roy, Oxford University Press.
2) The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill.
3) Web Programming, building internet applications, Chris Bates 2ndedition, Wiley Dream tech.
4) Java Server Pages —Hans Bergsten, SPDO'Reilly.
5) Java Script, D. Flanagan
6)Beginning Web Programming-Jon Duckett WROX.

MCA III SEMESTER

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20MC3T04 **CRYPTOGRAPHY AND NETWORK SECURITY**

Course Objectives:

- To learn various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms,
- To Familiar in design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, andS/MIME

Course Outcomes:

- Explain Basic Principles, different security threats, countermeasures, foundation course of cryptography mathematics and Symmetric Encryption.
- Classify the basic principles of Asymmetric key algorithms and operations of asymmetric key cryptography.
- Design Cryptographic Hash Functions as SHA-3 and Digital Signatures as Elgamal
- Explain the concept of Revise Key Management and Distribution and User Authentication
- Determine the knowledge of Network and Internet Security Protocols such as S/MIME

UNIT I:

Basic Principles: Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography. **Symmetric Encryption:** Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT II:

Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography-Primes, primality Testing, Factorization, Asymmetric Key Cryptography-RSA Cryptosystem, Rabin Cryptosystem, ElGamal Cryptosystem, Elliptic Curve Cryptosystem

UNIT III:

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two

Simple Hash Functions Requirements and Security Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), SHA-3. **Digital Signatures:** Elgamal Digital Signature Scheme, Schnorr Digital Signature, NIST Digital Signature Algorithm

Unit IV:

Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates. **User Authentication:** User Authentication, Remote User-Authentication Principle, Remote User-Authentication Using Symmetric Encryption, Kerberos, Remote User-Authentication Using Asymmetric Encryption

Unit V: Network and Internet Security Electronic Mail Security: Internet Mail Architecture, Email Formats, Email Threats and Comprehensive Email Security, S/MIME. **IP Security:** IP Security Policy, Encapsulating Security Payload, Combining Security Associations Internet Key Exchange

Reference Books:

1) Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGrawHill,2015
2) CryptographyandNetworkSecurity,WilliamStallings,GlobalEdition,7ePearson,2017
3) Network Security and Cryptography, First Edition, Bernard Meneges, Cengage Learning, 2018

MCA III SEMESTER

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20MC3T05 **SOFTWARE PROJECT MANAGEMENT**

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course outcomes:

Upon the completion of the course students will be able to:-

- Apply the process to be followed in the software development life-cycle models
- Apply the concepts of project management & planning
- Implement the project plans through managing people, communications and change
- Conduct activities necessary to successfully complete and close the Software projects
- Implement communication, modeling, and construction & deployment practices in software development

UNIT-I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation. **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II:

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT- III:

Model based software architectures: A Management perspective and technical perspective.

Work Flows of the process: Software process workflows, Iteration workflows.

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments. **Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT- IV:

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT-V:

Agile Methodology, adapting to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Reference Books:

1) Software Project Management, Walker Royce, PEA, 2005.
2) Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3) The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois, Jez Humb,1st Edition, O'Reilly publications,2016.
4) Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
5) Software Project Management, Joel Henry, PEA
6) Software Project Management in practice, Pankaj Jalote, PEA,2005,
7) Effective Software Project Management, Robert K.Wysocki,Wiley,2006
8) Project Management in IT, Kathy Schwalbe, Cengage

MCA III SEMESTER

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20MC3T06 **CLOUD COMPUTING**

Course Objectives:

The main objective of the course is to implement Virtualization, Task Scheduling algorithms, apply Map-Reduce concept to applications, building Private Cloud and to know the impact of engineering on legal and societal issues involved

Course Outcomes:

At the end of the course, student will be able to

- Interpret the key dimensions of the challenge of Cloud Computing
- Examine the economics, financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
- Evaluate own organizations' needs for capacity building and training in cloud computing- related IT areas
- Illustrate Virtualization for Data-Center Automation

UNIT–I:

Systems modeling, Clustering and virtualization: Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency.

UNIT–II:

Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Centre Automation.

UNIT–III:

Cloud Platform Architecture: Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource

Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

UNIT–IV:

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments. **Storage Systems**: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system, Apache Hadoop, Big Table, Megastore, Amazon Simple Storage Service (S3).

UNIT-V:

Cloud Resource Management and Scheduling : Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling Map Reduce Applications Subject to Deadlines.

Reference Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra M K Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Cloud Computing, AH and son approach, Arshadeep Bahga, Vijay Madisetti, University Press
4. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill.rp 20ll.
5. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
6. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'Really SPD,rp 20ll.

Note: The students shall register in any of the Clouds like AWS/Azure, etc and learn about cloud services.

MCA III SEMESTER

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20MC3T07 **CYBER SECURITY**

Course Objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks .

Course Outcomes:

- Understand the basics of cyber security
- Understand types of cybercrimes and cyber laws
- Understand Cyber crime concepts with respect to Mobile Devices
- Understand Organizational implications on cyber security
- Understand privacy policy mechanisms

UNIT I:

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT II:

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing

UNIT III:

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, OrganizationalMeasuresforHandlingMobile,OrganizationalSecurityPoliciesandMeasuresin Mobile Computing Era, Laptops

UNIT IV:

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. **Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT V:

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Reference Books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.
3. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
4. Introduction to Cyber Security, Chwan- Hwa (john) Wu, J. David Irwin, CRC Press T&F Group

MCA III SEMESTER

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20MC3T08 **ADVANCED DATABASES**

Course Objectives: To introduce basic concepts of different types of databases like distributed databases, object oriented databases and parallel databases and to give basics of designing different types of databases.

Course Outcomes: By the completion of the course, the students should be able to:

- Outline the concepts of relational database system.
- Understand the basic concepts in distributed databases.
- Analyze the advanced concepts of distributed databases.
- Understand the design issues in parallel databases.
- Apply the concepts of object oriented databases to solve real world problems.

UNIT – I:

RELATIONAL MODEL ISSUES: ER model, Normalization, Query processing, query optimization, transaction processing, Database tuning, comparison of different databases.

UNIT – II:

DISTRIBUTED DBMS: Concepts and Design, Introduction, Overview of Networking, Functions and architectures of a DDBMS, Distributed Relational Database Design, and Transparencies in a DDBMS.

UNIT – III:

DISTRIBUTED DBMS: Advanced concepts- Distributed Transaction Management, Distributed Concurrency control, Distributed Deadlock Management, Distributed Database Recovery, Distributed query optimization.

UNIT – IV:

Introduction to Parallel databases, architectures for parallel databases, Parallel Query Evaluation – data partitioning and parallelizing sequential operator evaluation code, Parallelizing individual operations, and parallel Query optimization.

UNIT – V:

Object Database System: Abstract data types, Objects identity and reference types, Inheritance, Database design for ORDBMS, ODMG (Object Data Management Group) data model, ODL (Object Definition Language), OQL (Object Query Language).

References:

1. Thomas Connolly, Carolyn Begg ―Database Systems, A Practical Approach to Design, Implementation and Management‖,Tthird edition, Pearson Education

2. Raghuramakrishnan and Johannes Gehrke: ―Database Management Systems‖, 3rdEdition, TMH, 2006.

MCA III SEMESTER

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20MC3L09 **MACHINE LEARNING WITH PYTHON LAB**

Course Objectives:

- Make use of Datasets in implementing the machine learning algorithms
- Implementthemachinelearningconceptsandalgorithmsinanysuitablelanguageofchoice.
- Design Python programs for various Learning algorithms.

Course Outcomes (COs): At the end of the course, student will be able to

- Implement procedures for the machine learning algorithms
- Design Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real world problems

Note: Consider any dataset from kaggle

Experiment 1:

Installation of Python and its packages (Pandas, NumPy, SciPy, matplotlib and scikit-learn) (Install Anaconda, Jypyter Notebook, and Programs covering basic concepts in Python Programming)

Basics of Python:

Write a program to read two numbers from user and display the result using bitwise & , |and
^ operators on the numbers.

Write a program to calculate the sum of numbers from 1 to 20 which are not divisible by 2, 3 or 5. Write a program to find the maximum of two numbers using functions.

Implement slicing operation on strings and lists.

Experiment 2:

Implement python program to load structured data onto Data Frame and perform exploratory data analysis

Implement python program for data preparation activities such as filtering, grouping, ordering and joining of datasets.

Experiment 3:

Implement Python program to prepare plots such as bar plot, histogram, distribution plot, box plot, scatter plot.

Experiment 4:

Implement Simple Linear regression algorithm in Python

Implement Gradient Descent algorithm for the above linear regression model

Experiment 5:

Implement Multiple linear regression algorithm using Python.

Experiment 6:

Implement Python Program to build logistic regression and decision tree models using the Python package stats model and sklearn APIs.

Experiment 7:

Implement Python Program to perform the activities such as

- splitting the data set into training and validation datasets
- building model using Python package on training dataset and test on the validation dataset

Experiment 8:

Write a Python program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment 9:

Implement Support vector Machine algorithm on any data set

Experiment 10:

Write a program to implement the naïve Bayesian classifier for a sample training dataset store dasa.csv file. Compute the accuracy of the classifier, considering few test datasets.

Experiment 11:

Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

Experiment 12:

Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision and recall for your data set.

Experiment 13:

Implement PCA on any Image dataset for dimensionality reduction and classification of images into different classes

Experiment 14:

Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

MCA III SEMESTER

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20MC3L10 **Big Data Analytics LAB**

COURSE OBJECTIVE:

To understand data summarization, and modelling techniques and create applications for Big Data Analytics

COURSE OUTCOMES:

1) Preparing for data summarization, query and analysis.
2) Applying data modelling techniques to large data sets.
3) Creating applications for Big data Analytics.
4) Building a complete business data analytic solution.

LIST OF LAB EXPERIMENTS

Week 1, 2:

1. Implement the following Data structures in Java

   a) Linked Lists b) Stacks c) Queues d) Set e) Map

Week 3, 4:

2. (i) Perform setting up and Installing Hadoop in its three operating modes:
   - Standalone,
   - Pseudo distributed,
   - Fully distributed

(ii)Use web based tools to monitor your Hadoop setup.

Week 5:

3. Implement the following file management tasks in Hadoop:
   - Adding files and directories
   - Retrieving files
   - Deleting files
   - Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Week 6:

4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

Week 7:

5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi-structured and record-oriented.

Week 8:

6. Implement Matrix Multiplication with Hadoop Map Reduce

Week 9, 10:

7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Week 11, 12:

8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

MCA III SEMESTER	L	T	P	C
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20MC3L11 **WEB TECHNOLOGIES LAB**

Course Objectives:

- To implement the web pages using HTML and apply styles.
- Able to develop a dynamic webpage by the use of java script.
- Design to create structure of webpage, to store the data in web document, and transport information through web.
- Able to write a well formed / valid XML document.

Course Outcomes:

- Create dynamic and interactive web pages using HTML, CSS & JavaScript
- Experiment with Learn and implement XML concepts
- Develop web applications using PHP
- Show the Install Tomcat Server and execute client-server programs
- Implement programs using Ruby programming

Experiment 1:

Develop static pages (using HTML and CSS) of an online book store. The pages should resemble: www.flipkart.com The website should consist the following pages.

a) Home page
b) Registration and user Login
c) User Profile Page
d) Books catalog
e) Shopping Cart
f) Payment By credit card
g) Order Conformation

Experiment 2:

Create and save an XML document on the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.

Experiment 3:

Write a PHP script to merge two arrays and sort them as numbers, in descending order.

Experiment 4:

Write a PHP script that reads data from one file and write into another file.

Experiment 5:

Write a PHP script to print prime numbers between 1-50.

Experiment 6:

Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.

Experiment 7:

Write a PHP script to: a. Find the length of a string. b. Count no of words in a string. c. Reverse a string.
d. Search for a specific string.

Experiment 8:

Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.

Experiment 9:

Redo the previous task using JSP by converting the static webpagesofassignments2into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.

Experiment 10:

Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form). Practice 'JDBC' connectivity. Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the website, whenever a new user clicks the submit button in the registration page.

Experiment 11:

Write a JSP which does the following job: Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.

Experiment 12:

Create a simple visual be an with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click.

MCA IV SEMESTER

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20MC4T01 **DIGITAL MARKETING**

Course Objectives:

Digital marketing aims at being SMART (Specific, Measurable, Achievable, Relevant and Time Related) so that people can withstand against competitors.

Course Outcomes

- Explain about web pages with basic HTML5, DHTML tags using CSS and XML, the overview of W3CDOM.
- Discuss the key elements of a digital Java Scripts.
- Apply search engine optimization techniques to a website.
- Illustrate how the effectiveness of a digital marketing campaign can be measured
- Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs

UNIT I:

HTML: Introduction, HTML5, Audio Elements, Video Elements, Organizing Elements. **Scripting Documents:** Dynamic Document content, Document properties, Legacy DOM, Document Collections, Overview of the W3C DOM, Traversing a Document, Finding Elements in a Document, Modifying a Document, Adding Content to a Document Example

UNIT II:

Cascading Style Sheets and Dynamic HTML: Overview of CSS, CSS for DHTML Scripting inline Styles, Scripting computed styles, Scripting CSS Classes, Scripting Style Sheets, **Java Script and XML:** Obtaining XML Documents, Manipulating XML with the DOM API, Transforming XML with XSLT querying XML with X path, Serializing XML, Example, XML and Web services.

UNIT III:

Search Engine Optimization (SEO): Searching Engine Marketing, Search Engine Optimization, Measuring SEO Success, Mapping with SEO Journey, **Search**

Advertising: Online Advertising Payment Models, Search Advertising (Desktop & Mobile Devices), Planning & Executing a search Advertising Camping, Strategic Implications of Advertising on the search Network.

UNIT IV:

Search Media Marketing: What is Social Media? Social Media Marketing, Social Media Marketing Strategy, Adopting Social Media in Organizations: Internal Learning, Paid-Owned-Earned Media, Social CRM,

Mobile Marketing:

Mobile Internet in India, What is Mobile Marketing? Email Marketing Strategy, Forms of Mobile Marketing, Mobile Advertising, M-Commerce.

UNIT V:

E-Mail Marketing: E-Mail Marketing in India, What is E-Mail Marketing? E-Mail Marketing Strategy, Executing E-Mail Marketing,

Internet Marketing:

Internet Marketing Strategy, Content Marketing, Content Marketing in India.

Reference Books:

1. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Ian Dodson, Wiley,2016
2. Programming the World Wide Web, Robet W Sebesta, Pearson, 8thedition,2015
3. Fundamentals of Digital Marketing, Second Edition, Pearson Paperback,2019
4. Internet Marketing- A Practical approach in the India Context by Moutusy Maity, Oxford
5. Java Script: The Definite Guide David Flanagan, O' Reilly Publisher

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20MC4T02 **HUMAN RESOURCE MANAGEMENT**

Course Objectives:

- Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes.
- Administer and contribute to the design and evaluation of the performance management program.
- Facilitate and support effective employee and labor relations in both non-union and union environments.

Course Outcomes:

- Explain the importance of human resources and their effective management in organizations
- Demonstrate a basic understanding of different tools used in forecasting and planning, human resource need.
- Describe the meanings of terminology and tools used in managing employees effectively
- Make use of Record governmental regulations affecting employees and employers
- Analyze the key issues related to administering the human elements such as motivation, compensation, appraisal, career planning, diversity, ethics, and training

UNIT I:

HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- - HR policies, Strategies to increase firm performance - Role and position of HR department – aligning HR strategy with organizational strategy - HRM at global perspective -challenges – cross- cultural problems – emerging trends in HRM.

UNIT II:

Investment perspectives of HRM: HR Planning – Demand and Supply forecasting - Recruitment and Selection- Sources of recruitment - Tests and Interview Techniques - Training and Development – Methods and techniques – Training evaluation - retention - Job Analysis – job description and specifications - Management development - HRD concepts.

UNIT III:

Wage and Salary Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Job design and Evaluation- Incentive Payment Systems. Welfare management: Nature and concepts – statutory and non-statutory welfare measures – incentive mechanisms.

UNIT IV:

Performance Evaluation: Importance – Methods – Traditional and Modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation, Concepts and Principles- Influencing Factors- Current Trends in Compensation- Methods of Payments - compensation mechanisms at international level.

UNIT V:

Managing Industrial Relations: Trade Unions - Employee Participation Schemes- Collective Bargaining–Grievances and disputes resolution mechanisms – Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress.

References:

1) K Aswathappa: "Human Resource and Personnel Management", Tata McGraw Hill, New Delhi, 2013
2) N. Sambasiva Rao and Dr. Nirmal Kumar: "Human Resource Management and Industrial Relations", Himalaya Publishing House, Mumbai
3) Mathis, Jackson, Tripathy:"Human Resource Management: Asouth-Asin Perspective", Cengage Learning, New Delhi, 2013
4) Subba Rao P: "Personnel and Human Resource Management-Text and Cases", Himalaya Publications, Mumbai, 2013.
5) Madhurima Lall, Sakina Qasim Zasidi: "Human Resource Management", Excel Books, New Delhi, 2010

MCA IV SEMESTER	**L**	**T**	**P**	**C**
	3	0	0	3

20MC4T03 **AD-HOC AND SENSOR NETWORKS**

Course Objectives:

- From the course the student will earn
- Architect sensor networks for various application setups
- Devise appropriate data dissemination protocols and model links cost
- Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers
- Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes:

- Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks
- Determine the principles and characteristics of wireless sensor networks
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks
- Illustrate the various sensor network Platforms, tools and applications
- Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs

UNIT I:

Introduction : Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio propagation Mechanisms ,Characteristics of the Wireless channel mobile ad hoc networks (MANETs), **Wireless Sensor Networks (WSNs):** concepts and architectures, Applications of Ad Hoc and Sensor Networks, Design Challenges in Ad hoc and Sensor Networks.

UNIT II:

MAC Protocols For Ad Hoc Wireless Networks: Issues in designing a MAC Protocol, Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention based protocols with Scheduling Mechanisms, Multi channel MAC - IEEE 802.11.

UNIT III:

Routing Protocols And Transport Layer In Ad Hoc Wireless Networks: Routing Protocol: Issues in designing a routing protocol for Ad hoc networks, Classification, proactive routing, reactive routing(on- demand), hybrid routing, Transport Layer protocol for Ad hoc networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer solutions –TCP over Ad hoc wireless, Network Security, Security in Ad Hoc Wireless Networks, Network Security Requirements.

UNIT IV:

Wireless Sensor Networks (WSNS) and Mac Protocols: Single node architecture - hardware and software components of a sensor node, **WSN Network architecture:** typical network architectures, data relaying and aggregation strategies, **MAC layer protocols:** self-organizing, Hybrid TDMA/FDMA and CSMA based MAC -IEEE802.15.4.

UNIT V:

WSN Routing, Localization & Qos: Issues in WSN routing, OLSR, Localization, Indoor and Sensor Network Localization, absolute and relative localization, triangulation, QOS in WSN, Energy Efficient Design, Synchronization.

Reference Books:

1) "Ad Hoc Wireless Networks: Architectures and Protocols ", C. Siva Ram Murthy, and B. S. Manoj, Pearson Education,2008
2) “Wireless Adhoc and Sensor Networks”, Labiod. H, Wiley, 1st edition-2008
3) “Wireless ad -hoc and sensor Networks: theory and applications”, Li, X, Cambridge University Press, fifthedition-2008.
4) “Ad Hoc & Sensor Networks: Theory and Applications”, 2nd edition, Carlos De Morais Cordeiro, Dharma Prakash Agrawal, World Scientific Publishing Company, 2011
5) "Wireless Sensor Networks", Feng Zhao and Leonides Guibas, Elsevier Publication 2nd edition- 2004
6) “Protocols and Architectures for Wireless Sensor Networks”, Holger Karl and Andreas Willig, Wiley, 2005 (soft copy available)

MCA IV Semester	L	T	P	C
	3	0	0	3

20MC4T04 **BLOCK CHAIN TECHNOLOGIES**

Course Objectives:

- Impart strong technical understanding of Blockchain technologies
- Develop familiarity of current technologies, tools, and implementation strategies
- Introduce application areas, current practices, and research activity

Course Outcomes (Cos): At the end of the course, student will be able to

- Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.
- Identify the risks involved in building Blockchain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Cryptocurrency markets.
- Examine how to profit from trading cryptocurrencies.

UNIT I:

The consensus problem, Asynchronous Byzantine Agreement, AAP protocol and its analysis, Nakamoto Consensus on permission-less, nameless, peer-to-peer network, Abstract Models for BLOCKCHAIN, GARAY model, RLA Model, Proof of Work (PoW) as random oracle, formal treatment of consistency, liveness and fairness-Proof of Stake (PoS) based Chains, Hybrid models (PoW+PoS).

UNIT II:

Cryptographic basics for cryptocurrency, A short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography

UNIT III:

Bitcoin, Wallet, Blocks, Merkley Tree, hardness of mining, transaction verifiability, anonymity, forks, double spending, mathematical analysis of properties of Bitcoin.

UNIT IV:

Ethereum: Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Smart Contracts, some attacks on smart contracts

UNIT V:

(Trends and Topics): Zero Knowledge proofs and protocols in Block chain, Succinct non interactive argument for Knowledge (SNARK), pairing on Elliptic curves, Zcash.

Reference Books:

1) Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available)
2) Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and crypto currency, IEEE Symposium on security and Privacy, 2015 (article available for free download) {curtain raiser kind of generic article, written by seasoned experts and pioneers}.
3) J.A.Garayet al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048). (serious beginning of discussions related to formal models for bit coin protocols).
4) R. Passetal, Analysis of Block chain protocol in Asynchronous networks, EUROCRYPT 2017, print.iacr.org/2016/454).A significant progress and consolidation of several principles).

MCA IV SEMESTER

L	T	P	C
3	0	0	3

20MC4T05 **SOFTWARE TESTING METHODOLOGIES**

Course Objectives:

- To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing
- To understand software test automation problems and solutions
- To learn how to write software test documents and communicate with engineers in various forms

Course Outcomes:

- Identify and understand various software testing problems.
- Design and conduct a software test process for a software project
- Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects
- Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems

UNIT I:

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation

UNIT II:

Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT III:

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing

Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques

UNIT IV:

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite.

Software Quality Management: Software Quality metrics, SQA models **Debugging:** process, techniques, correcting bugs.

UNIT V:

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit. Test Automation using Selenium tool.

Testing Object Oriented Software: basics, Object oriented testing

Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems

Reference books:

1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford.
2) Software Testing- Yogesh Singh, CAMBRIDGE.
3) Software testing techniques – Baris Beizer, Dream tech, second edition.
4) Effective Methods for Software testing, Willian E Perry, 3ed,Wiley

MCA IV SEMESTER

L	T	P	C
3	0	0	3

20MC4T06 **E Commerce**

COURSE OBJECTIVES:

1. Discuss the benefits and trade-offs of various e-commerce clicks and bricks alternatives.
2. Identify the essential processes of an e-commerce system.
3. Identify several factors and web store requirements needed to succeed in e-commerce.
4. Understand the main technologies behind e-commerce systems and how these technologies interact.
5. Define various electronic payment types and associated security risks and the ways to protect against them.

COURSE OUTCOMES:

1. Identify and analyze stake holder needs
2. Understand electronic payment systems
3. Acquire Knowledge on Intra organizational commerce
4. Design and prepare marketing strategies for corporate digital Library
5. Design and prepare accurate e-commerce related presentations of multimedia information taking into account technical and aesthetic considerations;

SYLLABUS

UNIT–I

Electronic Commerce-Frame work, the anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce – Mercantile Process models.

UNIT–II

Electronic payment systems– Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter-Organizational Commerce – EDI, EDI Implementation, Value-added networks.

UNIT–III

Intra Organizational Commerce – Work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT – IV

Corporate Digital Library – Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing – Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT – V

Consumer Search and Resource Discovery – Information search and Retrieval, Commerce Catalogues, Information Filtering Multimedia – key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.

REFERENCES:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.(Units 1,2,3,4,5)
2. Electronic Commerce – Gary P.Schneider – Thomson.
3. The E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.
4. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon,
Elizabeth Chang, John Wiley.

COURSE STRUCTURE
MECHANICAL ENGINEERING
B. TECH I SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20ME1T01	BSC	Linear Algebra and Differential Equations	3	-	-	3	3
2	20ME1T02	BSC	Engineering Physics	3	-	-	3	3
3	20ME1T03	HSMC	English	3	-	-	3	3
4	20ME1T04	ESC	Basic Electrical & Electronics Engineering	3	-	-	3	3
5	20ME1T05	ESC	Engineering Graphics	1	-	4	5	3
6	20ME1L06	HSMC	English Communication Skills Lab	-	-	3	3	1.5
7	20ME1L07	BSC	Engineering Physics Lab	-	-	3	3	1.5
8	20ME1L08	ESC	Basic Electrical & Electronics Engineering Lab	-	-	3	3	1.5
Total number of credits								**19.5**

B. TECH II SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20ME2T01	BSC	Transform Techniques	3	-	-	3	3
2	20ME2T02	BSC	Engineering Chemistry	3	-	-	3	3
3	20ME2T03	ESC	Engineering Mechanics	3	-	-	3	3
4	20ME2T04	ESC	Thermodynamics	3	-	-	3	3
5	20ME2T05	ESC	Problem Solving Through C	3	-	-	3	3
6	20ME2L06	BSC	Engineering Chemistry Lab	-	-	3	3	1.5
7	20ME2L07	ESC	Engineering & IT Workshop	-	-	3	3	1.5
8	20ME2L08	ESC	Problem Solving through C Lab	-	-	3	3	1.5
9	20ME2M09	MC	Environmental Science	2	-	-	2	-
Total number of credits								**19.5**

B. TECH III SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20ME3T01	BSC	Numerical Methods and Vector Calculus	3	-	-	3	3
2	20ME3T02	PCC	Material Science & Metallurgy	3	-	-	3	3
3	20ME3T03	PCC	Production Technology	3	-	-	3	3
4	20ME3T04	PCC	Mechanics of Solids	3	-	-	3	3
5	20ME3T05	PCC	Fluid Mechanics and Hydraulic Machines	3	-	-	3	3
6	20ME3L06	PCC	Production Technology Lab	-	-	3	3	1.5
7	20ME3L07	PCC	Fluid Mechanics and Hydraulic Machines Lab	-	-	3	3	1.5
8	20ME3L08	PCC	Mechanics of Solids & Metallurgy Lab	-	-	3	3	1.5
9	20ME3S09	SC	Computer aided drafting and modeling Lab	0	-	4	4	2
Total number of credits								**21.5**

B. TECH IV SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20ME4T01	BSC	Complex Variables and Statistical Methods	3	-	-	3	3
2	20ME4T02	PCC	Design of Machine Elements	3	-	-	3	3
3	20ME4T03	PCC	Internal Combustion Engines & Air Compressors	3	-	-	3	3
4	20ME4T04	PCC	Kinematics of Machinery	3	-	-	3	3
5	20ME4T05	HSMC	Managerial Economics & Financial Analysis	3	-	-	3	3
6	20ME4L06	PCC	Proficiency Through Reading & Writing Lab	-	-	3	3	1.5
7	20ME4L07	PCC	Computer Aided Machine Drawing Lab	-	-	3	3	1.5
8	20ME4L08	PCC	Thermal Engineering Lab	-	-	3	3	1.5
9	20ME4S09	SC	Programming through MATLAB	0	-	4	4	2
10	20ME3M10	MC	Constitution of India	2	-	-	2	-
Total number of credits								**21.5**
Honors/Minor courses				**4**	**0**	**0**	**-**	**4**

B.TECH V SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20ME5T01	PCC	Dynamics of Machines	3	-	-	3	3
2	20ME5T02	PCC	Turbo machines	3	-	-	3	3
3	20ME5T03	PCC	Metal Cutting &Machine Tools	3	-	-	3	3
4		**OEC**	**Open Elective-I**	3	-	-	3	3
5	**Professional Elective -I**			3	-	-	3	3
	20ME5T06	PEC	Experimental Stress Analysis					
	20ME5T07		Design for Manufacturing					
	20ME5T08		Refrigeration & Air Conditioning					
6	20ME5L09	PCC	Theory of Machines Lab	-	-	3	3	1.5
7	20ME5L10	PCC	Machine Tools & Computer Aided Manufacturing Lab	-	-	3	3	1.5
8	20ME5S11	SC	Simulation of Mechanical Systems Lab	-	-	4	4	2
9	20ME5M12	MC	Essence of Indian Traditional knowledge	2	-	-	2	-
10	20ME5I13	I	Summer Internship	-	-	-	-	1.5
Total number of credits								**21.5**
Honors/Minor courses				**4**	**-**	**-**	**4**	**4**

B. TECH VI SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20ME6T01	PCC	Design of Transmission Elements	3	-	-	3	3
2	20ME6T02	PCC	Heat Transfer	3	-	-	3	3
3	20ME6T03	PCC	Metrology and Measurements	3	-	-	3	3
4	**Professional Elective -II**			3	-	-	3	3
	20ME6T04	PEC	Finite Element Methods					
	20ME6T05		Computational Fluid Dynamics					
	20ME6T06		Production Planning & Control					
5		**OEC**	**Open Elective-II**	3	-	-	3	3
6	20ME6L09	PCC	Metrology & Instrumentation Lab	-	-	3	3	1.5
7	20ME6L10	PCC	Heat Transfer Lab	-	-	3	3	1.5
8	20ME6L11	PCC	CAE & CFD Lab	-	-	3	3	1.5
9	20ME6S12	SC	Soft skills	-	-	4	4	2
10	20ME6M13	MC	Disaster Management	2	-	-	2	-
11	20ME6P14	P	Community Service Project	-	-	-	-	4
Total number of credits								**25.5**
Honors/Minor courses				**4**	**-**	**-**	**4**	**4**

B. TECH VII SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	**Professional Elective –III/MOOCS**			3	-	-	3	3
	20ME7T01	PEC	Advanced Materials					
	20ME7T02		Power Plant Engineering					
	20ME7T03		Advanced Optimization Techniques					
2	**Professional Elective –IV/ MOOCS**			3	-	-	3	3
	20ME7T04	PEC	Management Science					
	20ME7T05		Additive Manufacturing					
	20ME7T06		Advanced Machining Processes					
3	**Professional Elective -V / MOOCS**			3	-	-	3	3
	20ME7T07	PEC	Mechanical Vibrations					
	20ME7T08		Automobile Engineering					
	20ME7T09		Non Destructive Evaluation					
4		OEC	**Open Elective-III**	3	-	-	3	3
5		OEC	**Open Elective-IV**	3	-	-	3	3
6	20ME7T14	HSMC	Universal Human Values 2: Understanding Harmony	3	-	-	3	3
7	20ME7S15	SC	Python Programming Lab	1	-	2	3	2
8	20ME7I16	I	Industrial Internship	-	-	-	-	3
Total number of credits								**23**
Honors/Minor courses				**4**	**-**	**-**	**4**	**4**

B. TECH VIII SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20ME8P01	P	Project (Project work/internship)	-	-	-	-	8
	INTERNSHIP (6 MONTHS)							
Total number of credits								**8**

OPEN ELECTIVE –I:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE5T04	Architecture and Town Planning	3	0	0	3	CE
2	20CE5T05	Elements of Civil Engineering	3	0	0	3	CE
3	20EE5T04	Basics of Control Systems	3	0	0	3	EEE
4	20EE5T05	Special Electrical Machines	3	0	0	3	EEE
5	20ME5T04	Design Thinking & Product Innovation	3	0	0	3	ME
6	20ME5T05	Nanotechnology	3	0	0	3	ME
7	20EC5T04	Linear System Analysis	3	0	0	3	ECE
8	20EC5T05	Digital Logic Design	3	0	0	3	ECE
9	20EC5T06	Solid State Devices	3	0	0	3	ECE
10	20CS5T07	Introduction to Artificial Intelligence	3	0	0	3	CSE
11	20CS5T08	Operating System	3	0	0	3	CSE
12	20CS5T09	Software Engineering	3	0	0	3	CSE
13	20IT5T07	Computer Networks	3	0	0	3	IT
14	20IT5T08	Computer Graphics	3	0	0	3	IT
15	20HS5T01	Quantitative Aptitude and Reasoning	3	0	0	3	BED
16	20MB5T01	Principles of Management	3	0	0	3	DMS
17	20MB5T02	Technology Management	3	0	0	3	DMS
18	20AD5T07	Foundations of Data Science	3	0	0	3	AIDS
19	20AM5T07	Introduction to Machine Learning	3	0	0	3	AIML

OPEN ELECTIVE –II:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE6T08	Remote Sensing and GIS	3	0	0	3	CE
2	20CE6T09	Environmental Impact Assessment	3	0	0	3	CE
3	20EE6T08	Renewable Energy Sources	3	0	0	3	EEE
4	20EE6T09	Energy Audit, Conservation and Management	3	0	0	3	EEE
5	20ME6T07	Industrial Robotics	3	0	0	3	ME
6	20ME6T08	Additive manufacturing	3	0	0	3	ME

7	20EC6T07	Electronic Circuits and Networks	3	0	0	3	ECE
8	20EC6T08	Principles of Communications	3	0	0	3	ECE
9	20EC6T09	Microcontrollers & its Applications	3	0	0	3	ECE
10	20CS6T07	Introduction to Machine Learning	3	0	0	3	CSE
11	20CS6T08	Information Security	3	0	0	3	CSE
12	20CS6T09	Agile Technologies	3	0	0	3	CSE
13	20IT6T07	Fundamentals of Machine Learning	3	0	0	3	IT
14	20IT6T08	Database Management Systems	3	0	0	3	IT
15	20HS6T01	Operations Research	3	0	0	3	BED
16	20MB6T01	Organizational Behaviour	3	0	0	3	DMS
17	20MB6T02	Project Management	3	0	0	3	DMS
18	20AD6T07	Visual Analytics	3	0	0	3	AIDS
19	20AM6T07	Big data Analytics	3	0	0	3	AIML

OPEN ELECTIVE –III:

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CE7T13	Construction Technology and Management	3	0	0	3	CE
2	20CE7T14	Green Buildings	3	0	0	3	CE
3	20EE7T13	Concept of Power System Engineering	3	0	0	3	EEE
4	20EE7T14	Instrumentation	3	0	0	3	EEE
5	20ME7T10	Green Engineering Systems	3	0	0	3	ME
6	20ME7T11	Hybrid Electric Vehicles	3	0	0	3	ME
7	20EC7T10	Data Communications	3	0	0	3	ECE
8	20EC7T11	Mechatronics	3	0	0	3	ECE
9	20EC7T12	Bio Medical Instrumentation	3	0	0	3	ECE
10	20CS7T10	Artificial Neural Networks	3	0	0	3	CSE
11	20CS7T11	Cyber Security	3	0	0	3	CSE
12	20CS7T12	Software Testing Methodologies	3	0	0	3	CSE
13	20IT7T10	Internet of Things	3	0	0	3	IT
14	20IT7T11	Computer Vision	3	0	0	3	IT
15	20HS7T01	Fuzzy sets	3	0	0	3	BED

16	20MB7T01	Digital Media management	3	0	0	3	DMS
17	20MB7T02	Entrepreneurship Development	3	0	0	3	DMS
18	20AD7T10	Data Analysis and Visualization with Python	3	0	0	3	AIDS
19	20AM7T10	NOSQL Databases	3	0	0	3	AIML

OPEN ELECTIVE –IV:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE7T15	Waste water treatment	3	0	0	3	CE
2	20CE7T16	Repair and Rehabilitation of Concrete Structures	3	0	0	3	CE
3	20EE7T15	Power Quality	3	0	0	3	EEE
4	20EE7T16	Electric Vehicles	3	0	0	3	EEE
5	20ME7T12	Micro-Electro- Mechanical Systems	3	0	0	3	ME
6	20ME7T13	Solar Energy Systems	3	0	0	3	ME
7	20EC7T13	Introduction to Embedded Systems	3	0	0	3	ECE
8	20EC7T14	Internet of Things	3	0	0	3	ECE
9	20EC7T15	Analog and Digital IC applications	3	0	0	3	ECE
10	20CS7T13	Data Analytics	3	0	0	3	CSE
11	20CS7T14	Block Chain Technology	3	0	0	3	CSE
12	20CS7T15	Software Project Management	3	0	0	3	CSE
13	20IT7T13	Cloud Computing	3	0	0	3	IT
14	20IT7T14	Business Intelligence	3	0	0	3	IT
15	20HS7T02	Polymer Chemistry	3	0	0	3	BED
16	20MB7T03	Total Engineering Quality Management	3	0	0	3	DMS
17	20MB7T04	Stress Management	3	0	0	3	DMS
18	20AD7T11	Natural Language Processing	3	0	0	3	AIDS
19	20AM7T11	Deep Learning	3	0	0	3	AIML

HONORS/MINOR COURSES OFFERED BY THE DEPARTMENT

Honors/ Minor Course Fulfillments:

- The 20 additional credits need to be acquired, 16 credits can be earned by undergoing specified courses, with each carrying 4 credits.
- The remaining 4 credits must be acquired through two online MOOCs (SWAYAM /NPTEL), which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of Studies.
- Minor Engineering subjects are offered to other branches by ME Department (except for ME Students).
- Honors engineering subjects are offered to ME Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (SWAYAM/NPTEL).

HONORS COURSES

S.No.	Course code	Course Name	L	T	P	C
		Pool-1				
1	20MEHN01	Advanced Mechanics of Solids	4	0	0	4
2	20MEHN02	Fracture Mechanics	4	0	0	4
3	20MEHN03	Advanced Machine Design	4	0	0	4
4	20MEHN04	Tribology	4	0	0	4
		Pool-2				
5	20MEHN05	Measurements in Heat Transfer	4	0	0	4
6	20MEHN06	Advanced Mechanics of Fluids	4	0	0	4
7	20MEHN07	Energy Storage Systems	4	0	0	4
8	20MEHN08	Advanced Thermodynamics	4	0	0	4
		Pool-3				
9	20MEHN09	Metrology and Computer Aided Inspection	4	0	0	4
10	20MEHN10	Lean Manufacturing	4	0	0	4
11	20MEHN11	Flexible Manufacturing Systems	4	0	0	4
12	20MEHN12	Robotics & Control	4	0	0	4
		Pool-4				
13	20MEHN13	Quality Engineering in Manufacturing	4	0	0	4
14	20MEHN14	Precision Engineering	4	0	0	4
15	20MEHN15	Automation in Manufacturing	4	0	0	4
16	20MEHN16	Materials Characterization Techniques	4	0	0	4

MINOR COURSES

S.No.	Course code	Course Name	L	T	P	C	Offered by
1	20MEMN01	Engineering Mechanics	3	1	0	4	MECH
2	20MEMN02	Thermal Engineering	3	1	0	4	MECH
3	20MEMN03	Production Technology	3	1	0	4	MECH
4	20MEMN04	Fundamentals of Engineering Design	3	1	0	4	MECH
5	20MEMN05	Production Planning and control	3	1	0	4	MECH
6	20MEMN06	Materials Technology	3	1	0	4	MECH
7	20MEMN07	Basics of Mechanical Engineering	3	1	0	4	MECH
8	20MEMN08	Automobile Engineering	3	1	0	4	MECH

B.TECH I SEMESTER		BSC	L	T	P	C
			3	0	0	3
20ME1T01	LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS					

Pre-requisite: Basic knowledge about matrices, differentiation and integration

Course Objective: Objective of the course is to impart

- Basic understanding of mathematical methods to solve simultaneous linear systems
- Understanding of formation and solutions of ordinary differential equations
- Knowing the mathematical methods to solve applications of differential equations

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the knowledge to solve a system of homogeneous and non homogeneous linear equations

CO2: Illustrate the methods of computing eigen values and eigen vectors

CO3: Able to analyze the real life situations, formulate the differential equations and then applying the methods

CO4: Determine the solutions of linear differential equations

CO5: Optimize functions of several variables and able to find extreme values of constrained functions

SYLLABUS

UNIT-I: Linear systems of equations:

Rank of a matrix, Echelon form, Normal form, PAQ is in normal form, linear dependence and independence of vectors, Consistency of linear system of equations, System of linear homogeneous equations, Gauss-elimination and Gauss -Jordan methods.

UNIT-II: Eigen values & Eigen vectors:

Eigen values, Eigen vectors, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), finding inverse and powers of a matrix using C-H theorem, Reduction to diagonal form, reduction of quadratic form to canonical form using orthogonal reduction, nature of quadratic forms.

UNIT-III: Ordinary Differential Equations of first order:

Linear equations, Bernoulli's equation, Exact differential equations. Equations reducible to exact equations, **Applications:** Orthogonal Trajectories, Newton's Law of cooling, Rate of decay &growth., R-L series circuits.

UNIT-IV: Linear Differential Equations higher order:

Definitions, Complete solution (without proof), Operator D, Rules to find complementary function, Inverse operator, Rules to find the particular integral(nonhomogeneous term of the form e^{ax} , sin(ax+b), cos(ax+b), polynomials in x^m, e^{ax} V(x), any other function), Method of variation of parameters.

UNIT-V: Partial Differentiation:

Functions of two variables, Partial derivatives, Homogeneous functions, Euler's theorem, Total derivative, Jacobian and functional dependence, Taylor's theorem for functions of two variables. **Applications:** Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH I SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME1T02 ENGINEERING PHYSICS

Pre-requisite: Knowledge of basic concepts of waves, Optics, Electricity and Magnetism

Course Objective: Objective of the course is to impart

- *Knowledge* of fundamentals of Physics which helps them in the study of advanced topics of Engineering.
- *Develop* analytical capability and understand various Engineering concepts.

Course Outcomes:

At the end of the course, student will be able to

CO1: *Impart* knowledge of Physical Optics phenomenon Polarization and identify these phenomenon in natural processes

CO2: *Gain* knowledge of applications of lasers and optical fibers in various fields .

CO3: *Classify* magnetic and dielectric materials and their Engineering applications.

CO4: *Impart* knowledge of architectural acoustics and Study of Ultrasonics.

CO5: *Classify* crystal systems and analyze the crystalline structure using various X-ray diffraction techniques .

SYLLABUS

UNIT-I: Wave Optics:

Interference: Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Colors in thin films-Newton's rings-Determination of wave length nd refractive index.

Diffraction: C Introduction- Fresnel and Fraunhofer diffraction - Fraunhofer Diffraction due to Single slit, Double slit, N –slits(Qualitative) - Diffraction Grating – Resolving Power of Grating(Qualitative).

Polarizations: Introduction- Types of polarization-polarization by reflection, refraction and Double refraction-Nicol's prism –Half and Quarter wave plates.

UNIT-II: Lasers and Fiber Optics:

Lasers:: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber-Construction- - Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes .

UNIT-III: Magnetic and Dielectric Materials:

Magnetic Materials: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para ferro, anti ferro&ferri – Domain concept of Ferromagnetism(Qualitative) - Hysteresis – soft and hard magnetic materials .

Dielectric Materials: Introduction - Dielectic polarization – Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation.

UNIT-IV: Acoustics and Ultrasonics:

Acoustics: Introduction – requirements of acoustically good auditorium– Reverberation – Reverberation time– Sabine's formula - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

Ultrasonics: Introduction - Properties - Production by magnetostriction and piezoelectric methods – Detection - Non Destructive Testing – pulse echo system through transmission and reflection modes - Applications.

UNIT-V: Crystallography and X-ray diffraction:

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC.

X-ray diffraction: Miller indices – separation between successive (hkl) planes-Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods – powder pattern of bulk, nano materials of ZnO and calculation of lattice cell by Scherrer's formula.

Text books:

1. Engineering Physics – Dr. M.N. Avadhanulu& Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering physics – D.K. Battacharya and PoonamTandon, Oxford University press.
3. Engineering Physics by P.K.Palanisamy SciTech publications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics – M.R.Srinivasan, New Age Publications
3. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
4. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press

B.TECH I SEMESTER **HSMC**

L	T	P	C
3	0	0	3

20ME1T03 ENGLISH

Pre-requisite:

Course Objective:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by nativespeakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authenticmaterials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oralpresentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: At the end of the course, student will be able to

CO1 understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information

CO2 ask and answer general questions on familiar topics

CO3 employ suitable strategies to master the art of letter writing and email writing

CO4 recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs

CO5 form sentences using proper grammatical structures and correct wordforms

SYLLABUS

UNIT-I A Drawer full of happiness (Detailed Study)
Deliverance (Non-detailed Study)

UNIT-II Nehru's letter to his daughter Indira on her birthday(Detailed Study)

	Bosom Friend (Non-detailed Study)
UNIT-III	Stephen Hawking-Positivity 'Benchmark' (Detailed Study) Shakespeare's Sister(Non-detailed Study)
UNIT-IV	Liking a Tree, Unbowed: WangariMaathai-biography (Detailed Study) Telephone Conversation(Non-detailed Study)
UNIT-V	Stay Hungry-Stay foolish (Detailed Study) Still I Rise(Non-detailed Study)

Text Books

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The Individual Society", Pearson Publications.(Non-detailed)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition,2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) MacmillanEducational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP,2012.

B.TECH I SEMESTER	ESC	L	T	P	C
		3	0	0	3

20ME1T04 BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Pre-requisite: Fundamental in Engineering Mathematics and Physics

Course Objective: Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.

1. Provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.
2. To explain the working principle, construction, applications of DC machines, AC machines
3. Know the fundamental of Electrical Engineering.
4. Understand .the concepts of diodes and transistors

Course Outcomes: At the end of the course, student will be able to

CO1: Analyze various electrical networks.

CO2: Understand operation of DC generators, single-phase transformer and acquire proper knowledge and working of 3-phase alternator and 3-phase induction motors

CO3: Understand operation of Sources of Energy & power transmission and distribution using single line diagrams.

CO4: Analyze operation of half wave, full wave bridge rectifiers and OP-AMPs.

CO5: Understanding operations of CE amplifier and basic concept of feedback amplifier.

SYLLABUS

UNIT-I: Electrical Circuits:

Basic definitions - Types of network elements - Ohm's Law - Kirchhoff's Laws – Resistive networks, Inductive networks -Capacitive networks – Series - Parallel circuits - Star-delta and delta-star transformations.

UNIT-II: Electrical Machines:

Principle of operation of DC generator – EMF equation - Principle of operation of DC motor- Principle of operation of single phase transformers – EMF equation – Losses – OC & SC tests. Principle of operation of 3-Phase induction motor – Slip-torque characteristics. Principle of operation of alternators – Principle of operation of Synchronous motor - Speed-torque characteristics. Selection of electrical machines for various mechanical applications.

UNIT-III: Electrical Power Generation, Transmission and Distribution:

Sources of Energy – conventional & non-conventional, Introduction and layout of Thermal, hydel power plants**,** Introduction and layout of nuclear power plants, layout of solar power plants, power transmission and distribution using single line diagrams.

UNIT-IV: Diodes:

Introduction to semi-conductor physics, PN junction diode, Zener diode, half wave, full wave and bridge rectifier using diodes, Zener diode as a voltage regulator.

UNIT-V: Transistors:

PNP and NPN junction transistor, transistor as an amplifier- Transistor amplifier - Frequency response of CE amplifier - Concepts of feedback amplifier.

Text Book(s)

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

References

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition

4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications,2nd edition
5. Industrial Electronics by G.K. Mittal, PHI

B.TECH - I SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		1	**0**	**4**	**3**

20ME1T05 ENGINEERING GRAPHICS

Objective:

1. To introduce the students to use orthographic projections, projections of points & simple lines.
2. To make the students draw the projections of the lines inclined to both the planes.
3. To make the students draw the projections of the plane inclined to both the planes.
4. To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
5. To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the concepts of projections and draw projections for simple entities such as points and lines.
2. Draw orthographic projections of planes and simple solids.
3. Understand the concept of sections and sectional views.
4. Develop the surfaces for various simple solids and understand the concept of intersection of two solids.
5. Analyze the 2D drawings and convert to 3D isometric views.
6. Learn computer aided drafting with AutoCAD and draw simple 2D part drawings and orthographic views using the software.

SYLLABUS

UNIT I

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

UNIT II

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders-Simple positions

UNIT III

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one plane.

Sections of Solids: Sections and sectional views of Right regular solids-Prisms, Pyramids, Cones and Cylinder.

UNIT IV

Interpenetration of right regular solids: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

Development of Surfaces: Development of Surfaces of right regular solids-Prisms, Pyramids, Cones and Cylinder

UNIT V

Conversion of orthographic views to isometric view for Simple Solids such as prism, pyramid, cylinder and cone; Conversion of isometric view to orthographic views.

Computer Aided Drafting: Introduction to AutoCAD, Geometric commands, Modify commands, Annotation, Layers, display control and Properties tool bars. Creation of simple 2D part drawings and orthographic views.

Text books:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers

Reference books:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers
2. Engineering Graphics by PI Varghese, McGraw Hill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, NewAge
4. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

B.TECH I SEMESTER	**HSMC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20ME1L06 ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

- Facilitate effective usage of functional English through role plays
- Focus on vocabulary enhancement
- Foster various nuances of phonetics and accent neutralization

Course Outcomes: At the end of the course, student will be able to

CO1: Acquire basic proficiency in English by learning functional aspects of English language

CO2: Learn the methods of enhancing vocabulary

CO3: Acquaint himself/herself with nuances of Phonetics

LIST OF EXPERIMENTS

1 Greetings and Introductions
2 Requesting Permission & Giving Directions
3 Inviting/Complaining/Congratulating
4 Root Words
5 Phonetics-Sounds and Symbols
6 Pronunciation Rules

References:

1. Strengthen Your Steps, Maruti Publications

2. Interact, Orient Blackswan

3. Word Power Made Easy, Pocket Books

B.TECH I SEMESTER	BSC	L	T	P	C
		0	0	3	1.5

20ME1L07 ENGINEERING PHYSICS LAB

Pre-requisite: Fundamental understanding of usage of an instrument with proper care.

Course Objective: Objective of the course is to impart

- Training Engineering graduates to handle instruments and their usage methods to improve the accuracy of measurements.

At the end of the course, student will be able to

CO1: **Outcomes**: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

CO2: Implement the basic principles of Mechanics to measure different physical parameters.

CO3: Enhance the knowledge of Usage of electronic devices in various applications

LIST OF EXPERIMENTS

1. Newton's rings –Determination of radius of curvature of Plano Convex Lens.
2. Determination of wavelength of spectral lines -Diffraction Grating
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of wavelength of laser source using diffraction grating
5. Determination of Numerical Aperture and bending loss of a given Optical Fiber.
6. Determination of dispersive power of prism.
7. Determination of Rigidity modulus of a material- Torsional Pendulum.
8. Determination of Acceleration due to Gravity and Radius of Gyration-Compound Pendulum.
9. Determination of Young's modulus by method of single cantilever oscillations
10. Verification of laws of vibrations in stretched strings – Sonometer.
11. Estimation of Planck's Constant using Photo electric Effect

12. Study of I /V Characteristics of Semiconductor diode.
13. I/V characteristics of Zener diode.

    Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
15. Energy Band gap of a Semiconductor using p - n junction diode

Reference Books

1. A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers, 2017.

B.TECH	ISEMESTER	ESC	L	T	P	C
			0	0	3	1.5

20ME1L08 BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

Course Objectives: To understand the operation of electrical machines & electronic devices

Course Outcomes:

CO 1 Compute the efficiency of DC shunt machine without actual loading of the machine

CO 2 Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SC tests.

CO 3 Analyze the performance characteristics and to determine efficiency of DC shunt motor & 3-Phase induction motor.

CO 4 Control the speed of dc shunt motor using Armature voltage and Field flux control methods.

CO 5 Draw the characteristics of PN junction diode & transistor

CO 6 Determine the ripple factor of half wave & full wave rectifiers.

LIST OF EXPERIMENTS

1. Swinburne's test on D.C. Shunt machine (Predetermination of efficiency of a given D.C. Shunt machine working as motor and
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (Determination of performance characteristics).
4. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
5. Brake test on D.C. Shunt Motor.
6. PN junction Diode characteristics A. Forward bias, B. Reverse bias. (Cut in voltage & Resistance calculations)
7. Transistor CE Characteristics (Input and Output).
8. Full wave Rectifier with and without filters.
9. CE Amplifiers.
10. RC Phase Shift Oscillator.
11. Class A Power Amplifier.

B.TECH II SEMESTER	BSC	L	T	P	C
		3	0	0	3

20ME2T01 TRANSFORM TECHNIQUES

Pre-requisite: Linear Algebra and Differential Equations

Course Objective: Objective of the course is to impart

- Learning the techniques of Laplace transforms to solve ordinary differential equations
- knowledge of Fourier series & Fourier transforms for piecewise continuous functions
- knowledge of solving boundary valued problems

Course Outcomes: At the end of the course, student will be able to

CO1: Able to analyze a class of integrals in terms of beta and gamma functions

CO2: Provide the techniques of Laplace transformations and able to solve problems related to digital signal processing

CO3: Analyze the general periodic functions in the form of an infinite convergent sine and cosine series

CO4: Illustrate the methods to solve the boundary value problems

CO5: Determine a solution of a discrete system using Z- transforms

SYLLABUS

UNIT-I: Special functions:

Beta function, Properties & problems, Gamma function, properties & problems, Relation between Beta and Gamma functions, Evaluation of improper integrals

UNIT-II: Laplace Transforms (all properties without proofs):

Definition, Transforms of elementary functions, properties of Laplace transforms, Transforms of periodic functions, Transforms of derivatives and integrals, Multiplication by t^n, Division by t, Evaluation of improper integrals.

Inverse Laplace transforms–Method of partial fractions, other methods of finding inverse transforms, Convolution theorem (without proof).

Application: Application to differential equations

UNIT-III: Fourier Series &Fourier Transforms:

Euler's formulae (without proof), Conditions of Fourier expansion, Functions having points of discontinuity, Change of inerval, Even and odd functions, Half-range series.

Fourier Integral theorem (without proof), Fourier cosine & sine integral, complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, properties of Fourier transforms (without proof), Convolution theorem(without proof), finite & infinite Fourier sine & cosine transforms.

UNIT-IV: Partial Differential Equations:

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of Variables, Applications: One-dimensional wave and heat equations, two-dimensional heat equation.

UNIT-V: Z-Transforms: (all properties without proofs)

Introduction, definition, some standard z-transforms, linearity property, damping rule, some standard results, shifting U_n to the right, multiplication by n, initial and final value theorems, Inverse z-transforms, convolution theorem, evaluation of inverse z-transforms by partial fractions, applications to difference equations.

Text Books:

1. B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

3. ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.

4. N. P. BALI & Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH II SEMESTER **BSC**

L	T	P	C
3	0	0	3

20ME2T02 ENGINEERING CHEMISTRY

Pre-requisite: Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objective: Objective of the course is to impart

- ***Importance*** of usage of plastics in house hold appliances and composites (FRP)in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuelcells. Understand the mechanism of corrosion and how it can be prevented.
- ***Express***the increases in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
- ***Classify and discuss*** the materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries. Lubricationis also ***summarized***.
- ***Relate*** the need of fuels as a source of energy to any industry, particularly industries like thermal power stations , steel industry ,fertilizer industry etc., and hence introduced.
- ***Explain*** the importance and usage of water as basic material in almost all the industries;
- ***Interpret*** drawbacks of steam boilers and also how portable water is supplied for drinking purposes.

Course Outcomes:

At the end of the course, student will be able to

CO1: ***Analyze*** the different types of composite plastic materials and ***interpret*** the mechanism of conduction in conducting polymers.

CO2: ***Utilize*** the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and c***ategorize*** the reasons for corrosion and study methods to control corrosion.

CO3: ***synthesize*** nanomaterials for modern advances of engineering technology.

Summarize the techniques that detect and measure changes of state of reaction.

Illustrate the commonly used industrial materials.

CO4: ***Differentiate*** petroleum, petrol, synthetic petrol and have knowledge how they are produced.

Study alternate fuels and ***analyse*** flue gases.

CO5: ***Analyze*** the suitable methods for purification and treatment of hard water and brackish water.

SYLLABUS

UNIT-I: Polymer Technology:

Polymerisation: Introduction, methods of polymerization (addition and Condensation), Physical and mechanical properties.

Plastics: Compounding, fabrication(compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite),mention some examples of plastic materials used in electronic gadgets.

Elastomers: Natural rubber-Drawbacks-vulcanization, preparation, properties and applications (BunaS, Thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics – GFRP and Aramid FRP

Conducting polymers: Intrinsic and extrinsic conducting polymers

Biodegradable polymers: preparation and applications

UNIT-II: Electro chemical Cells And Corrosion:

PartI*:ELECTRO CHEMICAL CELLS:* Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, Li ion battery and zinc aircells), fuelcells(H_2-O_2,CH_3OH-O_2,phosphoric acid and molten carbonate).

PartII: *Corrosion:* Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (cathodic protection),Protective coatings (cathode ic coatings, anodic coatings, electroplating and electroless plating)

UNIT-III: Chemistry Of Materials:

Part- A: ***Nanomaterials:-***Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]) with example (TiO_2), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Part-B: ***Refractoriness:-*****Definition, classification, properties (refractoriness, refractoriness underload, porosity and thermal spalling), failure of refractories.**

Lubricants:-Definition, mechanism of lubricants, properties (definition and importance).

Cement: - Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio(SR) and alumina ratio(AR), deterioration of cement.

UNIT-IV: Fuels:

Introduction, calorific value, higher calorific value, lower calorific values, problems using Dulong's formula, proximate and ultimate analysis of coal sample and their significance, numerical problems, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch and Bergius), petrol knocking, dieselknocking,octaneandcetaneratings,anti-knockingagents,Introductiontoalternativefuels(Bio-diesel,ethanol, methanol, natural gas, liquefied petroleum gas, compressed natural gas).

UNIT-V: Water Technology:

Hardness of water, determination of hardness by complex metric method, boiler troubles (priming and foaming, scale formation, boiler corrosion, Causticem brittlement), internal treatments, softening of hard water (zeolite process and related sums, ion exchange process), potable water and its specifications, break point chlorination-desalination (reverse osmosis and electrodialysis).

Standard Books:

1. P. C. Jainand M.Jain "**Engineering Chemistry**",15/e, Dhanpat Rai & Sons, Delhi,(Latest edition).
2. Shikha Agarwal, "**Engineering Chemistry**", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "**ATextbook of Engineering Chemistry**", S.Chand & Co,(2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

Reference:

1. K.Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry**", Pearson India Edn.
2. O.G.Palana, "**Engineering Chemistry**", Tata Mc Graw Hill Education Private Limited, 2009). CNR Rao and JM Honig (Eds)
3. "**Preparation and characterization of materials**" Academic press, New York (latestedition) B. S. Murthy, P. Shankar and others,
4. "**Textbook of Nano science and Nanotechnology**", University press (latestedition)

B.TECH II SEMESTER	ESC	L	T	P	C
		3	0	0	3

20ME2T03 ENGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

Course outcomes:

1. The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters.
2. The student should be able to determine centroid for lines, areas and center of gravity for volumes and their composites.
3. The student should be able to determine area and mass movement of inertia for composite sections
4. The student should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum.

SYLLABUS

UNIT – I

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

UNIT II

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction, Wedges.

Analysis of plane trusses-Method of Joints, Method of Sections.

UNIT – III

Objectives: The students are to be exposed to concepts of centre of gravity.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT – IV

Objectives: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives: The students are to be exposed to rigid motion kinematics and kinetics

Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration

– Motion of Rigid Body – Types and their Analysis in Planar Motion.

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation– Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TEXT BOOKS:

1. Engineering Mechanics - S.Timoshenko &D.H.Young., 4thEdn - , McGraw Hill publications.
2. Engineering Mechanics- S S Bhavikati –New Age International Publishers

REFERENCES:

3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Engineering Mechanics, Fedinand . L. Singer, Harper –Collins.
5. Engineering Mechanics statics and dynamics , A Nelson , McGraw Hill publications
6. Engineering Mechanics- A KTayal
7. Engineering Mechanics , R.K.Bansal, Laxmi Publications
8. Engg. Mechanics- KL Kumar-Tata McGraw Hill publications

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME2T04 THERMODYNAMICS

Course objectives:

1. To introduce the basic laws of thermodynamics
2. To make them understand the applications of laws of thermodynamics
3. To introduce the concepts of entropy, Availability and Irreversibility
4. To make them understand the properties of Steam and use of Steam Tables
5. To introduce air standard cycles and their applications.

Course outcomes: at the end of the course, the student will be able

1. understand the basic laws of thermodynamics
2. apply the laws of thermodynamics
3. understand the concept of entropy, Availability and Irreversibility
4. understand the properties of Steam and use of Steam Tables
5. understand the use of standard cycles and their applications.

SYLLABUS

Unit I

Introduction: Basic Concepts: Macroscopic and microscopic view points, definitions of thermodynamic terms, quasi – static process, point and path function, forms of energy, ideal gas and real gas, Zeroth law of thermodynamics.

First law of Thermodynamics: Joule's experiment-first law of thermodynamics, corollaries-perpetual motion machines of first kind, first law applied to non-flow and flow process-limitations of first law of thermodynamics**.**

Unit II

Second Law of Thermodynamics: Kelvin - Planck statement and Clausius statement and their equivalence, corollaries - perpetual motion machines of second kind - reversibility and irreversibility, cause of irreversibility - Carnot cycle, heat engine, heat pump and refrigerator, Carnot theorem, Carnot efficiency.

Unit III

Entropy: Clausius inequality - Concept of Entropy- entropy equation for different processes and systems

Availability and Irreversibility: Definition of exergy and energy, expressions for availability and irreversibility. Availability in steady flow, non-flow processes and irreversibility.

Unit IV

Properties of Steam and use of Steam Tables: Pure Substances, P-V-T surfaces, T-s and h-s diagram, Mollier chart, dryness fraction, property tables, analysis of steam undergoing various thermodynamic processes using Mollier chart– steam calorimetry.

Unit V

Air Standard Cycles: Otto, Diesel and dual cycles, P-V and T -S diagrams - description and efficiencies, mean effective pressures. Comparison of Otto, Diesel and dual cycles

Refrigeration cycle: Rankine cycle, Brayton cycle.

Text Book(s)

1. P.K.Nag, Engineering Thermodynamics, 5/e, Tata McGraw Hill,2013.
2. Yunus A. Cengel, Michaela A. Boles, Thermodynamics, 7/e, Tata McGraw Hill,2011.

References

1. J.B.Jones and G.A.Hawkins, Introduction to Thermodynamics, 2/e, John Wiley & Sons,2012.
2. Moran, Michael J. and Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, 3/e, Wiley,2015
3. Claus Borgnakke Richard E. Sonntag, Fundamentals of Thermodynamics, 7/e, Wiley,2009 R.K. Rajput, S.Chand& Co., Thermal Engineering, 6/e, Laxmi publications,2010

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME2T05 PROBLEM SOLVING THROUGH C

Pre-requisite:

Course Objective:

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor. To assimilate about File I/O and significance of functions

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of programming

CO2: Understand and Apply loop construct for a given problem

CO3: Demonstrate the use pointers

CO4: Understand the use of functions and develop modular reusable code

CO5: Understand File I/O operations

SYLLABUS

UNIT-I:

INTRODUCTION TO COMPUTERS: Functional Components of computer, computer software, categories of memory, types of programming languages, Development of algorithms, flow charts, software development process, Computer Numbering system

BASICS OF C PROGRAMMING: Introduction to programming paradigms, Structure of C program, Data Types, C Tokens, Operators: Precedence and Associativity, Expressions Input/output statements, Assignment statements

UNIT-II:

Decision making statements: if, if else, nester if. Multi way decision making statements: else if, Switch statement. **Loop statements**: while, do while, for, Compilation process.

UNIT-III:

Introduction to Arrays: Declaration, Initialization, One dimensional array, Example Programs on one dimensional array, Selection sort, linear and binary search, two dimensional arrays, Matrix Operations, Multi-dimensional Arrays

Strings: Declaration, String operations: length, compare, concatenate, copy, String handling functions.

UNIT-IV:

FUNCTIONS: Introduction to functions: Function prototype, function definition, function call, Built-in functions, Recursion, Storage classes, Passing Arrays & Strings to the functions, Preprocessor directives

POINTERS: Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers, Parameter passing: Pass by value, Pass by reference, Dynamic Memory Allocation

UNIT-V:

STRUCTURES AND UNIONS: Structure, Nested structures, Pointer and Structures, Array of structures, Example Program using structures and pointers, Self-referential structures, Unions.

FILE PROCESSING: Files, Types of file processing: Sequential access, Random access, Sequential access file, Random access file, Command line arguments

Text Books:

1. Krnighan. B.W and Ritche, D.M, “The C Programming Language”, Second Edition, Pearson Education, 2006

2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.

References:

1. Pradepdey, Manas Ghosh, “Fundamentals of Computing and programming in C”, First Edition, Oxford University Press, 2009.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh Edition,

Pearson Publication.
3. E Balagursamy, “Programming in C, Sixth Edition, Tata McGraw Hill.
4. Ajay Mittal, “Programming in C A practical Approach”, Pearson education

B.TECH II SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20ME2L06 ENGINEERING CHEMISTRY LAB

Pre-requisite: Acquire some experimental skills.

Course Objective: Objective of the course is to impart

- The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations.
- A few instrumental methods of chemical analysis.

Course Outcomes:

At the end of the course, student will be able to

CO1: The student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

LIST OF EXPERIMENTS

1. Determination of HCl using standard Na2CO3 solution.
2. Determination of alkalinity of a sample containing Na2CO3 and NaOH.
3. Determination of Mn+2 using standard oxalic acid solution.
4. Determination of ferrous iron using standard K2Cr2O7 solution.
5. Determination of Cu+2 using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe+3 by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method
10. Determination of the concentration of strong acid vs strong base (by

conductometric method).

11 Determination of strong acid vs strong base (by potentiometric method).

12 Determination of Mg+2 present in an antacid.

13 Determination of CaCO3 present in an egg shell.

14 Estimation of Vitamin C.

15 Determination of phosphoric content in soft drinks.

16 Adsorption of acetic acid by charcoal.

17 Preparation of nylon-6, 6 and Bakelite (demonstration only).

			L	T	P	C
B.TECH II SEMESTER	**ESC**		**0**	**0**	**3**	**1.5**

20ME2L07: ENGINEERING & IT WORKSHOP

Course Objective: To impart hands-on practice on basic engineering trades and skills.

Trade:

1. **Carpentry**
   a. T-Lap Joint
   b. Cross Lap Joint
   c. Dovetail Joint
   d. Mortise and Tenon Joint
2. **Fitting**
   a. Vee Fit
   b. Square Fit
   c. Half Round Fit
   d. Dovetail Fit
3. **House Wiring**
   a. Parallel / Series Connection of three bulbs
   b. Stair Case wiring
   c. Florescent Lamp Fitting
   d. Measurement of Earth Resistance
4. **TinSmithy**
   a. Taper Tray
   b. Square Box without lid
   c. Open Scoop
   d. Funnel
5. **Product prototyping using 3D Printing**
6. **IT Workshop**

   Task 1: Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.

   Task 2: Practicing disassembling and assembling components of a PC

Note: At least two exercises to be done from each trade.

B.TECH II SEMESTER	**ESC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20ME2L08 **PROBLEM SOLVING THROUGH C LAB**

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers &functions.
- To review the file operations, pre processor commands.

Course Outcomes:

- Demonstrate Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute

the area of the various geometrical shape.

3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( )function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name
3. Write a program in C to remove a file from the disk.

B.TECH II SEMESTER

	L	T	P	C
MC	2	-	-	-

20ME2M09 ENVIRONMENTAL SCIENCE

Course objective:

To understand the importance of Environment and the importance of biodiversity

Course outcomes:

- The importance of environment, Natural resources and current global environmental challenges for the sustenance of the life on planet earth.
- The concepts of the ecosystem and its function in the environment.
- 3.The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- The various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices.
- The environmental legislations of India and Social issues and the possible means
- Environmental assessment and the stages involved in EIA.

SYLLABUS

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Introduction- Scope of Environmental Studies- Importance of Environmental Studies- Need for public awareness, Environmental ethics- Contemporary Environmentalists- Environmental Global moves: Stockholm conference, Earth summit

Concept of an ecosystem - Structure of an ecosystem- function of an ecosystem- Food chains, food webs- ecological pyramids- Energy flow in the ecosystem- Ecological succession- Nutrient cycling- 1^oproduction& 2^oproduction- Major ecosystems: Forest ecosystem- Grassland ecosystem, Desert ecosystem- Aquatic ecosystem: pond, Lake Ecosystem- Streams, river ecosystem, Oceans

UNIT-II: NATURAL RESOURCES AND CONSERVATION

Introduction and classification of natural resources-Forest resources: Use and over-exploitation- Deforestation-Timber extraction-Mining- Conservation- Water resources: Use and over utilization of surface and ground water,- Floods, drought, Dams and associated problems- Water conservation, rain water harvesting, water shed management-Energy resources: renewable energy sources –solar-wind-hydro-tidal- Ocean thermal-geo thermal-bio mass-bio gas-bio fuels- Hydrogen.- Non-renewable energy sources-coal-petroleum-natural gas-Nuclear energy

UNIT-III: **BIODIVERSITY AND ITS CONSERVATION**

Definition, classification- Value of biodiversity-Threats to biodiversity: habitat loss, man-wildlife conflicts- Endangered and endemic species of India-Conservation of biodiversity- Biodiversity at national and local levels, Hot-sports of biodiversity

UNIT-IV: ENVIRONMENTAL PROBLEMS

Global warming, Climate change- Acid rain, Ozone depletion- Air pollution- Water pollution- Soil pollution- Noise pollution, Nuclear hazards- Solid Waste Management: Causes, Consequences and Control methods- Solid Waste Management- Population growth and explosion, effects, control measures- Pollution case studies- Role of an individual in prevention of pollution

UNIT-V: ENVIRONMENTALLEGISLATION&MANAGEMENT

Sustainable development- Air (Prevention and Control of Pollution) Act- Drawbacks- Water (Prevention and control of Pollution) Act- Drawbacks- Wildlife Protection Act- Drawbacks- Forest Conservation Act- Drawbacks- Environmental Protection Act- Drawbacks- Environmental Impact Assessment and its significance- Preparation of Environmental Management Plan and Environmental Impact Statement- Ecotourism

TEXT BOOKS:

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age Publications, New Delhi

2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada

3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.

4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCES:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi

3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

4. Perspectives in Environment Studies, AnubhaKaushik, C P Kaushik, New Delhi.

B.TECH III SEMESTER **BSC**

L	T	P	C
3	0	0	3

20ME3T01 **NUMERICAL METHODS AND VECTOR CALCULUS**

Pre-requisite: Linear Algebra and Differential Equations & Transformation Techniques

Course Objective: Objective of the course is to impart

- understand the basic numerical methods to solve simultaneous linear equations
- knowledge of numerical methods to solve ordinary differential equations
- the types of integration over the lines, surfaces & volumes

Course Outcomes:

At the end of the course, student will be able to

CO1: Determine the solution of transcendental equations by different numerical methods

CO2: Provide the interpolation techniques which analyze the data of an unknown function

CO3: Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries

CO4: Evaluate areas and volumes using double & triple integrals

CO5: Apply the concepts of calculus to scalar and vector fields and establish the relation between line, surface and volume integrals.

SYLLABUS

UNIT-I: Numerical Solution of Equations:

Solution of Algebraic and transcendental equations: Bisection method, Method of false position and Newton-Raphson method. Iterative methods of solution of linear simultaneous equations: Jacobi's and Gauss-Seidel iteration methods.

UNIT-II: Interpolation:

Forward and backward, relation between these operators, Differences of a polynomial, Interpolation with unequal intervals: Lagrange's interpolation formula, Newton's forward & backward interpolation formulae & problems.

UNIT-III: Numerical Integration & Numerical Solutions of ordinary differential equations with initial conditions:

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rules.

Numerical Solution of ODE: Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method of 4^{th} order.

UNIT-IV: Multiple Integrals:

Double integrals in Cartesian & polar coordinates, Change of order of integration, Triple integrals, Change of variables (Cartesian to Polar, Rectangular coordinates to Cylindrical & Rectangular coordinates to Spherical polar coordinate systems). **Applications:** Area enclosed by plane curves, Volume of solids.

UNIT-V: Vector Differentiation & Vector Integration:

Introduction, Scalar and Vector point functions, Del applied to scalar point functions-Gradient, directional derivatives, Del applied to vector point functions-Div& Curl, physical interpretation of div & curl, Del applied twice to point functions, Del applied to products of point functions (Identities without proofs).Line integral, Green's theorem in the plane (without proof), Surface integrals, Stoke's theorem (without proof), Volume integral, Gauss Divergence theorem (without proof).

Text Books:

B. S. GREWAL, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.

B. V. RAMANA, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.

Reference Books:

ERWIN KREYSZIG, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.

N. P. BALI &Dr. MANISH GOYAL, A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.

B.TECH III SEMESTER **PCC**

L	T	P	C
3	0	0	3

20ME3M02 MATERIAL SCIENCE & METALLURGY

SYLLABUS

UNIT – I

Structure of Metals and Constitution of alloys: Bonds in Solids, Crystal structure of metals, grains and grain boundaries, determination of grain size and effect of grain size on the mechanical properties of metal / alloys. Necessity of alloying, types of solid solutions, Hume Rothery's rules.

UNIT –II

Equilibrium Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, eutectic systems, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Pb-Sn, Fe-Fe3C, Cu-Ni and Al-Cu.

UNIT –III

Cast Irons and Steels: Extraction of Iron, Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, applications of cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Had field manganese steels, Maraging steels, tool and die steels.

UNIT – IV

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT – VNon-ferrous Metals and Alloys: Structure and properties of Copper and its alloys, Aluminum and its alloys, Titanium and its alloys.

Ceramic Materials:

Crystalline ceramics, glasses, cermets, abrasive materials, nanomaterials–definition, properties and applications.

Composite Materials:

Classification of composites, methods to manufacture the composites, particle reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal matrix composites and C – C composites.

Text Books:

1. Donald R. Askeland and WendelinJ.Wright, Essential of Materials Science and Engineering –Global Engineering Publisher, 4th edition, 2019.
2. Sidney H.Avner, Introduction to Physical Metallurgy- McGraw Hill Publishers, 2ndedition and 2017.

References:

1. Dr. V.D.Kodgire, Material Science and Metallurgy – Everest Publishers, 31st edition and2011.
2. Callister& Balasubramanian, Materials Science and engineering, Wiley Publications, 9thedition and 2015.
3. Traugott Fischer – Material Science for Engineering students –Elsevier Publisher and 2009.
4. V. Rahghavan, PHI Publisher - Material science and Engineering, 6th edition, and2015.
5. Yip-Wah Chung- Introduction to Material Science and Engineering, CRC Press, 1st edition and 2006
6. A V K Suryanarayana - Material Science and Metallurgy, B S Publications 1st edition and2014.
7. U. C. Jindal Material Science and Metallurgy – Pearson Publications, 1st edition and2011.
8. Vijendra Singh - Physical Metallurgy, Standard Publishers, 1st edition, and2005.

B.TECH III SEMESTER

PCC	L	T	P	C
	3	0	0	3

20ME3T03 PRODUCTION TECHNOLOGY

SYLLABUS

UNIT – I

CASTING: Steps involved in making a casting. Patterns – Types of patterns – Materials used for patterns, pattern allowances, Gating ratio and design of Gating systems. Risers – Types, function and design, casting design considerations. Gases in metals. Solidifications. General defects in castings. Basic principles and applications of Centrifugal casting, Die casting and Investment casting-advantages, disadvantages and applications.

UNIT – II

WELDING: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, Manual metal arc welding, Submerged arc welding, Inert Gas welding- TIG & MIG welding- advantages, disadvantages and applications. Welding defects – causes and remedies – destructive and non-destructive testing of welds. Introduction to brazing & soldering.

UNIT – III

METAL FORMING: Hot working and Cold working, Strain hardening and Annealing. Bulk forming processes: Forging - Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing. Introduction to powder metallurgy – compaction and sintering, advantages and applications.

UNIT – IV

SHEET METAL FORMING: - Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools. High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electrohydraulic forming, rubber pad forming, advantages and limitations.

UNIT – V

Plastics and Polymers: Introduction, Types of plastics and Composites based on plastics.

Processing of Plastics:

Thermoplastics: Blow and Injection molding**,**

Thermosets: Liquid Molding Process, Reaction injection molding, Resin transfer molding

Text Books:

1. P.N. Rao, Manufacturing Technology -Vol I- 1st edition, Tata McGraw Hill Education and 2013

2. Mikell P. Groover. Fundamentals of Modern Manufacturing Materials, Processes, and Systems -John Wiley publications, 4th edition and 2010.

References:

1. A.Ghosh& A.K.Malik – Manufacturing Science - East West Press Pvt. Ltd, 2nd edition and 2010.

2. Allyn and Bacon - Process and materials of manufacture- PHI publisher, 4th Edition, 1990.

3. R.K. Jain - Production Technology, Khanna Publisher 1st edition and 2015.

4. P C Sharma- Production Technology - S. Chand, 1st edition and 2006.

5. H.S. Shaun - Manufacturing Processes- Pearson publication, 1st edition and 2012.

6. J.P. Kaushish - Manufacturing Processes- PHI publication, 1st edition and 2010.

B.TECH III SEMESTER	PCC	L	T	P	C
		3	0	0	3

20ME3T04 MECHANICS OF SOLIDS

SYLLABUS

UNIT – I

STRESSES & STRAINS : Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress-straindiagramformildsteel–Workingstress–Factorofsafety–Lateralstrain,Poisson'sratio & volumetric strain, Relation between elastic constants – Bars of varying section – composite bars – Temperature stresses- Compound Stresses - Principal planes and principal stresses - Mohr's circle, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II

SHEAR FORCE AND BENDING MOMENT: Definition of beam – Types of beams and loads – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

FLEXURALSTRESSES: Theory of simple bending–Assumptions–Derivation of bending equation: $M/I = f/y = E/R$, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT – IV

DEFLECTION OF BEAMS : Differential equations of the deflection curve, Slope and deflection using double integration method, Macaulay's method and Moment area method for simply supported, cantilever and overhanging beams. Statically Indeterminate Beams and solution methods.

TORSION: Introduction-Derivation of torsion equation- Torsion of Circular shafts- Pure Shear- Transmission of power by circular shafts, Shafts in series, Shafts in parallel.

UNIT – V

THIN CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

THICK CYLINDERS: –lame's equation – cylinders subjected to inside & outside pressures – compound cylinders.

COLUMNS: Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula.

Text Books:

1. GH Ryder, Strength of materials, 3/e, Mc Millan publishers India Ltd.,1983.
2. Popov, Mechanics of Solids, 2/e, New Pearson Education,2015.

References:

1. U.C Jindal, Strength of Materials, Pearson Education,2012.
2. Junnarkar S. B, Mechanics of Structures, Vol-III Charotar,1974.
3. SS Rattan, Strength of materials, 3/e, Tata McGraw-Hill,2016.
4. Andrew Pytel, Ferdinand Leon Singer, Strength of Materials, 4/e, Harper & Row,2007.

B.TECH III SEMESTER **PCC**

L	T	P	C
3	0	0	3

20ME3T05 FLUID MECHANICS AND HYDRAULIC MACHINES

SYLLABUS

UNIT – I

FLUID STATICS: Definition of fluid, continuum, dimensions and units, properties of fluids – specific gravity, viscosity and its significance, compressibility, surface tension, capillarity, vapor pressure and manometry, Pascal's law, hydrostatic law.

BUOYANCY AND FLOATATION: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

FLUID KINEMATICS: Methods of Analysis- System and control volume, Classification of flows-steady and unsteady, uniform and non-uniform, laminar and turbulent, rotational and irrotational, viscous and inviscid, internal and external flows, Continuity equation. Kinematics-stream tube, stream function, circulation and vorticity, stream function and potential function, condition for irrotational flow.

UNIT-II

FLUID DYNAMICS: Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications- force on pipe bend, Measurement of flow - Venturimeter, Orificemeter and pitot tube, stagnation properties.

CLOSED CONDUIT FLOW: Reynolds's experiment – Darcy-Weisbach equation – minor losses in pipes – pipes in series and pipes in parallel – total energy line – hydraulic gradient line.

UNIT-III

BOUNDARY LAYER THEORY: concept of boundary layer, displacement, momentum and energy thickness, separation of boundary layer.

DIMENSIONAL ANALYSIS: Fundamental and derived dimensions, Rayleigh method, Buckingham theorem, dimensionless groups, application of dimensional groups, model testing and similitude, types of similarity- geometric, kinematic and dynamic.

UNIT-IV : IMPACT OF JETS: Impulse momentum equation, Hydrodynamic force of jet striking stationary and moving-vanes, flat and curved vanes, centrally and tangentially, series of vanes, radial vanes, velocity triangles, work done and efficiency

HYDRAULIC TURBINES: Classification of hydraulic turbines- Impulse and Reaction turbines, Pelton, Francis and Kaplan turbines, working principles, draft tube– theory and its functions, Unit and specific quantities, performance curves.

UNIT-V

ROTODYNAMIC PUMPS: Classification – mixed, axial, construction, principle and application.

CENTRIFUGAL PUMPS- Classification, working principle, work done by impeller, specific speed, performance characteristic curves, Cavitation & NPSH.

POSITIVE DISPLACEMENT PUMPS: Working - gear pump, vane pump, rotary piston pump,

RECIPROCATING PUMP - Working, Slip, Indicator diagrams, Air vessels.

TEXT BOOKS

1 Dr. P.N. Modi & Dr.S.M. Seth, Hydraulics & Fluid Mechanics Including Hydraulics Machines, Rajsons Publ, 21stEd.,2017.
2 R. K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publ.,10th Ed.,2018.

REFERENCES BOOKS

1 R.K. Rajput, Fluid Mechanics and Hydraulic Machines, S. Chand Publ., 6thEd.,2015.
2 D. Ramadurgaiah, Fluid Mechanics and Machinery, New-age International, 1st Ed.,2002.
3 T.R. Banga& S.C. Sharma, Fluid Mechanics & Hydraulic Machines, Khanna Publ.,16th Ed.,2016.
4 V.M. Domkundwar&A.V. Domkundwar, Fluid Mechanics and Hydraulic Machines, DhanpatRai& Co.2014.

B.TECH III SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20ME3L06 PRODUCTION TECHNOLOGY LAB

LIST OF EXPERIMENTS

(Minimum of 12 Exercises need to be performed)

I. METAL CASTING:

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - for strength and permeability.
3. Mould preparation, Melting and Casting.

II WELDING:

1. Gas welding
2. Gas cutting
3. Manual metal arc welding - Lap & Butt Joints
4. TIG/MIG Welding
5. Resistance Spot Welding
6. Brazing and soldering

III METAL FORMING:

1. Blanking & Piercing operations.
2. Perform V-bending operation using hydraulic press.

IV PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding

B.TECH III SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20ME3L07 FLUID MECHANICS AND HYDRAULIC MACHINES LAB

LIST OF EXPERIMENTS

1. Experimental Verification of Bernoulli's Theorem.
2. Calibration of Venturimeter.
3. Calibration of Orific emeter.
4. Determination of friction factor for a given pipeline.
5. Determination of loss of head due to sudden contraction in a pipeline.
6. Turbine flow meter.
7. Impact of jets on Vanes.
8. Performance Test on Pelton Wheel.
9. Performance Test on Francis Turbine.
10. Performance Test on Single Stage Centrifugal Pump.
11. Performance Test on Multi Stage Centrifugal Pump.
12. Performance Test on Reciprocating Pump.

B.TECH III SEMESTER

	L	T	P	C
PCC	0	0	3	1.5

20ME3L08 MECHANICS OF SOLIDS & METALLURGY LAB

LIST OF EXPERIMENTS

NOTE: Any 6 experiments from each section A and B.

(A) MECHNICS OF SOLIDSLAB:

1. Direct tension test
2. Bending test on
    a) Simple supported beam
    b) Cantilever beam
3. Torsion test
4. Hardness tests
    a) Brinells hardness test
    b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

(B) METALLURGYLAB:

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardenability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

B.TECH III SEMESTER	SC	L	T	P	C
		0	0	4	2

20ME3S09 **COMPUTER AIDED DRAFTING AND MODELING LAB (Skill Oriented Course)**

SYLLABUS

UNIT-1

Definition of Design, Steps in conventional design. CAD, Geometric Definition of Design, Steps in conventional design. CAD, Geometric modeling, types of geometric models: 2D, 2.5D, 3D.

Techniques to create geometric models: wireframe, surface and solid modeling techniques.

UNIT-2

Menus and toolbars in AutoCAD, Coordinate systems to specify a point in AutoCAD, Drawing Basic Geometric Shapes (entities) in AutoCAD, Using Modify Commands

UNIT-3

Sectional views: types, cutting plane line, section lines, Hatching and Gradients, Dimensioning: elements, types, systems, Dimension edit

Tolerance: Limits, fits, tolerances, Fits, and its types, Bill of materials (BoM)

UNIT-4

Concept of Projections: Orthographic, Isometric, Oblique, and Perspective projections, First angle projection and third angle projection, Examples of converting isometric view into orthographic views, Layers for various features of part drawings, Isometric Drawings: in a 2D plane

Isometric Drawings: in 3D plane (3D wireframe modeling, Plotting and Publishing)

Surface modeling: Plane surface, Tabulated surface, Ruled surface, Revolved surface, Lofted surface, Sweep

2.5D Solid modeling using Extrude, Sweep, Revolve, Loft

UNIT-5 3D Solid Modeling- Primitives, Boolean Operations. Constructive Solid Geometry/Primitive instancing (CSG), 3D Solid Modeling exercise using CSG, Advanced Drafting, Mechanical Features

B.TECH IV SEMESTER	**BSC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME4T01: COMPLEX VARIABLES AND STATISTICAL METHODS

Pre-requisite: Basic knowledge about Calculus and Probability

Course Objective: Objective of the course is to impart

- basic understanding of complex variable theory
- description of sampling distribution of means, proportions & variances
- testing the hypothesis concerning means, proportions & variances

Course Outcomes:

S. No.	At the end of the course, student will be able to
CO 1:	Determine analytic and non-analytic functions
CO 2:	Analyze the analytic function into a power series which is useful in the study of communication systems.
CO 3:	Understand random variables and probability distributions
CO 4:	Apply different distributions to compute confidence intervals
CO 5:	Test the hypothesis concerning means and proportions

SYLLABUS

UNIT-I: Analytic Functions:

Introduction, Complex function, Limit and continuity of a complex function, Derivative of f(z), Analytic functions, Harmonic functions & orthogonal system, finding analytic functions by Milne-Thomson method. Applications to flow problems.

UNIT-II: Complex Integration and Residues: (all theorems without proofs)

Complex integration, Cauchy's theorem and Cauchy's integral formula, Series of complex terms, Taylor's series and Laurent's series. Zeros and singularities of an analytic function, Residues and Cauchy-Residue theorem. Evaluation of real definite integrals using contour integration about unit circle.

UNIT-III: Random variables and distributions:

Introduction-Discrete & Continuous Random variable - Distribution functions.
Binomial, Poisson distributions. Continuous distribution: Normal distributions, Normal approximation to Binomial distribution.

UNIT-IV: Sampling Theory:

Introduction - Population and samples- Sampling distribution of means (s known)- Central limit theorem- t-distribution- Sampling distribution of means (s unknown)- Sampling distribution of variances - Point estimation- Maximum error of estimate - Interval estimation.

UNIT-V: Tests of Hypothesis:

Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors – Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences.

Text Books:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014.
2. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition, PHI.

Reference Books:

3. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.
4. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8thedition, Cengage Publshers.

B.TECH IV SEMESTER	PCC	L	T	P	C
		3	0	0	3

20ME4T02 DESIGN OF MACHINE ELEMENTS

SYLLABUS

Unit I

Mechanical Engineering Design: Design process, design considerations, codes and standards of designation of materials, selection of materials, preferred numbers.

Design for Static Loads: Modes of failure, Factor of safety, design of components subjected to axial, bending, torsional and impact loads. Design for Theories of failure for static loads.

Unit II

Design for Dynamic Loads: Stress concentration, Types of fluctuating stresses, Endurance limit, Notch sensitivity, fatigue strength under axial, bending and torsion, fatigue design for infinite life. Fatigue theories of failure, Soderberg, Goodman and modified Goodman criterion for fatigue failure. Fatigue design under combined stresses.

Unit III

Design of Bolted Joints: Threaded fasteners, preload of bolts, various stresses induced in the bolts. Torque requirement for bolt tightening, eccentrically loaded bolted joints, gasketed joints.

Riveted Joints: Design of lap, butt and eccentrically loaded joints, failure and efficiency of riveted joints.

Welded Joints: Strength of lap and butt welds, eccentrically loaded welded joints. Joint is subjected to bending and torsion.

Unit IV

Design of Cotters and Knuckle Joints: cotter joints-spigot and socket, sleeve and cotter, jib and cotter joints-knuckle joints.

Power Transmission Shafts: Design of shafts subjected to bending, torsion and axial loading. Shafts subjected to fluctuating loads using shock factors. Shaft design on torsional rigidity basis.

Unit V

Keys: Function, types, design of sunk, saddle, Kennedy and Woodruff keys.

Couplings: Design of rigid, flange and bushed pin couplings, universal coupling.

Springs: Design of helical compression, tension, torsion springs. Design against fluctuating loads, concentric springs and leaf springs.

Text Book(s)

1. V.B.Bhandari, Design of Machine Elements, Tata McGraw Hill, 3/e, 2010.
2. J.E. Shigley, Mechanical Engineering Design, Tata McGraw Hill, 2/e, 1986.

References

1. R.L. Norton, Machine Design an Integrated approach, 2/e, Pearson Education,2004.
2. R.K. Jain, Machine Design, Khanna Publications,1978.
3. M.F.SpottsandT.E.Shoup, Design of Machine Elements, 3/e, Prentice Hall (Pearson Education),2013.
4. Data book

Note: Design data book is permitted.

B.TECH IV SEMESTER	PCC	L	T	P	C
		3	0	0	3

20ME4T03 **INTERNAL COMBUSTION ENGINES & AIR COMPRESSORS**

SYLLABUS

UNIT – I

I.C. Engines: Classification - Working principles, Valve and Port Timing Diagrams, - Engine systems, Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of Wankle engine, Principles of supercharging and turbo charging.

Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

UNIT – II

Combustion in S.I. Engines: Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Types of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, antiknock additives – combustion chamber – requirements, types.

Combustion in C.I. Engines: Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT – III

Measurement, Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

UNIT – IV

Compressors: Classification – positive displacement and roto dynamic machinery – Power producing and power is absorbing machines, fan, blower and compressor.

Reciprocating Compressor: Principle of operation, work required Isothermal efficiency, volumetric efficiency and effect of clearance, multi stage compression, under cooling, minimum work condition for two stage compression.

UNIT V

Rotary (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor – Mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Slip factor, power input factor, pressure coefficient and adiabatic coefficient.

Axial Flow Compressors: Mechanical details and principle of operation and degree of reaction, work done factor - isentropic efficiency– Polytropic efficiency.

Text Books:

1. V. Ganesan, Internal Combustion Engines, Tata McGraw Hill, 4th Ed.,2017.

2. John B. Heywood, Internal Combustion Engine Fundamentals, McGraw-Hill, 2nd Ed.,2018.

References:

1. R.K. Rajput, Thermal Engineering, Lakshmi Publications, 8th Ed., 2010

2. M.L. Mathur& R.P. Sharma, Internal Combustion Engines, Dhanpath Rai & Sons Publications.

3. R.S. Khurmi & J.S. Gupta, Thermal Engineering, S. Chand Publications, 15th Ed.,2015.

B.TECH IV SEMESTER **PCC**

L	T	P	C
3	0	0	3

20ME4T04 KINEMATICS OF MACHINERY

UNIT – I

MECHANISMS : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained. Grublers criterion, Grashoff's law, Degrees of freedom, Kutzbach criterion for planar mechanisms, Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism– inversion of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

UNIT – II

LOWER PAIR MECHANISM: Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russel – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph. Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio; Hooke's Joint: Single and double – Universal coupling–application–problems.

UNIT – III

KINEMATICS: Velocity and acceleration – Motion of a link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain. Velocity and acceleration analysis of for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

Plane motion of body: Instantaneous centre of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV

CAMS: Definitions of cam and followers – their uses – Types of followers and cams – Terminology –Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases. Analysis of motion of followers: Roller follower – circular cam with straight, concave and convex flanks.

Power Transmissions: Introduction, Belt and rope drives, selection of belt drive- types of belt drives, V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

UNIT – V

GEARS: Higher pairs, friction wheels and toothed gears–types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

GEAR TRAINS: Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains. Selection of gear box-Differential gear for an automobile.

Text Books:

1. A.Ghosh & A.K.Malik , Theory of Mechanisms and machines, 4/e, East West Press Pvt. Ltd,2011

2. S.S.Rattan , Theory of Machines, 4/e, Tata Mc-Graw Hill, 2014

3. J.J Uicker, G.R.Pennock&J.E.Shigley, Theory of machines and Mechanisms –3/e Oxford publishers,2009.

References:

1. J.E.Shigley, Theory of Machines and Mechanisms, 4/e, Oxford, 2014

2. P.L.Ballaney, Theory of Machines & Mechanisms, 25/e, Khanna Publishers,Delhi, 2003

3. Ashok G. Ambekar, Mechanism and Machine Theory 1/e PHI Publishers,2007.

4. Bevan (Author), The Theory of Machines, 3/e Paperback,2009

5. J.S. Rao, Kinematics of Machinery through Hyper Works, 18 volume, Springer Publ,2001

6. Vickers, Theory of machines and Machinery, 4/e, Oxford 2014

B.TECH IV SEMESTER		HSMC	L	T	P	C
			3	0	0	3
20ME4T05	MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product

CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs

CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units

CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis

CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

SYLLABUS

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of

Demand, Types of Elasticity of Demand and Measurement Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

B.TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20ME4L06 **PROFICIENCY THROUGH READING AND WRITING LAB**

Unit I Vocabulary Building

1.1 The concept of word formation

1.2. Root words from foreign languages and their use in English

1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives

1.4 Synonyms, antonyms, and standard abbreviations

Unit II Writing Skills

2.1 Organizing principles of paragraphs in documents

2.2 Creative writing

2.3 Essay writing

Unit III Identifying Common Errors in Writing

3.1 Subject-verb agreement

3.2 Noun-pronoun agreement

3.3 Misplaced modifiers

3.4 Articles

3.5 Prepositions

3.6 Redundancies

3.7 Clichés

Unit IV Comprehension

4.1 Scanning

4.2 Skimming

4.3 Identifying the main ideas

Unit V Reading for Pleasure

5.1 Review of an autobiography/biography

5.2 Review of a novel

5.3 Review of a self help book

Suggested Readings:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007.
3. On Writing Well. William Zinsser. Harper Resource Book. 2001.
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.

B.TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20ME4T07 COMPUTER AIDED MACHINE DRAWING

The following contents are to be done by any 2D CAD software package

Conventional representation of materials and components:

Detachable joints: Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint, bolted joint with washer and locknut, stud joint, screw joint.

Riveted joints: Drawing of rivet, lap joint, butt joint with single strap, single riveted, double riveted double strap joints.

Welded joints: Lap joint and T joint with fillet, butt joint with conventions.

Keys: Taper key, sunk taper key, round key, saddle key, feather key, woodruff key. Shaft coupling, bushed pin-type flange coupling, universal coupling, Oldhams' coupling.

The following contents to be done by any 3D CAD software package Sectional views

Creating solid models of complex machine parts and create sectional views.

Assembly drawings: (Any four of the following using solid model software)

Lathetoolpost,toolheadofshapingmachine,tailstock,machinevice,gatevalve,car burettor,piston, connectingrod,eccentric,screwjack,plumberblock,axlebearing,pipevice,clampi ngdevice,Geneva cam, universal coupling.

Manufacturing drawing:

Representation of limits, fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances.

Text Books:

1. K.L.Narayana, P.Kannaiah, A text book on Machine Drawing, SciTech Publications,2014

Reference Books:

1. Cecil Jensen, Jay Helsel and Donald D.Voisinet, Computer Aided Engineering Drawing, Tata Mcgraw-Hill, NY,2000.

2. James Barclay, Brain Griffiths, Engineering Drawing for Manufacture, Kogan Page Science, 2003.
3. N.D.Bhatt, Machine Drawing, Charotar, 50/e,2014.
4. K.L.Narayana, Production Drawing, NewAge International Publishers, 3/e,2014

B.TECH IV SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20ME4T08 THERMAL ENGINEERING LAB

LIST OF EXPERIMENTS

1. I.C. Engines valve / Port timing diagrams.
2. I.C. Engines performance test and Exhaust emission measurements (4 -stroke diesel engine).
3. I.C. Engines performance test and Exhaust emission measurements (2-stroke petrol engine).
4. Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine.
5. Determination of FP by retardation and motoring test on IC engine.
6. I.C. Engines heat balance at different loads and show the heat distribution curve.
7. Performance test on variable compression ratio engines.
8. Performance test on reciprocating air compressor unit.
9. Performance Test on Refrigeration Tutor.
10. Economical speed test of an IC engine.
11. Disassembly/assembly of Engines.
12. Study of boilers, mountings and accessories.

B.TECH IV SEMESTER **SC**

L	T	P	C
0	0	4	2

20ME4S09 **PROGRAMMING THROUGH MATLAB (Skill Oriented Course)**

The Structure of this Skill Course is divided into three modules under Matlab environment. With these additional skills, The student can get through knowledge in Matlab. By its nature, the presentation on MATLAB and its Toolboxes in this course cover all the background and details necessary for a complete understanding of MATLAB. The limited objective of the presentation here is to give enough information to enable the reader to apply MATLAB to the analysis and design problems covered in this course For further details, the readers are referred to extensive documentation, in both printed and online format, provided by the Math Works Inc

Objectives:

- Introduction to MATLAB family of programs
- Brief introduction to MATLAB base program in an interactive "hands on" tutorial style
- At the end of the day, our most important goal is that you gain useful computational skills that are applicable to your field of study. Advances in computing have revolutionized science and engineering in the past couple decades. hope will enable you to harness this computational power and help you accomplish great things in your career

Module 1

1 Introduction to MATLAB
2 Visualization and Programming
3 Solving Equations, Curve Fitting, and Numerical Techniques
4 Advanced Programming (iterations, Fibonacci series calendars and clocks, Google page rank, Game of life, Sudoku)
5 Various Functions and Toolboxes

Module 2

1 Introduction to Simulink

2 Analysis of Linear and Non linear Systems

3 Plotting of Specific Functional systems with Simulink

4 Basic Functional Units in Communication Systems

5 Control Systems analysis in time and frequency

Module 3

1 Optimum Statistical Parameters

2 Curve Fitting And Regression

3 Basic Neural Networks for computations

4 Vibrations and Dynamics

5 Kinematics Simulators

B.TECH IV SEMESTER

	L	T	P	C
MC	2	0	0	-

20ME4M10 CONSTITUTION OF INDIA

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

CO1: Understand historical background of the constitution making, importance for building a democratic India, features and principles of Indian Constitution.

CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO3: Understand the roles and powers of State Government and its Administration and value of the fundamental rights and duties for becoming good citizen of India.

CO4: Understand and analyze the decentralization of power between Union, State and Local self-Government and local administration.

CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission, UPSC, Welfare commissions for sustaining democracy.

SYLLABUS

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution -Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, CentreState relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, Rajya Sabha, The

Supreme Court and High Court: Powers and Functions;

UNIT III

State Government and its Administration Governor, Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV

A.Local Administration, District's Administration Head, Role and Importance, Municipalities, Mayor and role of Elected Representative, CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy(Different departments),

Village level, Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V

Election Commission: Election Commission, Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.

2) Subash Kashyap, Indian Constitution, National Book Trust

3) J.A. Siwach, Dynamics of Indian Government & Politics

4) D.C. Gupta, Indian Government and Politics

5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

6) J.C. Johari, Indian Government and Politics Hans

7) J. Raj Indian Government and Politics

8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-sources:

1) nptel.ac.in/courses/109104074/8

2) nptel.ac.in/courses/109104045/

3) nptel.ac.in/courses/101104065/

4) www.hss.iitb.ac.in/en/lecture-details

5)www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

B.TECH V SEMESTER	PCC	L	T	P	C
		3	0	0	3

20ME5T01 DYNAMICS OF MACHINES

Pre-requisite: Kinematics of Machinery

Course Objective: The Students will acquire the knowledge

1. To analyze stabilization of sea vehicles, aircrafts and automobile vehicles.
2. To solve frictional losses, torque transmission of mechanical systems.
3. To analyze dynamic forces of slider crank mechanism and design of flywheel.
4. To understand the methods of balancing reciprocating and rotary masses.
5. To understand the concept of vibrations and its significance on engineering design.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the stabilization of sea vehicles, aircrafts and automobile vehicles

CO2: Solve frictional losses, torque transmission of mechanical systems.

CO3: Analyze dynamic forces of slider crank mechanism and design of flywheel

CO4: Understand the methods of balancing reciprocating and rotary masses.

CO5: Illustrate the concept of vibrations and its significance on engineering design

SYLLABUS

UNIT-I: PRECESSION:

Gyroscopes, effect of precession motion on the stability of moving vehicles such as motorcar, motor cycle, aero planes and ships, static and dynamic force analysis of planar mechanisms,(Demonstration of models in video show).

UNIT-II:

FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis: lubricated surfaces, boundary friction, and film lubrication.

CLUTCHES: Friction clutches- single disc or plate clutch, multiple disc clutch, cone clutch, centrifugal clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle.

General description and operation of dynamometers: Prony, Rope brake, Epicyclic, Bevis Gibson and belt transmission.

UNIT-III:

TURNING MOMENT DIAGRAMS: Dynamic force analysis of slider crank mechanism, inertia torque, angular velocity and acceleration of connecting rod, crank effort and turning moment diagrams – fluctuation of energy – fly wheels and their design.

GOVERNERS: Watt, porter and proell governors, spring loaded governors – Hartnell and Hartung with auxiliary springs. Sensitiveness, isochronism and hunting.

UNIT-IV: BALANCING:

Balancing of rotating masses single and multiple – single and different planes, use analytical and graphical methods. Primary, secondary, and higher balancing of reciprocating masses. analytical and graphical methods, unbalanced forces and couples –examination of "V" multi cylinder in line and radial engines for primary and secondary balancing, locomotive balancing, hammer blow, swaying couple, variation of tractive effort.

UNIT-V: VIBRATIONS:

Free Vibration of spring mass system –Natural frequency-types of damping – damped free vibration, Simple problems on forced damped vibration, vibration isolation and transmissibility transverse loads, vibrations of beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method, whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems.

Text Books:

1. S.S Rattan, Theory of Machines, Mc. Graw Hill.
2. Ashok G. Ambedkar, Mechanism and machine theory, PHI Publications.

Reference Books:

1. JS Rao and RV Dukkipati, Mechanism and Machine Theory, New Age .
2. Shigley, Theory of Machines, MGH.
3. Thomas Bevan, Theory of Machines, CBS Publishers.

B.TECH V SEMESTER		**PCC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME5T02	**TURBO MACHINES**					

Pre-requisite: Internal Combustion Engines & Air Compressors

Course Objective:

1. To provide the knowledge of basic principles, governing equations and applications of turbo machine.
2. To provide the students with opportunities to apply basic thermo-fluid dynamics flow equations to Turbo machines.
3. To explain construction and working principle and evaluate the performance characteristics of Turbo Machines.

Course Outcomes: At the end of the course, student will be able to

CO1: Recognize typical designs of turbomachines and differentiate from positive displacement machines.
CO2: Explain the working principles of turbomachines and apply it to various types of machines.
CO3: Perform the preliminary design of turbomachines (pumps, compressors, turbines) on 1-D basis.
CO4: Determine the off-design behavior of turbines and compressors and relate it to changes in the velocity triangles.
CO5: Recognize relations between choices made early in the turbo machinery design process and the final components and operability.

SYLLABUS

UNIT-I: Basic Concepts:

Rankine cycle - schematic layout, thermodynamic analysis, concept of mean temperature of heat addition, methods to improve cycle performance – regeneration & reheating.

UNIT-II: Boilers:

Classification – working principles– mountings and accessories-working principles, boiler horse power, equivalent evaporation, efficiency and heat balance – draught, classification – Chimney height calculations, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

UNIT-III: Steam Nozzles:

Function of a nozzle – applications - types, flow through nozzles, Area- velocity relationship, Performance characteristics of Nozzles, condition for maximum discharge, critical pressure ratio, Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.

Steam Turbines: Classification – impulse turbine; mechanical details – velocity diagram – effect of friction- blade or diagram efficiency – condition for maximum efficiency. De-Laval turbine - methods to reduce rotor speed-compounding, condition for maximum efficiency.

UNIT-IV:

Reaction Turbine: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency - calculation of blade height.

Steam Condensers: classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency

UNIT-V:

Gas Turbines: Simple gas turbine plant-closed and open cycle gas turbines, Brayton cycle, Efficiency, work ratio and optimum pressure ratio for simple gas turbine cycle, actual cycle, methods for performance improvement- regeneration, Inter-cooling and reheating.

Jet propulsion: Turbo-jet engines, thrust, thrust power, efficiencies, Turbo-prop engines, Ramjet and pulse jet engines, Rocket engines..

Text books:

1. Thermodynamics and Heat Engines/R.Yadav, Volume -II /Central Publishing House
2. Gas Turbines /V.Ganesan /TMH
3. Heat Engineering /V.P Vasandani and D.S Kumar/Metropolitan Book Company, New Delhi

Reference Books:

1. Gas Turbines and Propulsive Systems /P.Khajuria & S.P.Dubey /Dhanpatrai

2. Gas Turbines / Cohen, Rogers and SaravanaMuttoo / Addison Wesley – Longman
3. Thermal Engineering-R.S Khurmi, &J S Gupta/S.Chand.
4. Thermal Engineering-P.L.Bellaney/ Khanna publishers
5. Thermal Engineering-M.L.Marthur& Mehta/Jain bros. Publishers
6. Thermal Engineering / RK Rajput/ Lakshmi Publications

Note: Use of steam tables and Mollier chart is allowed.

B.TECH V SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME5T03 METAL CUTTING &MACHINE TOOLS

Pre-requisite: Production Technology

Course Objective: The Students will acquire the knowledge

1. To apply the elementary theory of metal cutting and principles in material removal processes
2. To understand the working principles and operations that can be performed on lathe machines.
3. To identify the working principles and operations that can be performed on shaper, slotter, planner machines and drilling machines calculate the material removal rates.
4. To understand the working principles and operations that can be performed for producing various features using milling machine tool and select appropriate machining processes for finishing operation with the desired quality
5. To apply appropriate jigs and fixtures on machine tools and write simple CNC programs and conduct CNC machining

Course Outcomes: At the end of the course, student will be able to

CO1	Students can understand the fundamental knowledge and principles in material removal processes.
CO2	Students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses.
CO3	To demonstrate the fundamentals of machining processes and machine tools.
CO4	To develop knowledge and importance of metal cutting parameters.
CO5	To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.

SYLLABUS

UNIT-I: FUNDAMENTAL OF MACHINING:

Classification of machining processes, cutting conditions, cutting parameters, geometry of single point cutting tool, tool angles, types of chips, mechanics of orthogonal cutting –Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, tool wear, machinability, economics of machining, coolants, tool materials and properties.

UNIT-II: LATHE MACHINES:

Engine lathe – principle of working, specification of lathe – types of lathe – work holders tool holders – box tools taper turning, thread turning – for lathes and attachments, constructional features of speed gear box and feed gear box. Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes – tool layout and cam design for automats.

UNIT-III:

SHAPING, SLOTTING AND PLANNING MACHINES: Principles of working – principal parts – specifications, operations performed, machining time calculations.

DRILLING & BORING MACHINES: Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling Machine.

UNIT-IV: MILLING MACHINES:

Introduction – principle of working – specifications – milling methods – classification of Milling Machines – principle features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters – geometry of milling cutters – methods of indexing, accessories to milling machines – cutting speed and feed – machining time calculations.

UNIT-V: FINISHING PROCESSES:

Introduction – theory of grinding – classification of grinding machines: cylindrical and surface grinding machines- tool and cutter grinding machines- different types of abrasives- bonds, specification and selection of a grinding wheel-lapping, Honing & Broaching operations- comparison to grinding.

Text Book(s)

1. Manufacturing Engineering and Technology -Kalpakjian S & Steven R Schmid/Pearson Publications 7th Edition
2. Manufacturing Technology Vol-II/P.N Rao/Tata McGraw Hill

References

1. Metal cutting and machine tools /Geoffrey Boothroyd, Winston A.Knight/ Taylor & Francis.
2. Production Engineering/K.C Jain & A.K Chitaley/PHI Publishers
3. Technology of machine tools/S.F.Krar, A.R. Gill, Peter SMID/ TMH
4. Fundamentals of modern manufacturing – Mikell P Groover – John Wiley & sons -5th edition.

B.TECH V SEMESTER	PEC	L	T	P	C
		3	0	0	3

20ME5T06 **EXPERIMENTAL STRESS ANALYSIS (PROFESSIONAL ELECTIVE -I)**

Pre-requisite: Mechanics of Solids

Course Objective:

1. Recognize the various techniques available to measure the stress and Strains using different sources.
2. Realize the working of recording instruments and data logging methods
3. Distinguish the principles of photo elasticity in two dimensional stress Analyses.
4. Objective of the course is to measure strain through various experimental methods like strain gauges, photo elasticity techniques, brittle coatings, moiré methods and birefrigerent coatings.
5. To understand the relation between the mechanics theory and experimental stress analysis to learn usage of the experimental techniques on the practical problem.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the overall concepts of stress/strain analysis by experimental means.

CO2: Familiar with the theory and practice of common experimental stress analysis Methods including moire methods, photo elasticity

CO3: Acquire the knowledge on Brittle and bi-refrigent coatings and working of strain gauges.

CO4: Student should be able to choose the appropriate method for measuring strain of strain & stress.

CO5: Analyze the results obtained from coating techniques and corroborated with theoretical results.

SYLLABUS

UNIT-I: Introduction:

Stress, strain, Plane stress and plane strain conditions, Compatibility conditions. Problems using plane stress and plane strain conditions, stress functions, Mohr's circle for stress strain, Three-dimensional stress strain relations.

UNIT-II: Strain Measurement and Recordings:

Various types of strain gauges, Electrical Resistance strain gauges, semiconductor strain gauges, strain gauge circuits. Introduction, static recording and data logging, dynamic recording at very low frequencies, dynamic recording at intermediate frequencies, dynamic recording at high frequencies, dynamic recording at very high frequencies, telemetry systems.

UNIT-III:

Photo elasticity: Photo elasticity – Polariscope – Plane and circularly polarized light, Bright and dark field setups, Photo elastic materials – Isochromatic fringes – Isoclinic

Three dimensional Photo elasticity: Introduction, locking in model deformation, materials for three-dimensional photo elasticity, machining cementing and slicing three-dimensional models, slicing the model and interpretation of the resulting fringe patterns, effective stresses, the shear difference method in three dimensions, applications of the Frozen-stress method, the scattered light method.

UNIT-IV: Brittle coatings:

Introduction, coating stresses, failure theories, brittle coating crack patterns, crack detection, ceramic based brittle coatings, resin based brittle coatings, test procedures for brittle coatings analysis, calibration procedures, analysis of brittle coating data. Moire Methods: Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, the displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-Fringes, experimental procedure and techniques.

UNIT-V:

Birefringent Coatings Introduction, Coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, Fringe-order determinations in coatings, stress separation methods.

Text Books:

1. Theory of Elasticity by Timoshenke and GoodierJr
2. Experimental stress analysis by Dally and Riley,McGraw-Hill

References:

1. A treatise on Mathematical theory of Elasticity by LOVE .A.H
2. Photo Elasticity by Frocht Experimental stress analysis, Video course by K.Ramesh / NPTEL

B.TECH V SEMESTER	PEC	L	T	P	C
		3	0	0	3

20ME5T07 **DESIGN FOR MANUFACTURING**
(PROFESSIONAL ELECTIVE -I)

Pre-requisite: Manufacturing Technology

Course Objective: The students will acquire the knowledge:

1. To understand the basic concepts of design for manual assembly
2. To interpret basic design procedure of machining processes
3. To understand design considerations metal casting, extrusion and sheet metal work
4. To interpret the design considerations of various metal joining process.
5. To interpret the basic design concepts involved in the assembly automation

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of design for manual assembly

CO2: Identify basic design procedure of various machining processes.

CO3: Illustrate the design considerations metal casting, extrusion and sheet metal work .

CO4: Interpret the design considerations of various metal joining process.

CO5: Understand the basic design concepts involved in the assembly automation.

SYLLABUS

UNIT-I: **Introduction:**

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production-creativity in design.

Materials: Selection of materials for design-developments in material technology-criteria for material selection-material selection interrelationship with process selection-process selection charts.

UNIT-II: **Machining processes:**

Overview of various machining processes-general design rules for machining dimensional tolerance and surface roughness-Design for machining – ease – redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT-III:

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design-product design rules for sand casting.

Metal joining: Appraisal of various welding processes, factors in design of weldments – general design guidelines-pre and post treatment of welds-effects of thermal stresses in weld joints-design of brazed joints.

UNIT-IV:

Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.

Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

UNIT-V: **Plastics:**

Visco elastic and creep behavior in plastics-design guidelines for plastic components-design considerations for injection moulding – design guidelines for machining and joining of plastics.

Text Books:

1. George E Dieter and Linda Schmidt, Engineering Design, 4th Edition, McGraw Hill (2015)
2. A.K.Chitale and R.C.Gupta, Product Design and Manufacturing, 5th Edition, PHI Learning (2011)
3. David M Anderson, Design for Manufacturability, CRC Press (2013)

References:

1. James G Bralla, Design For Manufacturability Handbook, 2nd Edition, McGraw Hill (2004)
2. Dr.P.C.Sharma, Production Technology, S.Chand& Company (2009)

B.TECH V SEMESTER	PEC	L	T	P	C
		3	0	0	3

20ME5T08 **REFRIGERATION AND AIR-CONDITIONING (PROFESSIONAL ELECTIVE -I)**

Pre-requisite: Thermodynamics

Course Objective:

1. Learning the fundamental principles and different methods of refrigeration and air conditioning.
2. Study various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables.
3. Comparative study of different refrigerants with respect to properties, applications and environmental issues.
4. Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
5. Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems.

Course Outcomes: At the end of the course, student will be able to

CO1: Illustrate the fundamental principles and applications of refrigeration and air conditioning system

CO2: Obtain cooling capacity and coefficient of performance by conducting test on vapour compression refrigeration systems

CO3: Present the properties, applications and environmental issues of different refrigerants

CO4: Calculate cooling load for air conditioning systems used for various

CO5: Operate and analyze the refrigeration and air conditioning systems.

SYLLABUS

UNIT-I: Introduction to Refrigeration:

Necessity and applications – unit of refrigeration and C.O.P. – Mechanical refrigeration – types of ideal cycles of refrigeration. Air refrigeration: bell Coleman cycle - open and dense air systems – refrigeration systems used in air crafts and problems.

UNIT-II: Vapour Compression Refrigeration:

Working principle and essential components of the plant – simple vapour compression refrigeration cycle – COP – representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – actual cycle influence of various parameters on system performance – use of p-h charts – numerical problems. VCR System Components: Compressors – general classification – comparison – advantages and disadvantages. Condensers – classification – working principles evaporators – classification – working principles expansion devices – types – working principles.

UNIT-III:

Refrigerants – Desirable properties – classification - refrigerants used – nomenclature – ozone depletion – global warming Vapour Absorption System: Calculation of maximum COP – description and working of NH3 – water system and Li Br –water (Two shell & Four shell) System, principle of operation three fluid absorption system, salient features. Steam Jet Refrigeration System: Working principle and basic components, principle and operation of (i) thermoelectric refrigerator (ii) vortex tube

UNIT-IV: Introduction to Air Conditioning:

Psychometric properties & processes – characterization of sensible and latent heat loads — need for ventilation, consideration of infiltration – load concepts of RSHF, GSHF- problems, concept of ESHF and ADP temperature. Requirements of human comfort and concept of effective temperature- comfort chart –comfort air conditioning – requirements of industrial air conditioning, air conditioning load calculations.

UNIT-V: Air Conditioning Systems:

Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers fans and blowers. Heat pump – heat sources.

Text Books:

1. A Course in Refrigeration and Air conditioning / SC Arora Domkundwar/ Dhanpatrai
2. Refrigeration and Air Conditioning / CP Arora / TMH.

References:

1. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
2. Principles of Refrigeration /Dossat / Pearson Education.
3. Basic Refrigeration and Air-Conditioning / Ananthanarayanan / TMH

B.TECH V SEMESTER	PPC	L	T	P	C
		0	0	3	1.5

20ME5L09 THEORY OF MACHINES LAB

Pre-requisite: Acquire some experimental skills.

Course Objective:

The Students will acquire the knowledge to analyze gyroscope, frequency of free and forced vibration and study static and dynamic balancing.

Course Outcomes: At the end of the course, student will be able to

CO1:	Examine the motion of a motorized gyroscope when the couple is applied along its spin axis.
CO2:	Find the frequency of undamped and damped free vibration of an equivalent spring mass system.
CO3:	Find the position of sleeve against controlling force and speed of a Hartnell governor and to plot the characteristic curve of radius of rotation
CO4:	Interpret the static and dynamic balancing using rigid blocks
CO5:	Interpret the moment of inertia of a flywheel and Determine whirling speed of shaft theoretically and experimentally

LIST OF EXPERIMENTS

1	To determine whirling speed of shaft theoretically and experimentally.
2	To determine the position of sleeve against controlling force and speed of a Hartnell Governor and to plot the characteristic curve of radius of rotation.
3	To analyse the motion of a motorized gyroscope when the couple is applied along its spin axis
4	To determine the frequency of undamped free vibration of an equivalent spring mass system.
5	To determine the frequency of damped force vibration of a spring mass system

6	To study the static and dynamic balancing using rigid blocks.
7	To find the moment of inertia of a flywheel
8	To plot follower displacement vs cam rotation for various Cam Follower systems.
9	To plot slider displacement, velocity and acceleration against crank rotation for single slider, crank mechanism/Four bar mechanism.
10	To find coefficient of friction between belt and pulley.
11	To study simple and compound screw jack and determine the mechanical advantage, velocity ratio and efficiency
12	To study various types of gears- Spur, Helical, Worm and Bevel Gears.

NOTE: Any 10 experiments mentioned above.

B.TECH V SEMESTER		**PCC**	**L**	**T**	**P**	**C**
			0	**0**	**3**	**1.5**
20ME5L10	**MACHINE TOOLS & COMPUTER AIDED MANUFACTURING LAB**					

Pre-requisite: Acquire some experimental skills.

Course Objective: The Students will acquire the knowledge to understand the parts of various machine tools and operate them. They are required to understand the different shapes of products that can be produced on machine tools.

Course Outcomes:

At the end of the course, student will be able to

CO1:	Make use of Lathe machine tool to produce step turning, taper turning, knurling and threading features on the given workpiece.
CO2:	Understand the working of Milling machine tool to produce grooves.
CO3:	Utilize Drilling machine tool to produce features of cylindrical holes on flat and round surfaces and perform tapping operation
CO4:	Make use of Shaper and Planer machine tools to produce features of slots and pockets on flat surfaces to the desired quality.
CO5:	Utilize Grinding machine tool to produce finished surfaces and grind cutting tools

LIST OF EXPERIMENTS

1	Introduction to general purpose machine
2	Step turning and taper turning on lathe machine
3	Thread cutting and knurling on lathe.
4	Drilling and Tapping
5	Shaping and Planning
6	Slotting
7	Milling
8	Cylindrical & Surface Grinding

9 Grinding of Tool angles

NOTE: Any 5 varieties of jobs on the above said machines

COMPUTER AIDED MANUFACTURING LAB

Pre-requisite: Acquire some Software Knowledge.

Course Objective: The Students will acquire the knowledge

1. To model of simple machine parts and assemblies from the part drawings using standard CAM packages.
2. To generate CNC Turning codes for different operations using standard CAM packages.
3. To generate CNC Milling codes for different operations using standard CAM packages.
4. To learn various fields of engineering where these tools can be effectively used to improve the output of a product.
5. To impart knowledge on how these tools are used in Industries by solving some real time problems using 3-D printing equipment.

Course Outcomes:

At the end of the course, student will be able to

CO1:	Understand the concepts of simple machine parts and assemblies from the part drawings using standard CAM packages.
CO2:	Understand the concepts of CNC Turning codes for different operations using standard CAM packages.
CO3:	Solve CNC Milling codes for different operations using standard CAM packages.
CO4:	Analyze the concepts of CNC programming for various operations of milling.
CO5:	Interpret the study of tools that are used in Industries by solving some real time problems using 3- D printing equipment.

LIST OF EXPERIMENTS

CNC-LATHE PROGRAMMING

1. Plain Turning And Facing Operation Without Canned Cycle & With Canned Cycle
2. Step Turning Operation Without Canned Cycle & With Canned Cycle
3. Pattern Repeated Cycle Without Canned Cycle & With Canned Cycle
4. Thread Cutting Without Canned Cycle & With Canned Cycle
5. Box Turning Cycle
6. Multiple Turning Cycle
7. Taper Turning Cycle
8. Multiple Grooving Cycle
9. Multiple Threading Cycle

CNC-MILLING PROGRAMMING

1. Linear And Circular Interpolation
2. Circular Pocketing
3. Rectangular Pocketing
4. Peck Drilling
5. Mirroring

NOTE: Any 5 experiments from above said list of experiments.

B.TECH V SEMESTER	**SC**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

20ME5S11 **SIMULATION OF MECHANICAL SYSTEMS LAB (Skill Oriented Course)**

Pre-requisite: Acquire some MAT LAB Knowledge.

Course Objective: To understand the simulation of various mechanical components using advanced MATLAB tool SIMULINK.

Course Outcomes: At the end of the course, student will be able to

CO1: Analyze the concept of spring mass damper systems.

CO2: Understand the concept of friction in mechanical components both translation and rotational.

CO3: Understand the concept of linkage and steering mechanisms.

CO4: Analyze the mode shapes and natural frequency in various spring mass damper systems.

LIST OF EXPERIMENTS

1 Mass-Spring-Damper with controller

2 Double Mass-Spring- Damper

3 Simple Mechanical System

4 Mechanical System with Translational Friction

5 Mechanical System with Translational Hard stop

6 Mechanical Rotational System with stick-slip motion

7 Linkage Mechanism

8 Steering Mechanism

9 Determination of deflection and stresses in 2D and 3D trusses and beams.

10 Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and axi-symmetric components.

11 Determination of stresses in 3D and shell structures (at least one

	example in each case)
12	Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.

NOTE: Any 10 experiments from above mentioned list of experiments.

B. TECH V SEMESTER

	L	T	P	C
MC	2	-	-	-

20ME6M12 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing.
- Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Understand the significance of Indian Traditional Knowledge
CO2: Classify the Indian Traditional Knowledge
CO3: Compare Modern Science with Indian Traditional Knowledge system.
CO4: Analyze the role of Government in protecting the Traditional Knowledge
CO5: Understand the impact of Philosophical tradition on Indian Knowledge System.

SYLLABUS

Unit I

Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in Global Economy.

Unit II

Basic structure of Indian Knowledge System: Astadash Vidya- 4 Ved - 4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi),6vedanga (Shisha, Kalppa, Nirukha,Vykaran, Jyothisha & Chand),4upanga (Dharmashastra, Meemamsa, purana & Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System: Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge - Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain &Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, Nruthya Yevam Sahithya.

Text Books

1. Traditional Knowledge System in India, by AmitJha, 2009.

2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.

References

1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, BharatiyaVidya

2. Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan

3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.

4. Pramod Chandra, India Arts, Howard Univ. Press, 1983.

5. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html

2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf

3.https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_tex t.pdf

		L	T	P	C
B.TECH V SEMESTER	**I**	**0**	**0**	**0**	**1.5**

20ME5I13 SUMMER INTERNSHIP

Pre-requisite: Knowledge on mechanical subjects.

Course Objective:

The main objective of this course is to make the student employable through an advanced training program or Industrial exposure.

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the academic knowledge either in Industry or any training program.

CO2: Understand administrative functions and ethical principles of the organisation.

CO3: Analyze and develop the concepts by practical observation.

CO4: Improve the report writing skills.

Note: The duration of internship is minimum of 8 weeks

B.TECH VI SEMESTER	**PCC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME6T01 DESIGN OF TRANSMISSION ELEMENTS

Pre-requisite: Mechanics of Solids, Design of Machine Elements

Course Objective:

The Students will acquire the knowledge

1. Understand to select the suitable bearing based on the application of the loads and predict the life of the bearing
2. Design of engine parts and Design of curved beams with various cross sections and crane hooks
3. Design power transmission elements such as belts and pulleys and power screws
4. Design of the machine tool elements such as levers and brackets and also rope drives.

Course Outcomes: At the end of the course, student will be able to

CO1: Select the suitable bearing based on the application of the loads and predict the life of the bearing.

CO2: Design the IC Engines parts.

CO3: Design the power transmission elements such as gears, belts,pulleys, and power screws.

CO4: Design the spur & helical gears for different engineering applications.

CO5: Design the machine tool elements such as levers and brackets and also rope drives.

SYLLABUS

UNIT-I: BEARINGS:

Classification of bearings- applications, types of journal bearings – lubrication – bearing modulus – full and partial bearings – clearance ratio – heat dissipation of bearings, bearing materials – journal bearing design – ball and roller bearings – static loading of ball & roller bearings, bearing life.

UNIT-II: ENGINE PARTS:

Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends – cranks and crank shafts, strength and proportions of over hung and center cranks – crank pins, crank shafts. Pistons, forces acting on piston – construction design and proportions of piston, cylinder, cylinder liners,

Design of curved beams: introduction, stresses in curved beams, expression for radius of neutral axis for rectangular, circular, trapezoidal and t-section, design of crane hooks, c –clamps.

UNIT-III:

POWER TRANSMISSIONS SYSTEMS, PULLEYS: Transmission of power by belt and rope drives , transmission efficiencies, belts – flat and v types – ropes - pulleys for belt and rope drives, materials, chain drives

DESIGN OF POWER SCREWS: Design of screw, square ACME, buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures.

UNIT-IV: SPUR & HELICAL GEAR DRIVES:

Spur gears- helical gears – load concentration factor – dynamic load factor, surface compressive strength – bending strength – design analysis of spur gears – estimation of centre distance, module and face width, check for plastic deformation, check for dynamic and wear considerations.

UNIT-V: MACHINE TOOL ELEMENTS:

Levers and brackets: design of levers – hand levers-foot lever – cranked lever – lever of a lever loaded safety valve- rocker arm straight – angular- design of a crank pin – brackets- hangers- wall boxes.

Wire Ropes: Construction, Designation, Stresses in wire ropes, rope sheaves and drums

Text Books:

1. Machine Design/V.Bandari/TMH Publishers
2. Machine Design/ NC Pandya & CS Shaw/ Charotar publishers
3. Design data book.

Reference Books:

1. Machine Design: An integrated Approach / R.L. Norton / Pearson Education
2. Mech. Engg. Design / JE Shigley/Tata McGraw Hill education
3. Design of machine elements- spots/Pearson Publications
4. Machine Design-Norton/Pearson Publications

Note: Design data book is permitted for examination.

B.TECH VI SEMESTER	PCC	L	T	P	C
		3	0	0	3

20ME6T02 HEAT TRANSFER

Pre-requisite: Engineering Thermodynamics

Course Objective: The Students will acquire the knowledge

1. To learn the different modes of heat transfer and conduction heat transfer through various solid bodies
2. To learn the one dimensional steady state heat conduction heat transfer and one dimensional transient heat conduction
3. To learn the basic concepts of convective heat transfer and forced convection heat transfer of external flows and internal flows
4. To learn the free convection heat transfer concepts and heat transfer Processes in heat exchangers
5. To learn the concepts of film wise condensation, drop wise condensation and radiation heat transfer

Course Outcomes: At the end of the course, student will be able to

CO1: Find heat transfer rate for 1D, steady state composite systems with heat generation and performance of pins.

CO2: Understand the concepts transient heat conduction and basic laws involved in the convection heat transfer

CO3: Apply the empirical equations for forced convection and free convection problems

CO4: Examine the rate of heat transfer with phase change and in the heat exchangers

CO5: Illustrate the concepts of radiation heat transfer

SYLLABUS

UNIT-I: Introduction:

Basic modes of heat transfer- rate equations- generalized heat conduction equation - steady state heat conduction solution for plain and composite slabs - cylinders - critical thickness of insulation- heat conduction through fins of uniform cross section- fin effectiveness and efficiency. Unsteady State Heat Transfer Conduction- Transient heat conduction- lumped system analysis and use of Heisler charts.

UNIT-II: Convection:

Basic concepts of convection–heat transfer coefficients - types of convection – forced convection and free convection. Forced convection in external flow– concepts of hydrodynamic and thermal boundary layer- use of empirical correlations for flow over plates and cylinders. Fluid friction – heat transfer analogy, approximate solution to laminar boundary layer equation for external flow. Internal flow – Use of empirical relations for convective heat transfer in horizontal pipe flow.

UNIT-III: Radiation:

Radiation heat transfer – thermal radiation – laws of radiation - Black and Gray bodies – shape factor-radiation exchange between surfaces - Radiation shields - Greenhouse effect.

UNIT-IV: Heat Exchangers:

Types of heat exchangers- parallel flow- counter flow- cross flow heat exchangers- overall heat transfer coefficient- LMTD and NTU methods- fouling in heat exchangers.

UNIT-V: Boiling and Condensation:

Different regimes of boiling- nucleate, transition and film boiling – condensation – film wise and drop wise condensation. Mass Transfer: Conservation laws and constitutive equations - Fick's law of diffusion, isothermal equi-mass - Equimolal diffusion- - diffusion of gases and liquids- mass transfer coefficient.

Text books:

1. P.K. Nag, Heat Transfer, 3/e, Tata McGraw-Hill, 2011.
2. F. P. Incropera and D.P. Dewitt, Fundamentals of Heat and Mass Transfer, 6/e, John Wiley, 2007.

Reference Books:

1. J.P.Holman, Heat Transfer, 9/e, Tata McGraw-Hill,2008.
2. Cengel. A.Yunus, Heat Transfer- A Practical Approach, 4/e, Tata McGraw-Hill, 2007.
3. S.P. Sukhatme, A Textbook of Heat Transfer, Universities Press, 2005
4. Lienhard and Lienhard, A Heat and Mass Transfer, Cambridge Press, 2011.

B.TECH VI SEMESTER		**PCC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME6T03	**METROLOGY AND MEASUREMENTS**					

Pre-requisite: Engineering Graphics, Fundamentals of Measuring Units.

Course Objective:

1. To impart the principles of measurement of dimensional and geometric parameters of mechanical elements.
2. To introduce working of various temperature, pressure, flow and strain measuring instruments.

Course Outcomes: At the end of the course, student will be able to

CO1	Determine tolerances and allowances to realize interchangeable manufacture. evaluate the surface roughness parameters.
CO2	Design of limit gauges.
CO3	Distinguish between line standards and end standards.
CO4	Apply the principles of interferometry in measurement of flatness and straightness.
CO5	Elaborate the basic principles of measurement systems. choose the appropriate instrument to measure the physical parameters like pressure, temperature, force, torque, displacement, speed and strain.

SYLLABUS

UNIT-I:

Systems of limits and fits: Introduction, normal size, tolerance limits, deviations, allowance, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – Interchangeability, deterministic & statistical tolerance, selective assembly. International Standard system, limits and fits.

Limit Gauges: Taylor's principle – Design of go and No go gauges, plug, ring, snap, gap, taper, profile and position gauges.

UNIT-II:

Linear Measurement: Length standard, line and end standard, slip gauges – calibration of the slip gauges, Dial indicator, micrometers. Measurement of Angles and Tapers: Different methods – Bevel protractor – angle slip gauges

– spirit levels – sine bar – Sine plate, rollers and spheres used to determine the tapers.

Optical Measuring Instruments: Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses. Interference of light, Michaleson's interferometer, NPL flatness interferometer and NPL gauge interferometer.

UNIT-III:

Flat Surface Measurement: Measurement of flat surfaces – instruments used – straight edges – surface plates – auto collimator.

Surface Roughness Measurement : Differences between surface roughness and Surface Waviness-Numerical assessment of surface finish – CLA, R.M.S, Rz values, Methods of measurement of surface finish – profilograph, Talysurf

UNIT-IV: Measuring Instruments

Measurement systems, generalized configuration and functional descriptions of measuring instruments, Static and Dynamic performance characteristics, sources of error - Classification and elimination of error. Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers.

UNIT-V:

Measurement of Temperature: Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor , Thermocouple , RTD, Optical and total radiation pyrometers.

Flow Measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical Tachometers, Electrical tachometers, Stroboscope.

Measurement of Force: Elastic force meters, load cells. Measurement of Strain: Various types of strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge – bending, torque, compressive and tensile load, Strain gauge Rosettes.

Text Book(s)

1. R.K. Jain, "Engineering Metrology", Khanna Publishers.
1. BeckWith, Marangoni,Linehard, " Mechanical Measurements", 6th edition, PHI / PE.

References

1. Mahajan,"Engineering Metrology ",Danpath Rai Publications.
2. D.S.Kumar, "Measurement Systems: Applications & design", Anuradha Agencies.
3. I.C.Gupta ,"Engineering Metrology", Danpath Rai Publications.
4. Connie Dotson "Fundamentals of Dimensional Metrology 4e ",Thomson Publications.
5. S.Bhaskar, "Instrumentation and Control systems ", Anuradha Agencies.

B.TECH VI SEMESTER	**PEC-II**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME6T04 **FINITE ELEMENT METHODS (PROFESSIONAL ELECTIVE -II)**

Pre-requisite: Mechanics of Solids

Course Objective:

1. To learn the theory and characteristics of finite elements that represent engineering structures of trusses and beams
2. To learn finite element modeling of two dimensional stress analysis
3. To learn the finite modelling for high order and isoperimetric elements
4. To learn the usage of finite element method for the steady state heat transfer analysis

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the basic concepts of finite element. Method

CO2: Formulate simple problems into finite elements.

CO3: Solve structural and thermal problems.

CO4: Solve complicated 2D structural problems for stress analysis under various loads

CO5: Analyze and formulate 1D and 2D problems under steady load conditions. Formulate finite element model under dynamic load conditions.

SYLLABUS

UNIT-I:

Introduction to finite element methods for solving field problems, Stress and equilibrium, Boundary conditions, Strain-Displacement relations, Stress- strain relations for 2D and 3D Elastic problems. Potential energy and equilibrium, The Rayleigh-Ritz method, Formulation of Finite Element Equations.

One dimensional problems: Finite element modelling coordinates and shape functions. Assembly of global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT-II:

Analysis of trusses: Stiffness Matrix for plane truss element. Stress Calculations and Problems.

Analysis of beams: Element Stiffness Matrix for two nodded, two degrees of freedom per node beam element and simple problems.

UNIT-III:

Finite element modelling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions. Estimation of load Vector, Stresses. Finite element modelling of Axis-symmetric solids subjected to axis-symmetric loading with triangular elements. Two dimensional four nodded isoperimetric elements and problems.

UNIT-IV:

Steady state heat transfer analysis: One dimensional analysis of slab and fin, two dimensional analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

UNIT-V:

Dynamic analysis: Formulation of finite element model, element –mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar truss.

3D Problems: Finite Element formulation for stress analysis, Convergence requirements, mesh generation, techniques such as semi-automatic and fully automatic use of software's such as ANSYS,NISA,NASTRAN.

Text Books:

1. Chandraputla, Ashok &Belegundu, Introduction to Finite Element in Engineering, Prentice Hall.
2. S.S.Rao, The Finite Element Methods in Engineering, Elsevier Butterworth -Heinemann 2nd Edition, 2011.

References:

1. J N Reddy, An introduction to the Finite Element Method, McGraw – Hill, New York, 1993.
2. R D Cook, D S Malkus and M E Plesha, Concepts and Applications of Finite Element Analysis, 3rd Edition, John Wiley, New York, 1989.
3. K J Bathe, Finite Element Procedures in Engineering Analysis, Prentice-Hall, Englewood Cliffs, 1982.

4. T J R Hughes, the Finite Element Method, Prentice-Hall, Englewood Cliffs, NJ, 1986.
5. O C Zienkiewicz and R L Taylor, the Finite Element Method, 3rd Edition. McGraw-Hill, 1989.

B.TECH VI SEMESTER		**PEC-II**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME6T05	**COMPUTATIONAL FLUID DYNAMICS (PROFESSIONAL ELECTIVE -II)**					

Pre-requisite: Finite Element Methods

Course Objective: The students will acquire the knowledge:

1. To explain elementary details and numerical techniques for solving various engineering problems involving fluid flow.
2. To solve problems of fluid flow using applied numerical methods and understand equations governing fluid flow and heat transfer
3. To interpret fluid flow problems with steady flow and finite difference in heat conduction and convention
4. To understand the concepts of finite differences, discretization, consistency, stability and fundamentals of fluid flow modelling
5. To understand the concepts of first order wave equation and finite volume method

Course Outcomes: At the end of the course, student will be able to

CO1: Find elementary details and numerical techniques for solving various engineering problems involving fluid flow.

CO2: Solve problems of fluid flow using applied numerical methods and understand equations governing fluid flow and heat transfer

CO3: Interpret fluid flow problems with steady flow and finite difference in heat conduction and convention

CO4: Understand the concepts of finite differences, discretization, consistency, stability and fundamentals of fluid flow modelling

CO5: Understand the concepts of first order wave equation and finite volume method.

SYLLABUS

UNIT-I: ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES:

Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition and instability, computational methods for error estimation, convergence of sequences.

UNIT-II:

APPLIED NUMERICAL METHODS: Solution of a system of simultaneous linear algebraic equations, iterative schemes of matrix inversion, direct methods for matrix inversion, direct methods for banded matrices.

REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: Introduction, conservation of mass, Newton's second law of motion, expanded forms of navier-stokes equations, conservation of energy principle, special forms of the navier-stokes equations.

UNIT-III:

Steady flow, dimensionless form of momentum and energy equations, stokes equation, conservative body force fields, stream function – vorticity formulation. Finite difference applications in heat conduction and convention – heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT-IV:

Finite differences, discretization, consistency, stability, and fundamentals of fluid flow modelling: introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT-V:

Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

FINITE VOLUME METHOD: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

Text Books:

1. Numerical heat transfer and fluid flow / Suhas V. Patankar- Butter-worth Publishers.
2. Computational fluid dynamics – Basics with applications – John. D. Anderson / Mc Graw Hill.

References:

1. Computational Fluid Flow and Heat Transfer/ Niyogi, Pearson Publications.
2. Fundamentals of Computational Fluid Dynamics – Tapan K. Sengupta / Universities Press.
3. Computational fluid dynamics, 3rd edition/Wendt/Springer publishers

B.TECH VI SEMESTER	**PEC-II**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME6T06 **PRODUCTION PLANNING & CONTROL (PROFESSIONAL ELECTIVE -II)**

Pre-requisite: Industrial Engineering and Management

Course Objective:

1. To understand the problems and opportunities faced by the operations manager in manufacturing and service organizations.
2. To develop an ability to apply PPC concepts in a various areas like marketing, accounting, finance, engineering, personnel management, logistics, etc.
3. To integrate operations concepts with other functional areas of business
4. To understand the PPC function in both manufacturing and service organizations.
5. To examine several classic Operations Management planning topics Including production planning and inventory control.
6. To learn several important contemporary topics relevant to business managers of all functional disciplines, including quality management, lean concepts, and sustainability.

Course Outcomes: At the end of the course, student will be able to

CO1: Recognize the objectives, functions, applications of PPC and forecasting techniques.

CO2: Explain different Inventory control techniques.

CO3: Solve routing and scheduling problems

CO4: Summarize various aggregate production planning techniques.

CO5: Describe way of integrating different departments to execute PPC functions

SYLLABUS

UNIT-I: **Introduction:**

Definition – Objectives of production Planning and Control – Functions of production planning and control – Elements of production control – Types of production – Organization of production planning and control department – Internal organization of department.

UNIT-II:

Forecasting – Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – qualitative methods and quantitative methods.

UNIT-III:

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P–Systems and Q-Systems. Introduction to MRP I,MRP II & ERP, LOB (Line of Balance), JIT and CANBAN system.

UNIT-IV:

Routing – Definition – Routing procedure –Route sheets – Bill of material – Factors affecting routing procedure. Schedule –definition – Difference with loading

UNIT-V:

Scheduling Policies – Techniques, Standard scheduling methods, line balancing, Aggregate planning, Expediting, controlling aspects.

Dispatching – Activities of dispatcher – Dispatching procedure – follow up – definition – Reason for existence of functions – types of follow up.

Text Books:

1. Elements of Production Planning and Control / Samuel Eilon.
2. Manufacturing,Planning and Control, Partik Jonsson Stig-Arne Mattsson, Tata Mc Graw Hill.

References:

1. Operations Management – S.N. Chary.
2. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.
3. Reliability Engineering & Quality Engineering by Dr. C. Nadha Muni
4. Reddy and Dr. K. Vijaya Kumar Reddy, Galgotia Publications, Pvt., Limited.
5. Production Control A Quantitative Approach / John E. Biegel.
6. Production Control / Moore.

B.TECH VI SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20ME6L09 METROLOGY & INSTRUMENTATION LAB

Pre-requisite: Acquire some experimental kills.

Course Objective: To impart hands on training in measuring methods and metrology instruments.

Course Outcomes: At the end of the course, student will be able to

CO1:	Measure length, height, diameter and angles using various instruments
CO2:	Measure surface roughness with roughness measurement instrument and alignment tests on Lathe Machine tool
CO3:	Apply resistant temperature detector for temperature measurement
CO4:	Utilize LVDT transducer and of rotameter
CO5:	Utilize displacement strain measurement trainer and capacitance measurement trainer

LIST OF EXPERIMENTS

1	Use of gear teeth Vernier calipers and checking the chordal addendum and chordal height of spur gear.
2	Alignment test on the lathe and milling machine using dial indicators
3	Study of Tool maker's microscope and its application
4	Angle and taper measurements by Bevel protractor, Sine bars.
5	Use of spirit levels in finding the flatness of the surface plate.
6	Surface roughness measurement by Talysurf instrument.
7	Calibration of Strain Gauge for load measurement.
8	Study and calibration of rotameter for flow pressure.
9	Calibration of transducer or thermocouple for temperature measurement.

10	Calibration of LVDT transducer for displacement measurement.
11	Calibration of capacitive transducer for angular measurement.
12	Calibration of photo and magnetic speed pickups for the measurement of speed.

Note: Any 10 number of experiments from above mentioned list.

B.TECH VI SEMESTER	PCC	L	T	P	C
		0	0	3	1.5

20ME6L10 HEAT TRANSFER LAB

Pre-requisite: Acquire some experimental skills.

Course Objective: The laboratory course is aimed to provide the practical exposure to the students with regard to the determination of amount of heat exchange in various modes of heat transfer including condensation & boiling for several geometries.

Course Outcomes:

At the end of the course, student will be able to

CO1:	Find the thermal conductivity of different materials, composite slabs and powders.
CO2:	Solve heat transfer coefficient for free and forced convection and pin fin efficiency for forced and free convection
CO3:	Examine the Stefan Boltzmann Constant and emissivity of grey body.
CO4:	Compare parallel and counter flow heat exchanger performance characteristics and investigation of Lambert's cosine law
CO5:	Solve the heat transfer rate through lagged pipes and heat transfer rate in film and drop wise condensation

LIST OF EXPERIMENTS

1	Determine the overall heat transfer coefficient across the width of composite wall
2	Determine the thermal conductivity of a metal rod
3	Determine the thermal conductivity of insulating powder material through concentric Sphere apparatus
4	Determine the thermal conductivity of insulating material through lagged pipe apparatus
5	Determine the efficiency of a pin fin in natural and forced convection.

6	Determine the heat transfer coefficient for a vertical cylinder in natural convection
7	Determine the heat transfer coefficient in forced convection of air in a horizontal tube.
8	Determine the heat transfer coefficients on film and drop wise condensation apparatus.
9	Determine the effectiveness of a parallel and counter flow heat exchanger.
10	Study the pool boiling phenomenon and different regimes of pool boiling.
11	Experiment on pool boiling
12	Determine the emissivity of the test plate surface.
13	Experiment on Stefan-Boltzmann apparatus
14	Determine the heat transfer rate coefficient in fluidized bed apparatus

Note: Any 10 number of experiments from above mentioned list.

			L	T	P	C
B.TECH VI SEMESTER		**PCC**	**0**	**0**	**3**	**1.5**
20ME6L11	**CAE & CFD LAB**					

COMPUTER AIDED ENGINEERING (CAE)

Pre-requisite: Acquire some experimental skills.

Course Objective:

1. To introduce fundamentals of the analysis software, its features and applications.
2. To learn the basic element types in Finite Element analysis.
3. To know the concept of discretization of continuum, Loading conditions and analyse the structure using pre-processor and postprocessor conditions.

Course Outcomes:

At the end of the course, student will be able to

CO1:	Classify the types of Trusses (Plane Truss & Spatial Truss) and Beams (2D & 3D) with various cross sections to determine Stress, Strains and deflections under static, thermal and combined loading
CO2:	Generalize Plane stress, plane strain conditions & axis-symmetric loading on inplane members to predicting the failure behavior and finding the SCF
CO3:	Analyse connecting rod with tetrahedron and brick elements, performing static analysis on flat & curved shells to determine stresses, strains with different boundary conditions.
CO4:	Predict the natural frequencies and modes shapes using Modal, Harmonic analysis. Also finding the critical load using Buckling analysis
CO5:	Simulate steady state heat transfer analysis of chimney, Transient heat transfer of castings, Non-linear, Buckling analysis of shells &CFD analysis

LIST OF EXPERIMENTS

1 Analysis of Plane Truss & Spatial Truss with various cross sections and materials to determine member forces, member strains & stresses, joint deflections under static, thermal and combined loading

2 2D & 3D beam analysis with different sections, different materials for different loads (forces and moments) with different end supports

3 Static analysis of plate with a hole to determine the deformations, the Stresses to study the failure behavior and SCF.

4 Plane stress, plane strain and axis-symmetric loading on the in plane members with in plane loading to study the stresses and strains.

5 Static analysis of connecting rod with tetrahedron and brick elements

6 Static Analysis of flat and curved shell due to internal pressure and moments to estimate the strains, stresses and reactions forces and moments with different boundary conditions

7 Buckling analysis of plates, shells and beams to estimate BF and modes

8 Modal analysis of beams, plates and shells for natural frequencies and mode shapes

9 Harmonic analysis of a Shaft subjected to periodic force and transient analysis of plate subjected to stepped and ramped loading with varying time

10 Steady state heat transfer Analysis Cross section of chimney and transient heat transfer analysis of solidification of castings.

11 Non linear analysis of cantilever beam with non-linear materials at tip moment and post Buckling analysis of shells for critical loads

12 Coupled field analysis.

13 Flow analysis of pipe with different fluids/gasses/air for velocity and pressure gradients

14 CFD analysis of aerofoil design

15 CFD analysis of ducts/impeller/fan

16 Use of MATLAB for finding B matrix, stiffness matrix and loading matrices of beam/in plane/solid elements and interfacing with CAE softwares.

COMPUTATIONAL FLUID DYNAMICS (CFD)

Pre-requisite: Acquire some experimental skills.

Course Objective:

This Course will provide core knowledge of the fundamentals of CFD for engineers, and an introduction to the methods and analysis techniques used in CFD. It also provides an introduction to the use of commercial CFD codes to analyze Internal and External flow heat transfer, Multiphase and Combustion problems of practical engineering interest.

1. To introduce student to applied computational fluid dynamics and to teach them how to solve a fluid flow problem using commercially available CFD software
2. Equip the Participant with the Computational Fluid Dynamics Fundamentals.
3. Enable the student formulate the design problems into CFD/FEA.

Course Outcomes: At the end of the course, student will be able to

CO1: Have a working knowledge of a variety of computational techniques that can be used for solving engineering problems.

CO2: To develop an understanding for the major theories, approaches and methodologies used in CFD;

CO3: To build up the skills in the actual implementation of CFD methods (e.g. boundary conditions, turbulence modelling etc.) in using commercial CFD codes;

CO4: To gain experience in the application of CFD analysis to real engineering designs.

CO5: Proficiency in engineering design

LIST OF EXPERIMENTS

1 Geometric Creation – Session01

2 Geometric Creation – Session02

3 Fluid Flow inside a bend pipe

4	Interpreting the results
5	Case Study
6	Governing Equations / Mathematical Models
7	Flow inside a cyclone / scrubber
8	External flow over a airfoil
9	External flow over a 2D/3D car
10	Case Study
11	Turbulent models
12	Pressure drop analysis in a valve
13	Heat Transfer mechanism
14	Heat transfer analysis in heat exchanger
15	Heat transfer analysis in solar flat plate collector
16	Heat transfer analysis in solar air heater
17	Multi-phase flow / species
18	Multi-phase fluidization
19	Multi-phase cyclone
20	Species (Combustion experiment)

Note: 1. Any of FEA software package may be used
ANSYS/ABAQUS/NASTRAN/NISA/CAEFEM/ADINA
2. Any 10 experiments from above mentioned list.

B. TECH VI SEMESTER

	L	T	P	C
SC	0	0	4	2

20ME6S12 SOFT SKILLS
(Skill Oriented Course)

Course Outcomes

The student will acquaint himself with various nuances of Soft Skills and Personality Development besides aspects related to Campus Recruitment Process.

SYLLABUS

1 Life Skills

2 JAM

3 Presentation Skills

4 Resume Writing

5 Group Discussion

6 Interview Skills

References:

1. ***Interact*,** Orient Blackswan

2. **Communication Skills,** Sanjay Kumar and Pushp Latha.OUP,2011

B.TECH VI SEMESTER

	L	T	P	C
MC	2	0	0	-

20ME6M13 DISASTER MANAGEMENT

Course Learning Objectives: The objective of this course is to

1. Understand Types of disasters like Earthquake, Landslide, Flood, Drought, Fire
2. Know Panchayati Raj Institutions/ Urban Local Bodies (PRIs/ ULBs), States, Centre, and other stakeholders
3. Understand Climate Change Adaptation - IPCC Scenario and Scenarios in the context of India
4. Understand Role of GIS and Information Technology Components in Preparedness, Risk Assessment
5. Know various case studies

Course Learning Outcomes:

On successful completion of this course, the students will be able to

CO1: Differentiate the types of disasters, causes and their impact on environment and society

CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation.

CO3: Draw the hazard and vulnerability profile of India, Scenarios in the Indian context

CO4: Analyze the Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

CO5: Understand about Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment

SYLLABUS

UNIT-I:

INTRODUCTION TO DISASTERS Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT-II:

APPROACHES TO DISASTER RISK REDUCTION (DRR) Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT-III:

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT-IV:

DISASTER RISK MANAGEMENT IN INDIA Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT-V:

DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters:

Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Text Books:

1. Singhal J.P.“Disaster Management”, Laxmi Publications, 2010. ISBN-10:

   ISBN-13: 978-9380386423

2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

Reference Books:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005

2. Government of India, National Disaster Management Policy, 2009

B.TECH VII SEMESTER		**PEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
20ME7T01	**ADVANCED MATERIALS (PROFESSIONAL ELECTIVE -III)**					

Pre-requisite: Material Science

Course Objective:

1. Understand the different composite and reinforcement materials.
2. Understand the different manufacturing methods for composites materials.
3. Analyze mechanical structure of composite materials.
4. Understand the properties and applications of functionally graded materials, shape memory alloys and nonmaterial.

Course Outcomes:

At the end of the course, student will be able to

CO1: Classify the composite materials and identify the applications
CO2: Identify the aerospace materials and their applications
CO3: Understand macro-mechanical analysis of a lamina
CO4: Interpret the functionally graded materials and their properties
CO5: Understand types of Nano materials and their properties

SYLLABUS

UNIT-I:

INTRODUCTION TO COMPOSITE MATERIALS: Introduction, Classification: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon–Carbon Composites, Fiber-Reinforced Composites and Nature-Made Composites, and Applications.

REINFORCEMENTS: Fibres- Glass, Silica, Kevlar, Carbon, Boron, Silicon carbide, and Born carbide fibres.

UNIT-II:

Polymer Composites, Thermoplastics, Thermosetting Plastics, Manufacturing of PMC, MMC & CCC and their applications.

UNIT-III:

MANUFACTURING METHODS: Autoclave, Tape Production, Moulding Methods, Filament Winding, HandLayup, Pultrusion, RTM.

UNIT-IV:

MACROMECHANICAL ANALYSIS OF A LAMINA: Introduction, Generalized Hooke's Law, Reduction of Hooke's law in Three Dimensions to Two Dimensions, Relationship of compliance and stiffness matrix to engineering elastic constants of an orthotropic lamina, laminate-laminate code.

UNIT-V:

FUNCTIONALLY GRADED MATERIALS: Types of functionally graded materials-Classification-Different systems-Preparation-Properties and applications of functionally graded materials.

SHAPE MEMORY ALLOYS: Introduction-Shape memory Effect-Classification of shape memory alloys Composition- Properties and applications of shape memory alloys.

NANO MATERIALS: Introduction-Properties at Nano Scales-Advantages & Disadvantages, Applications in comparison with bulk materials (Nano – Structure, Wires, Tubes, Composites).

Text Books:

1. Nano material /A.K. Bandyopadyay/New age Publishers
2. Material science and Technology: A comprehensive treatment/Robert W.Cahn,/VCH
3. Engineering Mechanics of Composite Materials / Isaac and M
4. Daniel/Oxford University Press

Reference Books:

1. Mechanics of Composite Materials / R. M. Jones/ Mc Graw Hill Company, New York, 1975.
2. Analysis of Laminated Composite Structures / L. R. Calcote/Van Nostrand Rainfold,NY 1969
3. Analysis and performance of fibre Composites /B. D. Agarwal and L. J.
4. Broutman /Wiley-Interscience, New York, 1980
5. Mechanics of Composite Materials – Second Edition (Mechanical Engineering) /Autar K.Kaw / CRC Press.

B.TECH VII SEMESTER	PEC	L	T	P	C
		3	0	0	3

20ME7T02 **POWER PLANT ENGINEERING (PROFESSIONAL ELECTIVE -III)**

Pre-requisite: Applied Thermodynamics

Course Objective: The course is aimed at providing knowledge of power generation through different prime movers viz steam, ICGT, Hydro, nuclear and hybrid systems along with their economics and Environmental considerations.

Course Outcomes:

At the end of the course, student will be able to

CO1: Identify the various conventional energy resources, and understand the concept of coal handling.

CO2: Understand the concept of combustion process and cooling towers.

CO3: Understand various Power plants like gas, hydro, diesel.

CO4: To understand the concept of nuclear power plant and types of nuclear reactors.

CO5: To understand and estimate unit power cost under specified conditions list out power plant effluents and their impact on environment.

SYLLABUS

UNIT-I:

INTRODUCTION: Energy sources and Power Development in India.

STEAM POWER PLANT: Plant Layout-Working of Different circuits-Types of Coal-Coal handling systems--Coal storage- Overfeed and underfeed fuel beds-Pulverized Fuel burning system -Ash handling systems-Dust collection and its disposal-Mechanical type –Electrostatic Precipitator Cooling Towers and heat rejection.

UNIT-II:

DIESEL POWER PLANT: Plant layout with auxiliaries-Fuel storage and Fuel supply system-Air supply system-Exhaust system-Water cooling system-Lubrication system-Starting system Supercharging-Advantages and

Disadvantages of Diesel plants over Thermal plants.

GAS TURBINE PLANT: Introduction-Classification-Layout with auxiliaries-Principles of working of Closed and Open cycle gas turbines-introduction to Combined cycle power plants and comparison

UNIT-III:

HYDRO ELECTRIC POWER PLANT: Hydrology-Hydrological cycle- Rainfall-Run off Hydrograph- Flow duration curve- Mass curve--Site selection of hydro plant-layout And types of hydro plants.

NUCLEAR POWER PLANT: Nuclear Fission and Fusion - Nuclear Fuels-Breeding Components of Reactor-Types of Nuclear Reactors-Pressurized water reactor(PWR)-Boiling water reactor(BWR)-CANDU reactor-Gas cooled reactor-Liquid metal cooled reactor-Fast Breeder Reactor-Nuclear waste and its Disposal.

UNIT-IV:

POWER FROM NON-CONVENTIONAL SOURCES: Solar power plants-Utilization of Solar collectors-Principle of working of Wind energy-Types- Tidal Energy.

DIRECT ENERGY CONVERSION SYSTEM: Solar cell- Fuel cell-Thermo Electric and Thermo ionic conversion system-MHD generation.

UNIT-V:

POWER PLANT ECONOMICS: Fixed cost-Operating cost.-Fluctuating loads-General arrangement of Power Distribution-Load curves-Load duration curve-Connected load- Maximum demand-Demand factor-Average load-Load factor-Diversity factor- Plant capacity factor.

POLLUTION AND CONTROL: Introduction- Particulate and gaseous pollutants-Air and Water pollution by Thermal plants and its control—Acid rains -Methods to control pollution.

Text books:

1. G.D. Rai, “An Introduction to Power Plant Technology”, Khanna Publishers, 2004, 3rd Edition.
2. P.K.Nag, “Power Plant Engineering”, 2nd Edition, Tata McGraw-Hill Education, 2014, 4th Edition.

Reference Books:

1. S.C. Arora and S. Domkundwar "A Course in Power Plant Engineering", Dhanpat Rai & Co. (P) Limited, 2014.
2. R. K. Rajput, "A Text Book of Power Plant Engineering", Laxmi Publications, New Delhi, 2016, 4th Edition.
3. M.M.El-Wakil, "Power Plant Technology", Tata McGraw-Hill Education, Revised 2nd edition.

B.TECH VII SEMESTER		**PEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

20ME7T03	**ADVANCED OPTIMIZATION TECHNIQUES (PROFESSIONAL ELECTIVE -III)**

Pre-requisite: Numerical Methods

Course Objective:

1. To introduce the advanced optimization techniques such as classical optimization techniques, numerical optimization techniques and genetic algorithms.
2. Learn the knowledge to formulate optimization problems

Course Outcomes:

At the end of the course, student will be able to

CO1: Solve single and multi-variable optimization techniques.

CO2: Apply various numerical methods to determine the optimized value.

CO3: Understand and Apply GA to find optimum value.

CO4: Apply various optimization techniques to mechanical applications.

SYLLABUS

UNIT-I:

Classical optimization techniques: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions.

UNIT-II:

Numerical methods for optimization: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, types of penalty methods for handling constraints.

UNIT-III:

Genetic algorithm (GA) : Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA, Multi-Objective GA: Pareto's analysis, Non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems.

UNIT-IV:

Genetic Programming (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

UNIT-V:

Applications of Optimization in Design and Manufacturing systems: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam and general optimization model of a machining process.

Text books:

1. Optimal design – JasbirArora, McGraw Hill (International) Publishers
2. Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers
3. Engineering Optimization – S.S.Rao, New Age Publishers

Reference Books:

1. Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison Wesley Publishers
2. Genetic Programming- Koza 3. Multi objective Genetic algorithms - Kalyanmoy Deb, PHI Publishers

B.TECH VII SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T04 **MANAGEMENT SCIENCE (PROFESSIONAL ELECTIVE -IV)**

Course Objectives:

1. To familiarize with the process of management and to provide basic insight into select contemporary management practices
2. To provide conceptual knowledge on functional management and strategic management.

Course Outcomes: At the end of the course, student will be able to

1. After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.
2. The student will acquire insight on the concepts of Project management, strategic management and Contemporary management practices.

SYLLABUS

UNIT-I: Introduction to Management:

Concept –nature and importance of Management – Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization - Types of organization structure- International Management: Global Leadership and Organizational Behavior Effectiveness (GLOBE) structure.

Unit-II: Isentropic Flow of an Ideal Gas:

Basic equation - stagnation enthalpy, temperature, pressure and density-stagnation, acoustic speed - critical speed of sound- dimensionless velocity-governing equations for isentropic flow of a perfect gas - critical flow area - stream thrust and impulse function.

Steady one dimensional isentropic flow with area change-effect of area change on flow parameters- chocking- convergent nozzle - performance of a nozzle under decreasing back pressure –De-lavel nozzle - optimum area ratio effect of back pressure - nozzle discharge coefficients - nozzle efficiencies.

UNIT-III: Simple Frictional Flow:

Adiabatic flow with friction in a constant area duct-governing equations - fanno line limiting conditions - effect of wall friction on flow properties in an Isothermal flow with friction in a constant area duct-governing equations - limiting conditions.

Steady one dimensional flow with heat transfer in constant area ducts- governing equations - Rayleigh line entropy change caused by heat transfer - conditions of maximum enthalpy and entropy.

UNIT-IV: Effect of Heat Transfer on Flow Parameters:

Intersection of Fanno and Rayleigh lines. Shock waves in perfect gas- properties of flow across a normal shock - governing equations - Rankine Hugoniat equations - Prandtl's velocity relationship - converging diverging nozzle flow with shock thickness - shock strength.

UNIT-V: Propulsion:

Air craft propulsion: - types of jet engines - energy flow through jet engines, thrust, thrust power and propulsive efficiency turbojet components-diffuser, compressor, combustion chamber, turbines.

Text Books:

1. Compressible fluid flow /A. H. Shapiro / Ronald Press Co., 1953
2. Fundamentals of compressible flow with aircraft and rocket propulsion/S. M. Yahya/New Age international Publishers, 2003
3. Fundamental of Gas dynamics-2nd edition/ M J Zucker/ Wiley publishers, 2002

References:

1. Elements of gas dynamics / HW Liepman & A Roshko/Wiley, 1957
2. Aircraft & Missile propulsion /MJ Zucrow/Wiley, 1958
3. Gas dynamics / M.J. Zucrow & Joe D.Holfman / Krieger Publishers, 1976.

B.TECH VII SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T05 **ADDITIVE MANUFACTURING**
(PROFESSIONAL ELECTIVE -IV)

Pre-requisite: Manufacturing Process

Course Objective:

The course aims at the importance of Additive Manufacturing, Classifications, models, specifications of various Additive Manufacturing Techniques. To learn the different tools, soft-wares required and the applications of Additive Manufacturing

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the working principle and process parameters of AM processes

CO2: Explore the applications of AM processes in various fields

CO3: Apply the suitable process and material for fabricating a given product

CO4: Use the suitable post process based on product application

CO5: Design and develop a product for AM Process

SYLLABUS

UNIT-I:

Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT-II:

Machines for Rapid Prototyping: Overview of Polymerization: Stereo lithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT-III:

Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive Manufactured Tools, Indirect Rapid

UNIT-IV:

Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture of Metal Components.

UNIT-V:

Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2015, 2nd Edition.
2. 3D Printing and Additive Manufacturing: Principles & Applications, Chua Chee Kai, Leong Kah Fai, World Scientific, 2015, 4th Edition.

References:

1. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venu vinod and Weiyin Ma, Springer, 2004.
2. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.
3. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006.

B.TECH VII SEMESTER	PEC	L	T	P	C
		3	0	0	3

20ME7T06 **ADVANCED MACHINING PROCESSES (PROFESSIONAL ELECTIVE -IV)**

Pre-requisite: Metal Cutting & Machine Tools

Course Objective: The Students will acquire the knowledge

1. To understand basic concepts of modern machining processes and ultrasonic machining.

2. To interpret the principles and procedure of principles of electro chemical machining.

3. To apply the principles and procedure of thermal metal removal processes.

4. To illustrate the principles and procedure of electron beam machining, laser beam machining and plasma machining. 5. To interpret the principles and procedure of abrasive jet machining.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the concepts of modern machining processes and ultrasonic machining.

CO2: Interpret the principles and procedure of principles of electro chemical machining.

CO3: Apply the principles and procedure of thermal metal removal processes.

CO4: Illustrate the principles and procedure of electron beam machining, laser beam machining and plasma machining

CO5: Interpret the principles and procedure of abrasive jet machining

SYLLABUS

UNIT-I: Introduction:

Need for non-traditional machining methods-classification of modern machining processes considerations in process selection, applications.
Ultrasonic machining – Elements of the process, mechanics of material removal, MRR process parameters, economic considerations, applications and limitations.

UNIT-II: ELECTRO – CHEMICAL MACHINING:

Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate, fundamentals of chemical, machining, advantages and applications.

UNIT-III: THERMAL METAL REMOVAL PROCESSES:

General principle and applications of Electric Discharge Machining, Electric Discharge Grinding and wire EDM – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, characteristics of spark eroded surface.

UNIT-IV:

Electron Beam Machining, Laser Beam Machining - Basic principle and theory, mechanics of material removal, process parameters, efficiency & accuracy, applications.

Plasma Machining: Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

UNIT-V:

Abrasive jet machining, Water jet machining and abrasive water jet machining: Basic principles, equipments, process variables, mechanics of material removal, MRR, application and limitations, agnetic abrasive finishing, abrasive flow finishing, Electro stream drilling, shaped tube electrolytic machining.

Text Books:

1. Fundamentals of Machining Processes-Conventional and non – conventional processes/Hassan Abdel – Gawad El-Hafy/CRCPress-2016.

References:

1. Modern Machining Process / Pandey P.C. and Shah H.S./TMH.
2. New Technology / Bhattacharya A/ the Institution of Engineers, India1984.
3. Non Traditional Manufacturing Processes / Benedict.

B.TECH VII SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T07 MECHANICAL VIBRATIONS (PROFESSIONAL ELECTIVE -V)

Pre-requisite: Engineering Mathematics, Mechanics of Solids.

Course Objective:

1. To analyze the various 1-D periodic and periodic responses of a vibrating system with and¬ without damping.
2. Able to derive equations of motion and solutions for two and multi degree freedom systems by the application of analytical methods .
3. Able to understand the numerical methods for quick estimation of 1st natural frequency of multi¬ degree freedom systems.
4. Apply the knowledge of the various physical vibration measuring instruments and their¬ applications in real life vibration data acquisition.
5. Apply the knowledge of transient vibrations to the various engineering Applications.

Course Outcomes: At the end of the course, student will be able to

CO1: To learn basic principles of mathematical modeling of vibrating systems

CO2: To learn the basic concepts free and forced multi degree freedom systems

CO3: To learn concepts involved in the torsional vibrations

CO4: To learn the principals involved in the critical speed of shafts

CO5: To learn the basic concepts of transient vibrations

SYLLABUS

UNIT-I: INTRODUCTION:

Relevance of and need for vibrational analysis – Basics of SHM - Mathematical modelling of vibrating systems - Discrete and continuous systems - single-degree freedom systems - free and forced vibrations, damped and undamped systems.

UNIT-II: MULTI DEGREE FREEDOM SYSTEMS:

Free and forced vibrations of multi-degree freedom systems in longitudinal, torsional and lateral modes - Matrix methods of solution- normal modes - Orthogonality Principle-Energy methods, Eigen values and Eigen vectors, modal analysis.

UNIT-III: CONTINUOUS SYSTEMS:

Torsional vibrations - Longitudinal vibration of rods - transverse vibrations of beams – Governing equations of motion - Natural frequencies and normal modes - Energy methods, Introduction to nonlinear and random vibrations.

UNIT-IV: CRITICAL SPEEDS OF SHAFTS:

Critical speed of a light shaft having a single disc without damping and with damping, critical speeds of shaft having multiple discs, secondary critical speed, critical speeds light cantilever shaft with a large heavy disc at its end.

UNIT-V: TRANSIENT VIBRATIONS:

Laplace transformations response to an impulsive input, response to a step input, response to pulse (rectangular and half sinusoidal pulse), phase plane method.

Text Books:

1. S.S. Rao, “Mechanical Vibrations ", 5th Edition, Prentice Hall, 2011.
2. L. Meirovitch, “Elements of vibration Analysis", 2nd Edition, McGraw-Hill, New York, 1985.

References:

1. W.T. Thomson, M.D. Dahleh and C Padmanabhan, “Theory of Vibration with Applications”, 5th Edition, Pearson Education, 2008.

B.TECH VII SEMESTER	PEC	L	T	P	C
		3	0	0	3

20ME7T08 **AUTOMOBILE ENGINEERING (PROFESSIONAL ELECTIVE -V)**

Pre-requisite: Applied Thermodynamics

Course Objective:

1. Understand the basic lay-out of an automobile, engine cooling, lubrication.
2. Understand the operation of ignition, electrical and air conditioning systems.
3. Understand the principles of transmission, steering
4. Understand the principles of braking and suspension systems.
5. Study latest developments in automobile emissions and safety systems.

Course Outcomes: At the end of the course, student will be able to

CO1: Describe the basic lay-out of an automobile and its components and classify various lubricating and cooling systems of an automobile.

CO2: Describe various fuel supply and electrical systems in SI and CI engines

CO3: Understand the concept of power transmission system and vehicle controlling.

CO4: Explain the principles of suspension and braking System

CO5: Explain the principles of safety systems and emission standards.

SYLLABUS

UNIT-I:

Introduction: Classification of automobiles, Components of four wheeler automobile- chassis, body, power unit, power transmission- front wheel drive, rear wheel drive, four-wheel drive

Lubricating System: Functions & properties of lubricants, methods of lubrication- splash, pressure, dry sump and wet sump lubrication, oil filters and oil pumps.

Cooling System: Necessity, methods of cooling - air cooling & water cooling, components of water cooling, radiator, thermostat.

UNIT-II:

Fuel supply systems: Carburetor-types, defects in carburetor, electronic injection system, multi point fuel injection system, fuel injection system in diesel engine, fuel injection pumps, fuel injector and nozzles.

Ignition System: Functions, requirements, types of an ignition system, battery ignition system - components, Magneto ignition system, Electronic ignition system

Electrical System: charging circuit- generator, current-voltage regulator, stating System-Bendix drive mechanism, lighting system, indicating devices, horn.

UNIT-III:

Transmission system: Types and functions of the clutches- cone clutch, single plate clutch, multi plate clutch, centrifugal and semi centrifugal clutch, Types of gear boxes- Sliding mesh, Constant mesh, Synchromesh, propeller shaft, universal joint and differential. wheels and tyres.

Steering System: steering geometry, condition for correct steering, types of steering Mechanisms-Ackermann and Davis steering mechanism, steering gears, power steering.

UNIT-IV:

Suspension System: Objectives of suspension system, front suspension system-rigid axle suspension system, independent suspension system, rear axle suspension, torsion bar, shock absorber.

Braking System: Mechanical brakes, hydraulic brakes-master cylinder, wheel cylinder, tandem master cylinder, brake fluid, air brakes and vacuum brakes.

UNIT-V:

Emissions from Automobile: Emission norms - Bharat stage and Euro norms. Engine emissions - exhaust and non-exhaust.

Safety Systems: seat belt, air bags, bumper, antilock brake system (ABS), wind shield, suspension sensor, traction control, central locking, electric windows, speed control.

Text Books:

1. Kirpal Singh, "Automobile Engineering Vol-1 & vol-2", Standard Publishers Distributors, 11th edition.
2. William H Crouse & Donald L Anglin, Automotive Mechanics, Tata Mc Graw Hill Publications, 10th edition.

References:

1. R.B Gupta , Automobile Engineering, Satya Prakashan Publications, 6th edition.
2. Newton steeds & Garrett, "The Motor vehicle", Society of Automotive Engineers, 13th edition.
3. G.B.S. Narang, "Automotive Engineering", Khanna Publishers, 5th edition.
4. Joseph Heitner, "Automotive Mechanics", IPC Transport Press Ltd, 2nd Edition.
5. Harbons singh Reyat, "The Automobile", S. Chand & company pvt. ltd., 6th edition.

B.TECH VII SEMESTER	**PEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T09 **NON DESTRUCTIVE EVALUATION (PROFESSIONAL ELECTIVE -V)**

Pre-requisite: Advanced Machining Processes

Course Objective:

1. To understand the concepts of various NDE techniques and their applications.
2. To gain knowledge of various NDE techniques using radiography, ultrasonics, liquid penetrates, magnetic patches and Eddy currents
3. To gain the knowledge on basic principles of these methods and will be able to select a testing process
4. To understand the advantages and disadvantages of these techniques.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the concepts of various NDE techniques and the requirements of radiography techniques and safety aspects.

CO2: Interpret the principles and procedure of ultrasonic testing

CO3: Understand the principles and procedure of Liquid penetration and eddy current testing

CO4: Illustrate the principles and procedure of Magnetic particle testing

CO5: Interpret the principles and procedure of infrared testing and thermal testing

SYLLABUS

UNIT-I:

Introduction to non-destructive testing, Industrial Applications of NDE: Span of NDE Activities Railways, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, NDE of pressure vessels, castings, welded constructions

UNIT-II:

Ultrasonics Test: Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

UNIT-III: Liquid Penetrant Test:

Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing.

Radiographic test, Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography

UNIT-IV: Magnetic Particle Test:

Magnetic Materials, Magnetization of Materials , Demagnetization of Materials, Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test

UNIT-V: Eddy Current Test:

Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current Testing Effectiveness of Eddy Current Testing

Text Books:

1. Non-destructive test and evaluation of Materials, J Prasad, GCK Nair, TMH Publishers
2. Ultrasonic testing by Krautkramer and Krautkramer 3. Non-destructive testing, Warress, JMc Gonmade

References:

1. Ultrasonic inspection training for NDT: E. A. Gingel, Prometheus Press,
2. ASTM Standards, Vol 3.01, Metals and alloys
3. Non-destructive, Hand Book – R. Hamchand

B.TECH VII SEMESTER	P	L	T	P	C
		0	0	0	3

20ME7I16 INDUSTRIAL/RESEARCH INTERNSHIP

Pre-requisite: Industrial Training/In-House Training.

Course Objective:

The main objective of this course is to make the student employable through Industrial exposure or any training on advanced technology through online mode.

Course Outcomes:

At the end of the course, student will be able to

CO1: Apply the academic knowledge in Industry or any advanced technology.

CO2: Understand administrative functions and ethical principles of the organisation.

CO3: Analyze and develop the concepts by practical observation.

CO4: Improve the report writing skills.

B.TECH VIII SEMESTER		P	L	T	P	C
			0	0	0	12

20ME8P01 **PROJECT (Project work/Internship)**

Pre-requisite:

Knowledge gained in all the theory and practical courses, as well as the knowledge gained in industrial training, internship and executing the mini project.

Course Objective:

The main objective of this course is to make the student plan and execute a project as a team using the available recourses within and outside the institute.

Course Outcomes:

At the end of the course, student will be able to

CO1: Implement the concepts of mechanical engineering.

CO2: Formulate and solve theoretical or practical engineering problems.

CO3: Analyze the concepts by practical observation.

CO4: Implement the knowledge in the report writing skills.

CO5: Manage and plan the work as a team.

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE5T04 ARCHITECTURE AND TOWN PLANNING
(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

- Initiating the students to different architectures of the world.
- Salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization.
- Architectural Design concepts, Principles of Planning and Composition.
- To understand town planning from ancient times to modern times.
- To impart the concepts of town planning standards.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Student should be able to distinguish architectural styles of eastern and Western world.

CO2: Student should understand the importance of Orders of Architecture.

CO3: Should be able to compose spaces of buildings using design concepts, planning principles.

CO4: Student should understand the town planning standards, landscaping features.

SYLLABUS

UNIT-I:

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace – Fort - Tomb.

UNIT-II:

Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT-III:

Principles of Planning: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements,

Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wright, Walter Groping.

UNIT-IV:

Histroical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT-V:

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- neighbor hood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation planning regulations and limitations.

Text books:

1. 'The great ages of World Architecture' by G.K. Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y. S.Sane.
3. 'Professional Practice' by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, NewDelhi.
4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning'by G.K. Haraskar.

Reference Books:

1. 'Drafting and Design for Architecture' by Hepler, Cengage
2. Learning 'Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.
3. 'Mordern Ideal Homes for India' by R. S. Deshpande.
4. 'Town and County Planning' by A.J. Brown and H.M. Sherrard.
5. 'Town Design' by Federik Glbbard, Architectural press, London.

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE5T05 ELEMENTS OF CIVIL ENGINEERING

(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources, Water Supply, Sanitary, Electrical Works in Building and Highway engineering.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: The student should be able to know the basics of civil engineering and concepts of surveying.

CO2: The student should be able to know various properties of building materials and various types of building.

CO3: The student should be able to know the fundamentals of Water Resources, Water Supply, Sanitary and Electrical Works in Building.

CO4: The student should be able to know the fundamental concepts highway engineering.

SYLLABUS

UNIT-I:

Introduction. Introduction of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on economy of country.

UNIT-II:

Surveying Introduction: Definition of Surveying, Fundamental principles of surveying, Classification of surveying.

Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining and Ranging.

Angular Measurement: Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing local attraction.

Levelling: Objectives and applications-terminology-Instruments, component parts of dumpy level, Types of levelling, levelling staff

UNIT-III:

Building Materials and Construction Materials: Introduction to construction materials - Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen. Construction: Classification of buildings, Building components and their functions.

UNIT-IV:

Water Resources Hydrologic cycle, water use and its conservation, Introduction to dams, barrages and check dams. Water Supply, Sanitary and Electrical Works in Building Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

UNIT–V:

Transportation Engineering, classification of roads, Introduction of flexible and rigid pavements, Introduction to road traffic and traffic control mechanism.

Text Books:

1. Elements of Civil Engineering, Mimi Das Saikia, Bhargab Mohan Dasand Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, Publisher: McGraw Hill Education, India Pvt. Ltd.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, Arun kumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books:

1. Surveying Theory and Practice, James M Anderson and Edward, 7th Edition, M Mikhail Publisher: McGraw Hill Education, India Pvt. Ltd.
2. Surveying and Leveling, R. Subramanian Publisher, Oxford University.
3. Building drawing, M.G. Shah, C.M.Kale and S.Y. Patki Publisher: TataMcGraw Hill.

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20EE5T04 BASICS OF CONTROL SYSTEMS
(OPEN ELECTIVE-I)

Course Objectives:

- To Enable the student to understand the importance of Modelling of Control systems
- To understand the First order & second order systems
- To understand the transfer function analysis
- To understand the Stability of the systems
- To understand the States Space Analysis

Course Outcomes:

At the end of the course, the student will be able to

CO1: Understand the different Classification of control systems and modelling

CO2: Understand the functioning of Signals & time response analysis

CO3: Understand the concept of Root Locus & Construction of Root Loci

CO4: Understand the concept of Bode plot & Nyquist Plot

CO5: Understand the concept of States Space Analysis of LTI System

SYLLABUS

UNIT – I

Mathematical Modeling of Control Systems: Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems

UNIT-II

Time Response Analysis: Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III

Stability and Root locus Technique: The concept of stability – Routh's stability criterion –limitations of Routh's stability –Root locus concept - construction of root loci

UNIT–IV

Frequency Response Analysis: Introduction to Frequency domain specifications- Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots.

UNIT–V

State Space Analysis of LTI Systems: Concepts of state variables and state model, state space representation of transfer function, Diagonalization- Solving the time invariant state equations.

Text Books:

1. Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2nd Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems, Manik Dhanesh N, Cengage publications.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International
   Publications, 5th Edition.
4. Control Systems Engineering, S.Palani,TataMcGraw Hill Publications.

B.TECH V SEMESTER **OE**

L	T	P	C
3	0	0	3

20EE5T05 SPECIAL ELECTRICAL MACHINES

(OPEN ELECTIVE-I)

Course Objective:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor.
- To explain the theory of travelling magnetic field and applications of linear motors.

Course Outcomes:

The student should be able to

CO1: Distinguish between brush dc motor and brush less dc motor.

CO2: Explain the performance and control of stepper motors, and their applications.

CO3: Explain theory of operation and control of switched reluctance motor.

CO4: Explain the theory of travelling magnetic field and applications of linear motors.

CO5: Understand the significance of electrical motors for traction drives.

SYLLABUS

Unit I: Stepper Motors: Classification and construction details of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of stepper motors – Applications of stepping motors.

Unit II: Switched Reluctance Motors: Construction – Comparison of conventional and switched reluctance motors –Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

Unit III : Brushless DC Motor: Construction – Principle of operation of BLDM – sensing and logic scheme, basic drive circuit, power converter circuit, transient analysis Theory of brushless DC motor as variable speed synchronous motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency.

UNIT-IV: **Linear motors:** Linear induction motor: Construction– principle of operation– applications. Linear synchronous motor: Construction – principle of operation– applications.

Unit V: Electric Motors for traction drives: AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:

1. Special electrical Machines, K. Venkata Ratnam, University press, 2009, New
2. "Linear Electric Motors: Theory, Design and Practical application" , Naser A and Boldea I, Prentice Hall Inc, New Jersey, 1987.

Reference Books:

1. Generalized Theory of Electrical Machines – PS Bhimbra, Khanna Publishers.
2. "Brushless Permanent Magnet and Reluctance Motor Drives" , Miller T.J.E. Clarendon Press, Oxford, 1989.
3. Electric Machines – Theory, operation, Applications and Control - Charles I. Hubert – Pearson Publications.

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME5T04 **DESIGN THINKING & PRODUCT INNOVATION (OPEN ELECTIVE-I)**

Pre-requisite: Managerial Economics and Financial Analysis,

Management Science.

Course Objective: At the end of the course, The student will able to

1. Design and develop the new product
2. Explain the basics of design thinking.
3. Describe the role of reverse engineering in product development.
4. Identify the needs of society and convert into demand.
5. Explain the product planning and product development process

Course Outcomes: At the end of the course, student will be able to

CO1: To bring awareness on innovative design and new product development.

CO2: To explain the basics of design thinking.

CO3: To familiarize the role of reverse engineering in product development.

CO4: To train how to identify the needs of society and convert into demand.

CO5: To introduce product planning and product development process.

SYLLABUS

UNIT-I: SCIENCE TO ENGINEERING:

Job of engineers, engineering units and measurement, elements of engineering analysis, forces and motion, energy, kinematics and motion, conversion of linear motion to rotary and vice versa, motion transmission. Physics to Engineering: Application of Newton laws, Pascal's law, Bouncy, Bernoulli's theorem, Ohm's law, electrical induction in
engineering products.

UNIT-II: HISTORICAL DEVELOPMENT:

Invention wheel, early mechanics in design, mechanical advantages,
industrial revolution, steam and petrol for mobility. Innovations in Electrical and Electronics: Electrical energy generation, electrical bulb, electrical equipment, electronics and automation, computing for early days to present, innovations in communications.

UNIT-III: SYSTEMATIC APPROACH TO PRODUCT DEVELOPMENT:

Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation. Solution finding methods: Conventional, intuitive, discursive, methods for combining solution, decision making for new design.

UNIT-IV: REVERSE ENGINEERING IN PRODUCT DEVELOPMENT:

Reversing engineering methods, identifying the bad features in a product, reduction in size and weight, usage of new materials, 3D printing, study of introducing electrical and electronic controls to the old products, importance of ergonomics in product development, environmental considerations in design, safety considerations in design.

UNIT-V:

Study of Product Development- Agriculture, development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy. Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of electrical vehicles, unmanned vehicles, design principles in drones.

Text Books:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, “Exploring Engineering: An Introduction to Engineering and Design”, 4th edition, Elsevier, 2016.
2. David Ralzman, “History of Modern Design”, 2nd edition, Laurence King Publishing Ltd., 2010
3. An AVA Book, “Design Thinking”, AVA Publishing, 2010.

Reference Books:

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, “Engineering Design: A Systematic Approach”, 3rd edition, Springer, 2007.
2. Tom Kelley, Jonathan Littman, “Ten Faces in Innovation”, Currency Books, 2006.

			L	T	P	C
B.TECH V SEMESTER		**OEC**	**3**	**0**	**0**	**3**
20ME5T05	**NANOTECHNOLOGY (OPEN ELECTIVE-I)**					

Pre-requisite: Materials Science

Course Objective:

- To familiarize with principles of quantum mechanics on which nano materials behave
- To elucidate applications of nanotechnology

Course Outcomes:

At the end of the course, student will be able to

CO1: Analyze the concepts and preparation methods of Nano materials

CO2: Understand the nano material properties and their behavior

CO3: Use various techniques for investigating nano material

CO4: Know the importance of Nano Technology for advanced materials processing

CO5: Know the importance of Nano structured Materials for Various Energies.

SYLLABUS

UNIT-I: Introduction to Nano technology:

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects

UNIT-II: Unique Properties of Nanomaterials:

Microstructure and Defects in nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple, and disclinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility, Magnetic Properties: Soft magnetic Nanocrystalline alloy, Permanent magnetic Nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT-III: Synthesis Routes :

Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method ,Self assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

UNIT-IV: Nanomaterials for Energy Conversion Systems:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy, Conversion Systems, Fuel Cells, Principles and nanomaterials design for Proton exchange membrane fuel cells (PEMFC); Direct methanol fuel cells (DMFC).

UNIT-V:

Issues and Challenges of functional Nanostructured Materials for electrochemical Energy Storage Systems, Primary and Secondary Batteries (Lithium ion Batteries), Cathode and anode materials, Nanostructured Carbon based materials, Nano-Oxides, Novel hybrid electrode materials, Current status and future trends.

Text books:

1. Electrochemical methods: Fundamentals and Applications, Allen J.Bard and Larry R. Faulkner, 2ndEdition John Wiley & Sons. Inc (2004)
2. D. Linden Ed., Handbook of Batteries, 2nd edition, McGraw-Hill, New York (1995)
3. G.A. Nazri and G. Pistoia, Lithium Batteries: Science and Technology, KulwerAcdemic Publishers, Dordrecht, Netherlands (2004).
4. J. Larmine and A. Dicks, Fuel Cell System Explained, John Wiley, New York (2000).

Reference Books:

1. Science and Technology of Lithium Batteries-Materials Aspects: An Overview, A. Manthiram, Kulwer Academic Publisher (2000).
2. M. S. Whittingham, A. J. Jacobson, Intercalation Chemistry, Academic Press, New York (1982).
3. M. Wakihara, O. Yamamoto, (Eds.) Lithium Ion Batteries: Fundamentals and Performance, Wiley –VCH ,Weinheim (1998).

B. Tech V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20EC5T04 LINEAR SYSTEM ANALYSIS (OPEN ELECTIVE –I)

Pre-requisite: Basic knowledge about vectors, differentiation and integration

COURSE OBJECTIVES:
The main objectives of this course are given below:

	At the end of the course, student will be able to
1	To understand basics of Signals and Systems required for all Engineering related courses.
2	To understand the behaviour of signal in time and frequency domain.
3	To understand the characteristics of LTI systems.
4	To understand concepts of Signals and Systems and its analysis using different transform techniques.
5	To understand sampling, convolution and correlation.

COURSE OUTCOMES:
At the end of this course the student will able to:

	At the end of the course, student will be able to
CO1:	Differentiate various signal functions.
CO2:	Represent any arbitrary signal in time and frequency domain.
CO3:	Understand the characteristics of linear time invariant systems.
CO4:	Analyse the signals with different transform technique.
CO5:	Understand the concept of sampling.

SYLLABUS

UNIT-I: Signal Analysis

Analogy between Vectors and Signals, Orthogonal Signal Space, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function

UNIT-II: Fourier series & Fourier transforms

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series.Deriving Fourier Transform from Fourier series,

Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform.

UNIT-III: Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Pauley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time.

UNIT-IV: Laplace Transforms & Z–Transforms

Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal.

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms

UNIT-V: Sampling theorem & Correlation

Graphical and analytical proof for Band Limited Signals, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parseval's Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation.

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2nd Ed.

Reference Books:

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH

B. TECH V SEMESTER

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

20EC5T05 DIGITAL LOGIC DESIGN (OPEN ELECTIVE –I)

Course Objectives:
At the end of the course, student will be able to

1. To represent numbers and conversion between different representations.
2. To analyze logic processes and implement logical operations.
3. To develop the combinational logic circuits.
4. To understand concept of programmable logic devices like PROM, PLA, PAL.
5. To design and analyze the concepts of sequential circuits.

Course Outcomes:
At the end of this course the student will able to:

CO1: Understand different number systems and their conversions.

CO2: Analyze the logical operations and Boolean algebra

CO3: Develop combinational circuits and perform logical operations.

CO4: Understand different programmable logic devices.

CO5: Design the sequential logic functions.\

SYLLABUS

UNIT-I:

Number Systems: Binary- Octal- Decimal- Hexadecimal Number Systems- Conversion of Numbers from One Radix to Another Radix- r‘s Complement- (r-1)‘s Complement- Subtraction of Unsigned Numbers- Signed Binary Numbers- Problems.

UNIT-II:

Logic Gates and Boolean Algebra: Basic Gates- Universal Gates- Ex-Or and Ex-Nor Gates- SOP- POS- Boolean Theorems- Dual of Logical Expressions- Minimizations of Logic Functions Using Boolean Theorems- K Map Method- Minimization of Boolean Functions.

UNIT-III: Signal Transmission through Linear Systems

Combinational Logic Circuits: Design of Half Adder- Full Adder- Half Subtractor- Full Subtractor- Ripple Adder and Subtractor- Design of Decoders- Encoders- Multiplexers- Demultiplexers- Magnitude Comparator.

UNIT-IV: Laplace Transforms & Z–Transforms

Introduction to Programmable Logic Devices (PLDs): PLA- PAL- PROM- Realization of Switching Functions Using PROM- Comparison of PLA, PAL and PROM.

UNIT-V: Sampling theorem & Correlation

Introduction to Sequential Logic Circuits: Basic Sequential Logic Circuits- Latch and Flip-Flop- RS- Latch Using NAND and NOR Gates- RS, JK, T and D Flip Flops- Conversion of Flip Flops- Flip Flops With Asynchronous Inputs (Preset and Clear)- Design of Registers- Universal Shift Register- Ring Counter- Johnson Counter.

TEXT BOOKS

1. Digital Design, M.Morris Mano, Michael D Ciletti, 4thEdition, PEA, 2003.

2. Fundamentals of Logic Design, Roth, 5thEdition, Cengage, 2004

REFERENCE BOOKS

1. Switching and Finite Automata Theory, Kohavi, 3rd Edition, Jha, Cambridge, 2005

2. Digital Logic Design, Leach, Malvino, Saha, TMH, 2000.

B. TECH V SEMESTER	OEC	L	T	P	C
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SOLID STATE DEVICES
20EC5T06 (OPEN ELECTIVE –I)

Course Objectives: Students undergoing this course, are expected to

1. Familiarize with the fundamentals of Semiconductor physics
2. Familiarize with various diodes and characteristics.
3. Familiarize with the transistors and their configurations.
4. Disseminate Amplifications with transistors
5. Understand the operation and working of Oscillators

Course Outcomes:

After undergoing the course, students will be able to

CO1: Understand importance of semiconductors.

CO2: Analyze Diode characteristics.

CO3: Differentiate various Transistor BJT configurations.

CO4: Design amplifiers at different applications using transistor.

CO5: Analyze different Feedback amplifiers & oscillators design

SYLLABUS.

Unit I: Basics Concepts of Semiconductor Physics, Charged Particles, Field Intensity, Potential, Energy, the eV unit of energy, Energy Band theory of Crystals, Insulators, Semiconductors and metals, Mobility and Conductivity, Electrons and Holes, Donor and Acceptor impurities, Charge Densities in a Semiconductor, Electrical properties of Ge and Si, Hall Effect, Diffusion and Drift Currents, Mass action Law, Fermi-Dirac distribution.

Unit II: Diodes: PN junction diode- Energy band diagram of PN junction Diode-V-I Characteristics –Current components in PN junction Diode- Diode equation-Diode resistance and capacitance, Characteristics of Zener Diode, Varactor Diode- SCR and UJT.

Unit III: Transistors Bipolar Junction Transistor: Transistor current components- Transistor equation- Transistor configurations- Characteristics of a transistor in CB, CC&CE configurations- Transistor as a Switch,Transistor as an amplifier. Field Effect Transistors (FET): Junction Field Effect Transistor construction & operation, characteristics of CS, CD & CG

Unit IV: Small Signal Transistor Amplifier models: Low Frequency Transistor Amplifier Models: Two port network, Transistor hybrid model, determination of h- parameters, generalized analysis of transistor amplifier model using h-parameters

Unit V: Feedback Amplifiers and Oscillators: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and their analysis. Generalized analysis of LC Oscillators, Hartley and Colpitt‘s oscillators with BJT and their analysis.

Text Books:

1) Millman, Halkias, ―Integrated Electronics- Analog and Digital Circuits and Systems, TMH.

2).Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGrawHill,Second Edition.

Reference Books:

1) Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.

2) . Basic Electronic Circuits -V.K.Mehta, S-chand Publications,2008

B. TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

INTRODUCTION TO ARTIFICIAL INTELLIGENCE
20CS5T07 (OPEN ELECTIVE –I)

Course Objectives:

- To gain a historical perspective of Artificial Intelligence and its foundations.
- To familiarize the basic principles of Artificial Intelligence towards problem solving Inference, Perception, Knowledge representation and Learning.
- To understand advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems.

Course Outcomes: At the end of the course, the students will be able to:

CO1: To Understand the history of Artificial Intelligence and its foundations.

CO2: Apply various Artificial Intelligence Techniques for problem solving.

CO3: Formalization of knowledge using the framework of predicate logic.

CO4: Ability to apply knowledge representation and reasoning to real world problems.

CO5: Derive conclusions from uncertain knowledge and quantify the uncertainty in the Conclusions obtained.

SYLLABUS

UNIT-1:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT-2: Problem Solving:

State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem Reduction and Game Playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT-3: Logic Concepts:

Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT-4: Knowledge representation:

Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT-5: Expert system and applications:

Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning (Units 1,2,3,4,5)

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
4. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

OPERATING SYSTEMS
20CS5T08 (OPEN ELECTIVE –I)

Course Objectives:

- Understand the importance of Operating System and its services.
- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes:

CO1: Understand the importance, functions and structures of operating systems.

CO2: Analyze and compare the performance of various CPU scheduling algorithms.

CO3: Develop software or hardware-based solutions for process synchronization.

CO4: Apply deadlock handling techniques to avoid deadlocks.

CO5: Compare various Memory Management Schemes and analyze various disk Scheduling Algorithms.

SYLLABUS

UNIT - I: Introduction: Defining operating system, operating system structures, operating systems operations, User and Operating-System Interface, Operating-system services, System calls: Types of system calls, operating system debugging, System Boot.

Study of Linux System: Components of LINUX, Inter process Communication

UNIT - II: Process Management: Process Concept, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Operations on Processes, Process creation, Process Termination, Process, Inter process communication.

Multithreaded Programming: Multithreading models, Scheduling: Basic Concepts, Scheduling algorithms

UNIT – III: Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File System Interface: File attributes, File operations, Access methods, Directory and Disk structures

UNIT - IV: Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock- Prevention - Mutual Exclusion, Hold and wait, No preemption, Circular wait, Avoidance-Safe state, Resource allocation, Bankers's Algorithm, Safety Algorithm, Detection-Single instance of each resource type, several instances of a resource type, Detection algorithm usage, recovery from Dead lock.

UNIT - V:

Memory Management Strategies: Swapping, Contiguous memory allocation, Paging, Segmentation

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

Mass-storage structure: Magnetic disk, Disk Scheduling

TEXT BOOKS:

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System, John Wiley, 9thedition.(Unit-1,2,3,4,5)
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition–2005.(Unit-5)

REFERENCES:

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 4th edition.
3. Charles Crowley ,Operating Systems: A Design-Oriented Approach, Tata Mc Graw Hill Education,1996.

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

SOFTWARE ENGINEERING
20CS5T09 (OPEN ELECTIVE –I)

Course Objective:

- Gain knowledge about software process models.
- Familiarize the basic software engineering methods, practices and its applications.
- Facilitate students in software design.

Course Outcomes:

CO1: Understand the software life cycle models

CO2: Understand the scrum approach to agile project management**.**

CO3: Analyze the software requirements and generate SRS document

CO4: Understand some of the different models that may be used to design

CO5: Understand various software testing approaches and quality control to ensure good quality software

SYLLABUS

Unit-I:

Introduction to Software Engineering: Nature of software, Software engineering, The Software Processes, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialised Process models, The Unified Process, Personal and Team Process Models.

Unit-II:

Requirements Engineering: Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

Requirements Modelling: Requirement Analysis, Scenario-Based Modelling, Data Modelling Concepts, Class-Based Modelling

Unit-III:

Design Concepts: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Unit-IV:

Understanding of UML diagrams: Structural diagrams - class diagram, object diagram, component diagram, deployment diagram, Behavioural diagrams - Use-case diagram, activity diagram, sequence diagram, collaboration diagram, state chart diagram.

Unit-V:

Implementation: Structured coding Techniques, Coding Styles-Standards and Guidelines, Implementation Issues.

Software Testing Strategies: A Strategic approach to Software Testing, Strategic Issues and Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing, Software Quality concepts.

TEXT BOOKS:

1. Roger S. Pressman (2010), Software Engineering, A Practitioner's Approach, 7th Edition, McGraw-Hill International Edition, India.
2. Ian Sommerville (2011), Software Engineering, 9th Edition, Pearson education, India.
3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.Jim ConallenKelli A. Houston," Object-Oriented Analysis and Design with Applications", 3rd edition.

REFERENCES:

1. Pankaj Jalote (2010), Software Engineering, A Precise Approach, Wiley India.
2. Waman S. Jawadekar (2008), Software Engineering: A Primer, McGraw-Hill, India.
3. Hans Van Vilet (2008), Software Engineering Principles and Practice, 3rd Edition, John Wiley & Sons Ltd.
4. Rajib Mall (2005), Fundamental of Software Engineering, PHI.
5. Deepak Jain, Software Engineering, Principles and Practices, Oxford, University Press, India.

B. TECH V SEMESTER

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OEC	3	0	0	3

COMPUTER NETWORKS
20IT5T07 (OPEN ELECTIVE –I)

Course Objectives:

- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the students to basic principles of networking using the goals like protocol layering and top down approach.
- Build an understanding of the basics of the internetworking and routing used in the computer networks.
- To provide guidelines in developing network applications

Course Outcomes:

At the end of the course, student will be able to

CO1- Independently enumerate the layers of the OSI model and TCP/IP.

CO2- Identify the different types of network topologies and protocols.

CO3- Compare and contrast methods to identify Errors and correct them

CO4- Differentiate between various network routing algorithms.

CO5- Understand WWW and HTTP Architectures.

SYLLABUS

UNIT - I: Introduction:

OSI overview, TCP/IP and other networks models, Examples of Networks: Arpanet, Internet, Network Topologies Wide Area Networks(WAN), Local Area Networks(LAN), Metropolitan Area Networks(MAN).

UNIT - II: Physical Layer and overview of PL Switching:

Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, introduction to switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT – III: Data link layer:

Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction, CRC, Checksum: idea, one's complement internet checksum, services provided to Network.

Elementary Data Link Layer protocols: Simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.

Sliding window protocol: One bit, Go-back N, Selective Repetitive protocol, Stop and wait protocol.

UNIT - IV: Random Access:

ALOHA, MAC addresses, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: Frequency Division Multiple Access(FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access(CDMA).

Network layer: Shortest Path, Distance Vector Routing Algorithm, Hierarchal routing algorithm.

UNIT - V: Application layer (WWW and HTTP):

WWWARCHITECTURE: Client (Browser), Server, Uniform Resource Locator, Resource Record, HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Request Message Format, HTTP Response Message Format

TEXT BOOKS:

1. Data Communications and Networks – Behrouz A. Forouzan. Third Edition TMH. (Units 1,2,4,5)
2. Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education(Units 1, 3, 4)

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

B. TECH V SEMESTER

	L	T	P	C
OEC	3	0	0	3

COMPUTER GRAPHICS
20IT5T08 (OPEN ELECTIVE –I)

Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

Course Outcomes:

After learning the course, the student will be able:

CO1: Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations.

CO2: Apply projections and visible surface detection techniques for display of 3D scene on 2D screen.

CO3: Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics.

CO4: Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).

CO5: Know and be able to discuss hardware system architecture for computer graphics. This Includes, but is not limited to: graphics pipeline, frame buffers, and graphic accelerators/co-processors.

SYLLABUS

UNIT - I: Introduction to Graphics:

Application area of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT - II: 3D Concepts:

Parallel and Perspective projections, Three dimensional object representation-Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT – III: Graphics Programming:

Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Key frame. Graphics programming using OPENGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes

UNIT – IV: Rendering:

Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadow of objects, Building a camera in a program, Creating shaded objects

UNIT - V: Overview of Ray Tracing:

Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics– C Version, second edition, Pearson Education, 2004

REFERENCES:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007

B. TECH V SEMESTER **OEC**

L	T	P	C
3	0	0	3

20HS5T01 QUANTITATIVE APTITUDE AND REASONING (OPEN ELECTIVE –I)

SYLLABUS

Unit-I: Divisibility and remainder rules of numbers, Unit digit , square root, cube root and simplification of numbers, HCF and LCM of numbers, Averages and Percentages, Alphabetical and miscellaneous series, Coding and decoding and Blood Relations

Unit-II: Profit & loss, Simple interest and Compound interest, Direction, Order and Ranking, Sitting arrangement and Puzzle

Unit-III: Ratio & proportions, Partnership, Alligation and mixtures and Ages.
Data sufficiency, Inequalities and Decision making.

Unit-IV: Time and work, Pipes & cisterns and Time and distance.
Syllogism, Statement and course of action and Statement and Assumption.

Unit-V: Boats and streams, Areas, Volume and surface areas.
Statement and argument, Cause and effect and Drawing inference.

Text Books:

1. “Objective Arithmetic” by R.S. Agarwal, S. Chand Publications.
2. Verbal and non-verbal Reasoning, R.S. Agarwal, S. Chand Publications

Reference Books:

1. Quantitative Aptitude by Dinesh Khattar, Pearson Education.
2. Quantitative Aptitude by Abhjit Guha.
3. Fast Track objective Arithmetic, Rajesh Verma, Arihant publications.

B. TECH V SEMESTER **OEC**

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PRINCIPLES OF MANAGEMENT
20MB5T01 (OPEN ELECTIVE –I)

COURSE OBJECTIVE

This course ensures that the students understand

1. Management Concepts
2. Applications of Concepts in Practical aspects of business and Development of Managerial Skills.
3. Managers manage business organizations in the dynamic global environment and maintain competitive advantage.
4. Business decisions are made using various tools and techniques to remain competitive
5. Managers use problem-solving strategies, critical thinking skills in real-life situations and implement successful planning.

COURSE OUTCOME

After learning the contents of this course, the student would be able to know

CO1: What are the circumstances that lead to management evolution and how it will affect future managers.

CO2: Analyze and evaluate the influence of historical forces on the current practice of management

CO3: Develop the process of management's functions: Planning and Organizing.

CO4: Evaluate leadership styles to anticipate the consequences of each leadership style and directing.

CO5: Identify the areas to control and selecting the appropriate controlling methods/techniques.

SYLLABUS

UNIT I

Introduction to Management: Definition, Functions, Process, Scope and Significance of Management.

Nature of Management, Functions of Management, Managerial Roles, Levels Managerial Skills and Activities, Difference between Management and Administration, Significance of Values and Ethics in Management.

Challenges of Management

UNIT II

Evolution of Management Thought: Approaches to Management - Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT III

Planning and Organizing: Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing.

UNIT IV

Directing: Effective Directing, Supervision, Motivation, Different Theories of Motivation-Maslow, Herzberg, McClelland, Vroom, Porter and Lawler, Job Satisfaction. Concept of Leadership- Theories and Styles. Communication Process, Channels and Barriers, Effective Communication.

UNIT V

Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

TEXT BOOKS

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Management-Tasks, Responsibilities & Practices, Drucker, F. Peter
4. Principles of Management, Terry and Franklin

REFERENCES

1. Essentials of Management, Koontz Weihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

NPTEL WEB COURSE:

nptel.ac.in/courses/122108038/

NPTEL VIDEO COURSE:

nptel.ac.in/courses/122108038/#

B. TECH V SEMESTER	OEC	L	T	P	C
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TECHNOLOGY MANAGEMENT
20MB5T02 (OPEN ELECTIVE –I)

Course Objective

- The course aims at providing an overview of various issues connected with Management of Technology in organizations.

Course Outcomes

CO1: To understand the importance of technology and innovation management

CO2: To understand the technology absorption, incremental innovation, research and development, technovation and technology fusion that dominate the contemporary world industry.

CO3: To understand the nature, significance, dimensions requirements, concepts, issues, themes, policies and structure of the management of technology and technovation.

SYLLABUS

UNIT-I

Evolution of Technology-Effects of New Technology- Technology Innovation.-Invention-Innovation- Diffusion- Revolutionary and Evolutionary Innovation- Product and Process Innovation- Strategic Implications of Technology- Technology – Strategy Alliance -Convergent and Divergent Cycle- The Balanced Approach.

UNIT-II

Technology Assessment- Technology Choice- Technological Leadership and Followership- Technology Acquisition- Technological Forecasting- Exploratory, Intuitive, Extrapolation, Growth Curves, Technology Monitoring- Normative: Relevance Tree, Morphological Analysis, Mission Flow Diagram.

UNIT-III

Diffusion of Technology- Rate of Diffusion; Innovation Time and Innovation CostSpeed of Diffusion- Technology Indicators- Various Indicators- Organizational Implications of Technology- Relationship between Technical Structure and Organizational Infrastructure- Flexible Manufacturing Management System (FMMS).

UNIT-IV

Financial Aspects in Technology Management- Improving Traditional Cost - Management System- Barriers to the Evaluation of New Technology- Social Issues in Technology Management- Technological Change and Industrial Relations- Technology Assessment and Environmental Impact Analysis.

UNIT-V

Human Aspects in Technology Management- Integration of People and Technology Organizational and Psychological Factors- Organizational Outcome- Technology Transfer-Technology Management Scenario in India.

Text Books

1. Sharif Nawaz: Management of Technology Transfer & Development, APCFT, Bangalore, 1983.
2. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,New Delhi.

References

1. Betz Fredrick: Managing Technology, Prentice Hall, New Jersey.
2. Gaynor: Handbook of Technology Management, McGraw Hill.
3. Tarek Khalil: Management of Technology, McGraw Hill International, 2000.
4. “Managing Technology and Innovation”, Robert & Roland, 1st Edition, Routledge.

B. TECH V SEMESTER

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

FOUNDATIONS OF DATA SCIENCE
20AD5T07 (OPEN ELECTIVE –I)

Course Objective: *This* ***course*** explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

UNIT-1: Data science in a big data world: Benefits and uses of data science and big data, Facets of data, The data science process, The big data eco system and data science, An introductory working example of Hadoop.

UNIT-2:

The data science process: Overview of the data science process, Step 1: Defining research goals and creating a project charter, Step 2: Retrieving data, Step 3: Cleansing, integrating, and transforming data, Step 4: Exploratory data analysis, Step 5: Build the models, Step 6: Presenting findings and building applications on top of them. Machine learning: What is machine learning and why should you care about it?, The modeling process, Types of machine learning, Semi-supervised learning.

UNIT-3:

Handling large data on a single computer: The problems you face when handling large data, General techniques for handling large volumes of data, General programming tips for dealing with large data sets, Case study 1: Predicting malicious URLs, Case study 2: Building a recommender system inside a database.

UNIT-4: First steps in big data: Distributing data storage and processing with frameworks, Case study: Assessing risk when loaning money, Join the NoSQL movement: Introduction to NoSQL, ACID: the core principle of relational databases,

CAP Theorem: the problem with DBs on many nodes, The BASE principles of NoSQL databases, NoSQL database types, Case study: What disease is that?

UNIT-5: The rise of graph databases: Introducing connected data and graph databases , Introducing Neo4j: a graph database, Connected data example: a recipe recommendation engine, Text mining and text analytics: Text mining in the real world, Text mining techniques, Case study: Classifying Reddit posts.

Text Book:

Introducing Data Science by Davy Cielen, Arno D. B. Meysman, and Mohamed Ali

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

20AM5T07 INTRODUCTION TO MACHINE LEARNING (OPEN ELECTIVE –I)

Pre-requisite: Probability and Statistics, Linear Algebra

Course Objective: *This* ***course*** explains basic concepts of Machine Learning and teaches you to use recent machine learning software for solving problems and understanding supervised and unsupervised learning methods

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the characteristics of machine learning.

CO2: Summarize the Model building and evaluation approaches.

CO3: Apply Bayesian learning and regression algorithms for real-world Problems.

CO4: Apply supervised learning algorithms to solve the real-world Problems.

CO5: Apply unsupervised learning algorithms for the real world data.

SYLLABUS

Unit-1: Introduction to Machine Learning and Preparing to Model:

Introduction to Machine Learning- Introduction, What is Human Learning? Types of Human Learning, What is Machine Learning? Types of Machine Learning, Problems Not To Be Solved Using Machine Learning, Applications of Machine Learning.

Preparing to Model- Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

Modeling & Evaluation, Basics of Feature Engineering:

Modeling & Evaluation - Introduction, Selecting a Model, Training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model.

Basics of Feature Engineering - Introduction, Feature Transformation, Feature Subset Selection.

Unit-2: Bayesian Concept Learning and Regression:

Bayesian Concept Learning - Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network.

Regression: Introduction, Regression Algorithms - Simple linear regression, Multiple linear regression, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

Unit-3: Supervised Learning: Classification, Ensemble Learning: Classification-Introduction, Example of Supervised Learning, Classification Model, Classification

Learning Steps, Common Classification Algorithms - k-Nearest Neighbour (KNN), Decision tree, Random forest model, Support vector machines.

Ensemble Learning- Boosting, Bagging

Unit-4: Basics of Neural Network

Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network, Learning Process in ANN, Backpropagation, Deep Learning

Unit-5: Unsupervised Learning:

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning.

Principle Component Analysis: Introduction, Probabilistic PCA- Maximum Likelihood PCA, EM Algorithm for PCA, Bayesian PCA, Factor Analysis; Kernel PCA

Clustering: Clustering as a Machine Learning task, Different types of clustering techniques, Partitioning methods, Hierarchical clustering, Density-based methods: DBSCAN.

Finding Pattern using Association Rule - Definition of common terms, Association rule, Apriori algorithm.

Text Books:

1. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, “Machine Learning”, Pearson Education India ,1st edition.
2. Christopher M. Bishop, “Pattern Recognition and Machine Learning”. New York :Springer, 2006.

Reference Books:

1. Tom M. Mitchell, “Machine Learning’, MGH, 1997.
2. Shai Shalev-Shwartz, ShaiBen David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge.
3. Peter Harington, “Machine Learning in Action” , Cengage, 1st edition, 2012.

B.TECH VI SEMESTER	OEC	L	T	P	C
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20CE6T08 REMOTE SENSING AND GIS (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Learn various types of sensors and platforms
- learn concepts of visual and digital image analyses
- Understand the principles of spatial analysis
- Appreciate application of RS and GIS to Civil engineering

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Be familiar with ground, air and satellite based sensor platforms.

CO2: Interpret the aerial photographs and satellite imageries

CO3: Create and input spatial data for GIS application

CO4: Apply RS and GIS concepts in water resources engineering

SYLLABUS

UNIT–I:

Introduction to remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems. Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

UNIT–II:

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT–III:

Geographic Information System: Introduction, key components, application areas of GIS, map projections. Data entry and preparation: spatial data input, raster data models, vector data Models.

UNIT – IV:

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT–V:

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications. Application to Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management.

Text Books:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

Reference Books:

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A KW Yeung, Prentice Hall (India), 2006
3. 'Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. 'Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20CE6T09 ENVIRONMENTAL IMPACT ASSESSMENT (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- impart knowledge on different concepts of Environmental Impact Assessment
- know procedures of risk assessment
- learn the EIA methodologies and the criterion for selection of EIA methods
- pre-requisites for ISO 14001 certification
- know the procedures for environmental clearances and audit
- appreciate the importance of stakeholder participation in EIA

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Prepare EMP, EIS, and EIA report

CO2: Identify the risks and impacts of a project

CO3: Selection of an appropriate EIA methodology

CO4: Evaluation the EIA report

CO5: Estimate the cost benefit ratio of a project

CO6: Know the role of stakeholder and public hearing in the preparation of EIA

SYLLABUS

UNIT–I:

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA.

UNIT–II:

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP.

UNIT-III:

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV:

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with

reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT–V:

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

Reference Books:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20EE6T08 RENEWABLE ENERGY SOURCES (OPEN ELECTIVE-II)

Course Objective:

- To give sufficient knowledge about the promising new and renewable sources of energy
- Explain the concept of various forms of renewable energy
- Learn the present energy scenario
- Analyse the environmental aspects of renewable energy resources.

Course Outcomes:

CO1: Know the need of various renewable energy systems

CO2: understand the concepts of bio-energy,

CO3: Acquire the knowledge of OTEC, tidal,

CO4: Acquire the knowledge of geothermal and Alternative energy sources

SYLLABUS

UNIT-I

Introduction: Introduction to energy sources, reserves and estimates, global energy scenario, renewable energy -environment implications, global warming and climate change, limitations of conventional energy sources, classification of non-conventional energy sources - solar energy, wind energy, bio-energy, Ocean Thermal Energy Conversion (OTEC), tidal, geothermal and hydro.

UNIT-II

Bio-energy: Biomass and its sources, energy plantation, production of fuel wood, bio-conversion processes, bio-gas, bio-diesel and ethanol production and utilization, thermo-chemical processes, biomass gasification, process, types of reactors, utilization of producer gas for thermal and electricity generation.

UNIT-III

Ocean thermal energy conversion, tidal, geothermal: Tidal energy, wave energy, data, technology options; open and closed *Ocean thermal energy conversion* cycles, geothermal energy sources, power plant and environmental issues.

UNIT-IV

Fuel Cells: Hydrogen generation-storage, transport and utilization, applications, power generation. Fuel cells-Technologies, types, economics and power generation.

UNIT-V

Solar Energy Storage and Applications:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2006
2. Renewable Energy Resources – Twidell&Wier, CRC Press(Taylor & Francis), 2012
3. *Y. W. B. Charles*, *B.H. Essel*, *—Biomass Conversion and Technology‖*, John Wiley, Latest Edition

Reference Books:

1. Renewable energy resources by G. N. Tiwari, M. K. Ghosal, Alpha Science International, 2005.
2. Renewable Energy Technologies by R. Ramesh, K. Uday Kumar, M. Anandakrishnan, Narosa Publishing House, 1997
3. Non-Conventional Energy Systems by K Mittal, A. H. Wheeler Publishing Company Limited, 01-Jan-1999.
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, P.H.I.
5. Godfrey Boyle, —Renewable Energy- Power for a Sustainable Future‖, Oxford University Press, U.K.,
6. Twidell, J.W. & Weir, A., —Renewable Energy Sources‖, E.F.N Spon Ltd., UK.

B.TECH VI SEMESTER **OEC**

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3	0	0	3

20EE6T09 ENERGY AUDIT, CONSERVATION AND MANAGEMENT (OPEN ELECTIVE-II)

Course Objective:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Course Outcomes:
At the end of the course student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

SYLLABUS

UNIT-I

Basic Principles of Energy Audit and management: Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Piecharts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions –Language – Questionnaire – Check list for top management.

UNIT-II

Lighting: Modification of existing systems – Replacement of existing systems – Priorities: Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level –Illumination of inclined surface to beam – Luminance or brightness – Types of lamps –Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT-III

Power Factor and energy instruments: Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters– Tong testers – Power analyzer.

UNIT-IV

Space Heating and Ventilation: Ventilation – Air–Conditioning (HVAC) and Water Heating**:** Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning –Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

UNIT-V

Economic Aspects and Financial Analysis: Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems.

Computation of Economic Aspects

Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment –Numerical examples.

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill

2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd– 2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevierpublications. 2012

2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.

3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.

4. Energy management hand book by W.C.Turner, John wiley and sons.

5. Energy management and conservation –k v

B.TECH VI SEMESTER **OEC**

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20ME6T07 **INDUSTRIAL ROBOTICS (OPEN ELECTIVE-II)**

Pre-requisite: Kinematics and Mathematics

Course Objective:

1. The student will be exposed to the concepts of automation and fundamentals of robotics
2. The students will be exposed to the concepts of transformations and robot kinematics,
3. The students will understand the functioning of sensors and actuators
4. The students will be exposed to robot programming languages and Programming.
5. The student will be exposed to the applications of robotics in manufacturing.

Course Outcomes: At the end of the course, student will be able to

CO1 Understand various applications of robotics and classification of coordinate system and control systems.

CO2 Build the concepts of components of industrial robotics.

CO3 Apply kinematic analysis with D-H notation, forward and inverse kinematics and Solve dynamic analysis with Lagrange – Euler and Newton – Euler formulations.

CO4 Model trajectory planning for a manipulator by avoiding obstacles.

CO5 Understand different types of actuators and applications of robots in manufacturing.

SYLLABUS

UNIT-I:

Introduction: Automation and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT-II: MOTION ANALYSIS AND CONTROL:

Motion Analysis: Basic Rotation Matrices, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT-III:

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion straight line motion.

UNIT-IV:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools.

UNIT-V:

Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.

Text Book(s)

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson, 3rd edition.

References

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
4. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley

5. Introduction to Robotics by SK Saha, The McGrah Hill Company, 6th, 2012
6. Robotics and Control / Mittal R K &Nagrath I J / TMH

B.TECH VI SEMESTER **OEC**

L	T	P	C
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20ME6T08 **3D PRINTING (OPEN ELECTIVE-II)**

Pre-requisite: Manufacturing Process

Course Objective:

The course aims at the importance of Additive Manufacturing, Classifications, models, specifications of various Additive Manufacturing Techniques. To learn the different tools, soft-wares required and the applications of Additive Manufacturing

Course Outcomes: At the end of the course, student will be able to

CO1:	Understand the working principle and process parameters of AM processes
CO2:	Explore the applications of AM processes in various fields
CO3:	Apply the suitable process and material for fabricating a given product
CO4:	Use the suitable post process based on product application
CO5:	Design and develop a product for AM Process

SYLLABUS

UNIT-I:

Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT-II:

Machines for Rapid Prototyping: Overview of Polymerization: Stereolithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT-III:

Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive Manufactured Tools, Indirect Rapid

UNIT-IV:

Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture of Metal Components

UNIT-V:

Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2015, 2nd Edition.
2. 3D Printing and Additive Manufacturing: Principles & Applications, Chua Chee Kai, Leong Kah Fai, World Scientific, 2015, 4th Edition.

References:

1. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venuvinod and Weiyin Ma, Springer, 2004.
2. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.
3. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006.

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC6T07 ELECTRONIC CIRCUITS AND NETWORKS (OPEN ELECTIVE-II)

Course Objectives:

At the end of the course, student will be able to

1. To understand the Differentiator and Integrator circuits
2. To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
3. To Introduce to Time-base Generators and Principles of Synchronization and Frequency division.
4. To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.
5. To understand and Design gates using various logic families.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand the basic concepts of Optoelectronic Devices

CO2: Design linear wave shaping circuits.

CO3: Design Non- linear wave shaping circuits.

CO4: Design Different Time Base Generators

CO5: understand the concepts of one port networks

SYLLABUS

UNIT-I: Optoelectronic Devices

Introduction, Photo sensors, Photoconductors, Photodiodes, Phototransistors, Light-Emitting Diodes, Liquid Crystal Displays, Cathode Ray Tube Displays, Emerging Display Technologies, Opto couplers.

UNIT-II: LINEAR WAVE SHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT-III: NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of

voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT-IV: VOLTAGE TIME BASE GENERATORS

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator.

UNIT-V: Synthesis of one port networks

Synthesis of one port networks
Synthesis of reactive one-ports by Foster's and Cauer methods (forms I and II) - Synthesis of LC, RC and RL driving-point functions.

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.

2. K. S. Suresh Kumar, ―Electric Circuit Analysis‖, Pearson Publications, 2013.

Reference Books:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC6T08 PRINCIPLES OF COMMUNICATIONS (OPEN ELECTIVE – II)

Course Objectives:

At the end of the course, student will be able to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Familiarize with the fundamentals of digital communication systems
4. Familiarize with various techniques for digital modulation and demodulation of signals
5. Distinguish the figure of merits of various analog modulation methods

Course Outcomes:

At the end of this course the student will able to:

CO1: Differentiate various Analog modulation schemes

CO2: Analyze demodulation schemes and their spectral characteristics

CO3: Analyze demodulation schemes and their spectral characteristics

CO4: Analyze demodulation schemes and their spectral characteristics

CO5: Analyze noise characteristics of various analog modulation methods

SYLLABUS

UNIT-I: Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver

UNIT-II: Angle Modulation, Frequency and Phase modulation, frequency deviation, Bandwidth, FM Modulators and Demodulators, Narrow band and wide band FM, FM Broadcasting.

UNIT-III: Pulse digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Generation and Demodulation, Frequency Division Multiplexing, Time Division Multiplexing

UNIT-IV: Digital Representation of Analog Signals, Pulse Code Modulation (PCM), Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Mathematical Representation of Noise.

UNIT-V: Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops.

Text Book:

1. Herbert Taub and Donald L. Schilling, ―Principles of Communication Systems., Tata McGrawHill.

2. Rishabh Anand, Communication Systems, Khanna Publishers

Reference Books:

1. B.P.Lathi,―Modern Digital and Analog communication Systems, 3rd Edition, Oxford University Press.

2. Simon Haykin, ―Communication Systems, 4th Edition, Wiley India

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20EC6T09 MICROCONTROLLERS & ITS APPLICATIONS (OPEN ELECTIVE-II)

Course Objectives:

At the end of the course, student will be able to

1. To understand the basics of 8051 Microcontroller and its functionalities
2. To understand the 8051 family instruction set
3. To develop machine language programming in microprocessors.
4. Todesign and develop microcontroller based interfacing for real time applications using low level language like ALP.
5. To understand the basics of ARM architectures and its functionalities.

Course Outcomes:

At the end of this course the student will able to:

CO1: To be able to understand the overview of 8051 Micro controller in general.

CO2: To be able to understand the instruction set of 8051 microcontroller

CO3: To be able to understand the Assembly Language Programming in microcontrollers.

CO4: To be able to understand the microcontroller is interfacing with I/O devices, memory, and serial communication using ALP.

CO5: To be able to understand the overview of ARM Architecture in general.

SYLLABUS

UNIT-I: Introduction to 8051 Microcontrollers

Overview of 8051 microcontrollers, Architecture**,** I/O ports, Memory organization, Addressing modes, SFRs, Counters and timers, Synchronous serial-cum, Asynchronous serial communication, Interrupts and priorities.

UNIT-II: 8051 FAMILY MICROCONTROLLERS INSTRUCTION SET

Basic assembly language programming, Data transfer instructions, Data and bit- manipulation instructions, Arithmetic instructions, Instructions for logical operations on the test among the registers, Program flow control instructions, Interrupt control flow.

UNIT-III: 8051 REAL TIME CONTROL

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the serial communication Interrupts, programming Timers and Counters, serial port and its programming,

UNIT-IV: I/O and Memory Interface and Serial Communication and Bus Interface

I/O and Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer, USART, External Communication Interfaces-RS232,USB

UNIT-V: ARM Architecture:

ARM processor fundamentals, ARM Architecture –Register, exceptions and interrupts, interrupt vector table, ARM instruction set- Data processing, Branch, load and store instructions; Software instructions, Program status register instructions loading constants

TEXTBOOKS:

1. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System
   Design, 2/e, Pearson Education, 2005.
2. Kenneth. J. Ayala, The 8051 Microcontroller, 3/e, Cengage Learning, 2004.

REFERENCE:

1. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems, 2/e, Pearson Education, 2007
2. ARM system Developers guide, Andrew N Sloss, Dominic Symes, Chris Wright, Elsevier,2012

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

INTRODUCTION TO MACHINE LEARNING
20CS6T07 (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

INFORMATION SECURITY
20CS6T08 (OPEN ELECTIVE –II)

Course Objectives:

- Understand the concepts of classical encryption techniques and concepts of finite fields and number theory
- Understand Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Understand the Design issues and working principles of various authentication protocols, PKI standards
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications.

Course Outcomes:

CO1: Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

CO2: Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

CO3: Apply different digital signature algorithms to achieve authentication and create secure applications

CO4: Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

CO5: Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

SYLLABUS

UNIT - I: Classical Encryption Techniques:

The OSI Security Architecture, Security Attacks, Services & Mechanisms, Symmetric Cipher Model, Substitution Techniques: Caesar Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One-Time Pad, Transposition Techniques: Rail fence, Row Transposition cipher, Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT - II:

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Block Cipher Modes of Operations.

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat’s and Euler’s Theorems, The Chinese Remainder Theorem

UNIT – III:

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security.

Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution

UNIT - IV:

User Authentication: Remote User Authentication Principles, Kerberos.

Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.

UNIT - V:

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS)

Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration

TEXT BOOKS:

1. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition. [Units 1,2,3,4,5]
2. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition. [Units 1,2,3,4,5]

REFERENCES:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

AGILE TECHNOLOGIES
20CS6T09 (OPEN ELECTIVE –II)

COURSE OBJECTIVES:

1. To have an understanding of the Agile Manifesto and Principles
2. To Apply Agile based techniques in each of the development phases.

COURSE OUTCOMES:

CO1: Understand the Agile Manifesto and Principles.
CO2: Apply agile software development practices to create high-quality software.
CO3: Acquire Knowledge on software design, set of software technologies and APIs.
CO4: Examine and demonstrate knowledge of Agile development
CO5: Demonstrate the Agile Approach to estimate project variables, control and Risk Management

SYLLABUS

UNIT-I

Agile Software Development: Genesis of Agile, Introduction and Background, Traditional Model Vs Agile Model, Values of Agile, Agile Manifesto and Principles, Stakeholders, Challenges.

UNIT-II

Lean Approach: Waste Management, Kaizen and Kanban, Add process and products add Value, Roles related to life cycle, Differences between Agile and Traditional Plans, Differences at different life cycle phases, Key techniques, Principles, Understand as a means of assessing the initial status of the project, How agile helps to build quality.

UNIT-III

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, **Agile Requirements:** User story definition, Characteristics and contents of user stories, Acceptance tests and verifying stories, Product Velocity, Burn down chart, Sprint planning and retrospective, Daily Scrum, Scrum roles- Product Owner, Scrum Master, Scrum Team, Scrum Case Study, Tools for Agile Project Management.

UNIT-IV

Agile Software Design and Development: Agile Design practices, Role of design principles including Single Responsibility principle, Open Closed Principle, Liskov Substitution principle, Interface Segregation principles, Dependency Inversion principle in Agile Design, Refactoring- Need and significance, Refactoring techniques, Continuous Integration, Automated Build tools, Version Control.

UNIT-V

Agile Testing and Review: Agile Testing Techniques, Test Driven Development, User Acceptance Test, Agile Metrics and Measurements, The Agile Approach to estimate project variables, Agile control- The 7 control parameters, Agile Approach to Risk, Agile approach to Configuration Management, Atern Principles and Philosophy, Best practices to manage Scrum.

TEXT BOOKS:

1. Robort C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013(Units 1, 3, 5)

2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson(Units 3,4)

3. Mike Cohn, Succeeding with Agile: Software Development Using Scrum, Addison Wesley Series.(Units 3, 4)

REFERENCES:

1. David J. Anderson and Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer,.

3. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley.

4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and management, Butterworth-Heinemann.

B. TECH VI SEMESTER

OEC	L	T	P	C
	3	0	0	3

20IT6T07 FUNDAMENTALS OF MACHINE LEARNING (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
4. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

	L	T	P	C
OEC	3	0	0	3

20IT6T08 DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE –II)

Course Objectives:

- Understand the basic database concepts, applications, schema and various models.
- Familiarize with entity relation model for a data base and write queries using SQL.
- Emphasize the importance of normalization, transaction management and concurrency control in databases

Course Outcomes:

CO1: Understand the concept of database, database models and familiarize with Entity Relationship models

CO2: Demonstrate the use of constraints, relational algebra operations.

CO3: Apply SQL queries to interact with database and understand the basics of NOSQL.

CO4: Apply normalization in database design to eliminate anomalies.

CO5: Understand the basic concepts of transaction processing and concurrency control.

SYLLABUS

UNIT-I: Database System Applications:

A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT-II: Introduction to the Relational Model:

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III: SQL:

QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

NOSQL: Definition of NOSQL, History of NOSQL and Different NOSQL products, Applications, features of NoSQL, Difference between SQL and NoSQL.

UNIT-IV: Schema Refinement (Normalization):

Introduction to Schema Refinement, Functional Dependencies Reasoning about FDs, Normal Forms, Properties of decomposition, Normalization, Schema refinement in database design, Other kinds of dependencies.

UNIT-V: Transaction Management and Concurrency Control:

Properties of transactions, Transactions and Schedules, Concurrent execution of transactions, Lock-based concurrency control, deadlocks, Performance of locking.

Concurrency control: 2PL, Serializability, recoverability, Introduction to lock management, dealing with deadlocks.

TEXT BOOKS:

1. Raghu rama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, TATA McGraw Hill.
2. "Professional NOSQL” by Shashan k Tiwari, 2011, WROX Press.

REFERENCE:

1. Peter Rob & Carlos Coronel, “Data base Systems design, Implementation, and Management”, 7th Edition, Pearson Education, 2000.
2. Silberschatz, Korth, “Data base System Concepts”, 6th Edition, McGraw Hill, 2010.
3. ElmasriNavathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.
4. C.J.Date, “Introduction to Database Systems”, 7th Edition, Pearson Education, 2002

B. TECH VI SEMESTER

OEC	L	T	P	C
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OPERATIONS RESEARCH
20HS6T01 (OPEN ELECTIVE –II)

Course Objectives:

1) Identify and develop operational research models from the verbal description of the real system.
2) Understand the mathematical tools that are needed to solve optimization problems.
3) Use mathematical software to solve the proposed models.
4) Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

Course Outcomes:

CO1: Understand the methodology of Operations Research& concepts of linear programming

CO2: Formulate the solutions to transportation problems

CO3: Explain the solutions for various sequencing problems

CO4: Illustrate the solutions to different replacement policies

CO5: Apply game theory to solve real world problems

SYLLABUS

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

UNIT-II

Transportation Problem. Formulation, Solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.

UNIT-III

Assignment model. Formulation. Hungarian Method for optimal solution. Solving Unbalanced problem. Sequencing Models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines Processing n Jobs through m Machines.

UNIT-IV

Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

UNIT-V

Game Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

Inventory models. Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

TEXT BOOKS:

1) P. SankaraIyer,"Operations Research", Tata McGraw-Hill, 2008.
2) A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

REFERENCES:

1) J K Sharma. "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2) P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.

B. TECH VI SEMESTER

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OEC	3	0	0	3

20MB6T01 ORGANIZATIONAL BEHAVIOUR (OPEN ELECTIVE –II)

Course Objectives

1 To understand the fundamentals of Organizational Behaviour.

2 For the understanding and balancing of Values and Emotions at work place.

3 To improve the student's Personality and Attitude.

4 To understand and improve the skill of perception and Group Behaviour.

5 Understanding and managing organizational culture, leadership and conflict.

Course Outcomes

Learning Organizational Behavior enables engineers:

CO1: To understand the psychology of workers and other members in the organization.

CO2: To be equipped with the right knowledge and skills regarding organizational processes, group behavior, organizational structure and culture.

CO3: To build up strategies for development at their work place.

CO4: To motivate and control employees.

CO5: To resolve organizational conflict effectively.

SYLLABUS

UNIT I

Fundamentals of OB: Definition, Scope and Importance of OB, Relationship between OB and the individual, Evolution of OB, Models of OB (Autocratic, Custodial, Supportive, Collegial & SOBC), Limitations of OB.

Unit II

Values, Attitudes and Emotions: Introduction, Values, Attitudes, Definition and Concept of Emotions, Emotional Intelligence - Fundamentals of Emotional Intelligence, The Emotional Competence Framework, Benefits of Emotional Intelligence, difference between EQ and IQ. Stress at workplace: Work Stressors – Prevention and Management of stress – Balancing work and Life, Workplace spirituality.

Unit III

Personality & Attitude: Definition Personality, importance of personality in Performance, The Myers-Briggs Type Indicator and The Big Five personality model, Johari Window, Transaction Analysis. Attitude – Definition, Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude.

Unit IV

Perception: Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). Motivation:

Definition & Concept of Motive & Motivation. Group and Team Dynamics: Meaning Group Dynamics, Types of Groups, Group Development, Team Effectiveness & Team Building.

Unit V

Organizational Culture: Types of Culture, Creating and Maintaining Organization Culture, Managing Cultural Diversity. Organizational Change: Types of Organizational change, Forces that acts as stimulants to change, overcome the Resistance to Change, Developing a Learning Organization. Leadership: Introduction, Managers V/s Leaders. Overview of Leadership- Traits and Types. Conflict Management: Sources of Conflict, Types of Conflict, Conflict Management Approaches.

Text Books

1. Pareek Udai: "Understanding Organizational Behavior", Oxford University Press, New Delhi, 2007.

1. K.Aswathappa: "Organizational Behavior-Text, Cases and Games", Himalaya Publishing House, New Delhi,2008.

2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "Organizational Behavior", Tata McGraw Hill Education, New Delhi, 2008.

References

1. Jerald Greenberg and Robert A Baron: "Behavior in Organizations", PHI Learning Pvt Ltd, New Delhi, 2009.

2. Robbins, Stephen P. Organizational behavior, 14/E. Pearson Education India, 2001.

B. TECH VI SEMESTER

OEC	L	T	P	C
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20MB6T02 PROJECT MANAGEMENT (OPEN ELECTIVE –II)

Course Objectives

The objective of this course is to enable the students to gain basic knowledge about the concept of project, project management, project life-cycle, project appraisal; to acquaint the students about various issues of project management.

SYLLABUS

Unit -I

Basics of Project Management –Concept– Project environment – Types of Projects – Project life cycle – Project proposals – Monitoring project progress – Project appraisal and Project selection – Causes of delay in Project commissioning– Remedies to avoid overruns. Identification of Investment opportunities – Sources of new project ideas, preliminary screening of projects – Components for project feasibility studies.

Unit- II

Market feasibility -Market survey – Categories of Market survey – steps involved in conducting market survey– Demand forecasting techniques, sales projections.

Unit- III

Technical and Legal feasibility: Production technology, materials and inputs, plant capacity, site selection, plant layout, Managerial Feasibility Project organization and responsibilities. Legalities – Basic legal provisions. Development of Programme Evaluation & Review Technique (PERT) –Construction of PERT (Project duration and valuation, slack and critical activities, critical path interpretation) – Critical Path Method (CPM)

Unit- IV

Financial feasibility – Capital Expenditure – Criteria and Investment strategies – Capital Investment Appraisal Techniques (Non DCF and DCF) – Risk analysis – Cost and financial feasibility – Cost of project and means of financing — Estimation of cash flows – Estimation of Capital costs and operating costs; Revenue estimation – Income – Determinants – Forecasting income –Operational feasibility - Breakeven point – Economics of working.

Unit -V

Project Implementation and Review: Forms of project organization – project planning – project control – human aspects of project management – prerequisites for successful project implementation – project review – performance evaluation – abandonment analysis.

Text Books

1. Prasanna Chandra, ―Projects, Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill Company Pvt. Ltd., New Delhi 1998.

2. Gido: Effective Project Management, 2e, Thomson, 2007.

References

1. Singh M.K, ―Project Evaluation and Management‖.

2. Vasanth Desai, Project Management, 4th edition, Himalaya Publications 2018.

3. Clifford F. Gray, Erik W. Larson, ―Project Management, the Managerial Emphasis, McGraw Hill, 2000.

B. TECH VI SEMESTER

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OEC	3	0	0	3

20AM6T07 BIG DATA ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: Data Base Management System

Course objectives:

In this course student will learn about

1. To understand the need of Big Data, challenges and different analytical architectures
2. Installation and understanding of Hadoop Architecture and its ecosystems
3. Processing of Big Data with Advanced architectures like Spark.
4. Describe graphs and streaming data in Spark.

Course Outcomes: At the end of the course, student will be able to

CO1: Discuss the challenges and their solutions in Big Data

CO2: Understand and work on Hadoop Framework and eco systems.

CO3: Explain and Analyze the Big Data using Map-reduce programming in Both Hadoop and Spark framework.

CO4: Demonstrate spark programming with different programming languages.

CO5: Demonstrate the graph algorithms and live streaming data in Spark.

SYLLABUS

Unit-I:

Introduction to big data: Data, Types of digital data, Evolution and Definition of big data, Challenges of big data, Characteristics and Need of big data.

Introduction to Hadoop: Introducing Hadoop, need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Hadoop Distributors.

HDFS (Hadoop Distributed File System): HDFS Daemons, Anatomy of file read, Anatomy of file write, working with HDFS commands.

Unit-II:

Introduction to MAPREDUCE Programming: Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Mapper, Reducer, Combiner, Partitioner, Searching, Sorting , Compression, Hadoop EcoSystem.

Unit-III:

Introduction to Pig: Key Features of pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, Relational Operators.

Introduction to HIVE: HIVE features, HIVE architecture, HIVE datatypes, HIVE File Formats, HIVE Query Language.

Unit-IV:

NoSQL: Introduction to NOSQL, Types of NoSQL Databases, and Advantages of NoSQL databases, CAP Theorem, BASE, SQL versus NoSql.

NoSQL databases: Introduction to MongoDB, Data types in MongoDB, MongoDB query language.

Unit-V:

Spark: Introduction to data analytics with Spark, Spark Stack, Programming with RDDS, Working with key/value pairs, Spark SQL, Schema RDDs,

Sparking Streaming: High level architecture of Spark Streaming, DStreams, Transformations on DStreams, Different Types of Transformations on DStreams.

Text Books:

[1].SeemaAcharya, SubhashiniChellappan, Big Data and Analytics, Wiley Publishers

[2].Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia, "Learning Spark: Lightning-Fast Big Data Analysis", O'Reilly Media, Inc.

Reference Books:

[1]. TomWhite, Hadoop,“TheDefinitiveGuide”,3rdEdition,O’ReillyPublications, 2012.

[2].David Loshin, "BigDataAnalytics: From Strategic Planning to Enterprise IntegrationwithTools,Techniques,NoSQL,andGraph”,MorganKaufmannPublishers, 2013

[3].Hadoopin PracticebyAlexHolmes, MANNING

[4].Hadoop in Action byChuckLam, MANNING

[5] Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , “Understanding Big Data Analytics for Enterprise ClassHadoopandStreamingData”, 1st Edition, TMH,2012.

[6] HienLuu, Beginning Apache Spark 2

E-resources and Other digital materials:

[1].Big Data Use cases for Beginners | Real Life Case Studies | Success Stories https://www.youtube.com/watch?v=HHR0-iJp2sM

[2]. Alexey Grishchenko, Hadoopvs MPP, https://0x0fff.com/hadoop-vs-mpp/

[3]. Random notes on bigdata- SlideShare: Available www.slideshare.net/yiranpang/random-notes-on-big-data-26439474

B. TECH VI SEMESTER

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20AD6T07 VISUAL ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: There is no prerequisite to learn this course.

Course Objective: *This* ***course*** explains apply the fundamentals of Tableau tool, Use all the basic functionality to visualize their data, Connect to various data sources, Build a variety of basic charts, Combine insights into a useable dashboard, Share and publish visualizations.

Course Outcomes: At the end of the course, student will be able to

CO1: Examine, navigate, and learn to use the various features of Tableau

CO2: Create and design visualizations and dashboards for your intended audience

CO3: apply predicative analytics to improve business decision making

CO4: Assess the quality of the data and perform exploratory analysis

CO5: Combine the data to and follow the best practices to present your story

SYLLABUS

UNIT-1:

Introduction: Tableau Application Suite, Installing and Activating Tableau Desktop, Data Preparation, Finding the Dataset, Understanding the Data, The Tableau Workspace, Saving, Opening, and Sharing Your Workbooks, Setting Up a Data Connector, Adding a Table to a Data Model, Data Extracts and Live Connections, Data Protection and Data Governance, Data Types, Data Collection with IFTTT and Google Sheets, Website Analysis with Google Analytics, Performance Optimization.

UNIT-2:

Data Visualizations and Aggregate Functions: Chart Types, Scatter Plots, Bar Charts, Legends, Filters, and Hierarchies, Line Charts, Straight Lines, Step Charts, Continuous Date Fields, Highlight Tables, Heat maps, Bullet Charts, Aggregate Functions, Calculated Fields, Aggregations in Calculated Fields, Text Operators, Splits, Date Fields, and Formats, Working with NULL Values, Parameters

UNIT-3:

Table Calculations and Maps: Different Types of Calculations, Quick Table Calculations, Customized Table Calculations, Bump Charts, Dual Axis Charts, Keywords and Syntax, Cohort Analysis, Regional Averages, Different Types of Maps, Map Layers, Maps with Pie Charts: Creating a Pie Chart Map, Dual Axis Map Embedding the Chart in Tooltips, Mapbox Maps, Mapbox in Tableau, Using the Background Map, Spatial Data.

UNIT-4:

Advanced Analytics and Interactive Dashboards: Overview of the Tableau Analytics Pane, Constant, Average, and Reference Lines, Trend Lines, Forecasts, Model Description, Cluster Analysis, Clustering in Tableau, Python, R, and MATLAB Integration, Connecting Tableau with TabPy, Security, The Dashboard Pane, Placing Charts on the Dashboard, Dashboard Actions, Filter Actions, Adding Web Content via URL Actions, Design Tips for Creating a Dashboard

UNIT-5:

Data Preparation with Tableau: Connecting to Data, Wildcard Unions, Inspecting the Data, Removing Unneeded Fields, Data Cleaning and Formatting, Cleaning Steps and Built-in Cleaning Features, Unions, Joins, Splits Grouping, Running the Flow and Outputting the Data, Saving Flows.

Text Book:

Alexander Loth, “**Visual Analytics with Tableau**”, ISBN: 978-1-119-56020-3, Wiley 2019

Reference Books:

1. "**Visual Thinking for Design”** by Colin Ware
2. "**Storytelling With Data: A Data Visualization Guide for Business Professionals”** by Cole Nussbaumer Knaflic
3. "**Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”** by Nathan Yau

B.TECH VII SEMESTER **OEC**

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20CE7T13 CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE-III)

Course Objectives:

- To introduce to the student the concept of project management including network drawing and monitoring
- To introduce various equipments like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
- to introduce the importance of safety in construction projects

Course Outcomes:

CO1: appreciate the importance of construction planning

CO2: understand the functioning of various earth moving equipment

CO3: the methods of production of aggregate products and concreting and usage of machinery required for the works.

CO4: apply the gained knowledge to project management and construction techniques

SYLLABUS

UNIT-I:

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts– critical Path Method – Applications

UNIT-II:

Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT-III:

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types

UNIT–IV:

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers –graders – scrapers– draglines - clamshell buckets

UNIT –V:

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers– selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality

control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder, Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

Reference Books:

1. Construction Project Management - An Integrated Approach, Peter Fewings, Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

B.TECH VII SEMESTER **OEC**

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20CE7T14 GREEN BUILDINGS
(OPEN ELECTIVE-III)

Course Objectives:

- To introduce the different concepts of green building techniques and how they may be synthesized to best fit a construction.
- To Know the importance of Green buildings
- To know and implement energy conservation and renewable resources
- To understand the knowledge of ECBC, LEED, GRIHA etc.

Course Outcomes:

CO1: Able to describe the importance and necessity of green building.

CO2: Able to suggest materials and technologies to improve energy efficiency of building.

CO3: Able to assess a building on the norms available for green building.

SYLLABUS

UNIT-I:

Introduction of Green Buildings, Salient features of green buildings, Advantages of Green Buildings- Sustainable site selection and planning of buildings to improve comfort, day lighting, ventilation, planning for drainage.

UNIT-II:

ENERGY EFFICIENT BUILDINGS Passive cooling and day lighting – Active solar and photovoltaic, building energy analysis methods, Lighting system design, Lighting economics and aesthetics, Impacts of lighting efficiency, Technological options for energy management.

UNIT-III:

ENERGY CONSERVATION Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings, waste to energy management in residential complexes or gated communities.

UNIT-IV:

RENEWABLE ENERGY RESOURCES Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar, windand hydro power appliances, success case studies of fully solar, wind and hydro power energies.

UNIT-V:

ENERGY REQUIREMENT AND GREEN BUILDING RATING SYSTEMS Energy

Conservation Building Code (ECBC) requirement for green buildings, Requirement for green rating systems - Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment (GRIHA), Building automation and building management systems.

Text Books:

1. 'Handbook on Green Practices published by Indian Society of Heating Refrigerating and Airconditioning Engineers', 2009
2. 'Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddyand K.S. Nanjunda Rao.
3. 'Green Building Handbook' by Tomwoolley and Samkimings, 2009

Reference Books:

1. 'Complete Guide to Green Buildings' by Trish riley.
2. 'Non-Conventional Energy Resources' by G. D. Rai, Khanna Publishers.
3. 'Standard for the design for High Performance Green Buildings' by Kent Peterson, 2009
4. Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.

B.TECH VII SEMESTER | **OEC** | **L T P C** | **3 0 0 3**

20EE7T13 CONCEPT OF POWER SYSTEM ENGINEERING (OPEN ELECTIVE-III)

Course Objective: To develop problem solving skills and understanding of Power System concepts through the application of techniques and principles of electrical Power Generation methods.

Course Outcomes: At the end of the course, student will be able to

CO1: Various electrical Power System Components, Supply systems

CO2: Thermal Power Station working procedure, each module path directions

CO3: Hydro Power Station working procedure, classifications

CO4: Nuclear Power Station working procedure, Chain Reaction

CO5: Solar power generation & Wind Power Generation, Applications

SYLLABUS

UNIT-I: Power System Components

Single line Diagram of Power system, Different kinds of supply system, conventional and Non-conventional energy sources, Applications.

UNIT-II: Thermal Power Stations

Choice of site Selection, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super, heaters, Economizers, electrostatic precipitators

UNIT-III: Hydro & Nuclear Power Stations

Choice of site, arrangement of hydroelectric installations, Hydrology. Mass curve, flow duration curve, classification of Hydro Power Plants, Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components

UNIT-IV: Solar power generation & Wind Power Generation

Solar radiation spectrum. Radiation measurement. Applications of solar thermal systems Solar Photovoltaic (SPV) systems, Introduction to wind energy, basic principles of wind energy conversion.

UNIT-V: Transmission & Distribution

Transmission structure, classifications, types of conductors, primary & secondary distribution, Substation Equipments , layout.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagarand, A Chakrabarti, DhanpatRai& Co. Pvt. Ltd.

2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers
3. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006

B.TECH VII SEMESTER **OEC**

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20EE7T14 INSTRUMENTATION (OPEN ELECTIVE-III)

Course Objectives:

1 To study the basics of measuring system.
2 To study various Electrical transducers and to measure the various types of Non–electrical quantities
3 To study various types of digital voltmeters
4 To study the working principles of various types of oscilloscopes and their applications.
5 To study various types of signal analyzers

Course Outcomes:

CO1: Able to study the basics of measuring system.
CO2: Acquire proper knowledge to use various types of Transducers and able to monitor and measure various parameters such as strain, Fow, temperature and pressure
CO3: Acquire proper knowledge and working principle of various types of digital voltmeters.
CO4: Able to measure various parameters like phase and frequency of a signal with the help of CRO.
CO5: Acquire proper knowledge and able to handle various types of signal analyzers.

SYLLABUS

UNIT-I

Basics of Measuring System: Measuring Systems, Performance Characteristics – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors and Random Errors, Statistical analysis of random errors.

UNIT-II

Transducer Basics and Applications: Definition of transducers – Classification of transducers – Advantages of Electrical transducers –Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers. Measurement of Temperature, Pressure, Strain and Flow.

UNIT-III

Digital Voltmeters: Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type DVM, digital frequency meter – Digital phase angle meter.

UNIT-IV

Oscilloscope: Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns – Sampling oscilloscope, data logger, Transient recorder.

UNIT-V

Signal Analyzers: Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co

Reference Books:

1. Measurement and Instrumentation theory and application, Alan S.Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doeblin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson/Prentice Hall ofIndia
4. Modern Electronic Instrumentation and Measurement techniques – by A.D HelfrickandW.D.Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

B.TECH VII SEMESTER	OEC	L	T	P	C
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20ME7T10 GREEN ENGINEERING SYSTEMS (OPEN ELECTIVE -III)

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: The course aims to highlight the significance of alternative sources of energy, green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

Course Outcomes: At the end of the course, student will be able to

CO1: Evaluate the impact of technology on environment

CO2: Compare biological ecology to industrial ecology

CO3: Design eco-friendly product

CO4: Create sustainable products, facilities, processes and infrastructure

CO5: Asses the life cycle of a product to evaluate its impact on energy and materials use. Determine the effects of air and water quality

SYLLABUS

UNIT-I:

INTRODUCTION: SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT-III:

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV: ENERGY EFFICIENT SYSTEMS:

(A) ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V: ENERGY EFFICIENT PROCESSES:

Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/ TMH
2. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3. Green Manufacturing Processes and Systems, Edited / J. Paulo Davim/Springer 2013

References:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international

2. Principles of Solar Engineering / D.YogiGoswami, Frank Krieth& John F Kreider / Taylor & Francis
3. Non-Conventional Energy / Ashok V Desai /New Age International (P) Ltd
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Non conventional Energy Source/ G.D Roy/Standard Publishers
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd
7. Fuel Cell Technology –Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T11 HYBRID ELECTRIC VEHICLES (OPEN ELECTIVE -III)

Pre-requisite: Internal-Combustion engines.

Course Objective:

The main objective of this course is to provide the knowledge on architecture of Hybrid Electric Vehicles, Fuel cells and their sub-systems. The focus is as well on explaining the requirements of hybrid electric vehicles and Fuel-cells for automobile applications. At the same time, various design considerations in fuel cell vehicles and electric vehicles will be explained.

Course Outcomes: At the end of the course, student will be able to

CO1:	Compare and contrast the working of Conventional and Electric Vehicles.
CO2:	Comprehend the use of Series and Hybrid Electric vehicle drive trains
CO3:	Apply the fundamentals of to develop the propulsion and storage systems for Hybrid Electric Vehicles.
CO4:	Perform a case study on Hybrid Electric vehicle drive trains for different parameters
CO5:	Describe the working principle of various types of fuel-cells.

SYLLABUS

UNIT-I:

ELECTRIC VEHICLES: Introduction, Electric Vehicle Principle- Components of Electric Vehicle Constituents of a conventional vehicle-Drive cycles and Drive Terrain, Operating principle of Fuel Cell, Differences between conventional battery and Electric battery, Transmission differences between conventional and Electric Vehicles, Differences between conventional lighting system and Electric vehicle lighting system.

UNIT-II:

HYBRID ELECTRIC VEHICLES: Introduction, A Brief history of Hybrid Electric vehicles (HEVs),Basics of Hybrid Electric Vehicles (HEVs), Architecture of HEVs-Series HEVs, Parallel HEVs, Series-Parallel HEVs.

HYBRID ELECTRIC VEHICLE DRIVE TRAINS: Parallel Hybrid Drive trains with Torque coupling, Parallel Hybrid Drive trains with both Speed coupling, Parallel Hybrid Drive trains with both speed Torque coupling.

UNIT-III:

ELECTRIC PROPULSION SYSTEMS: DC Motors- Operating principle and control of DC motors, Induction Motor Drives: Operating principle and Control Mechanisms, Brushless Motor Drives-Principle and Construction, Switched Reluctance Motor (SRM) Drives- Basic structure, Drive Convertor, Modes of Operation.

ENERGY STORAGE SYSTEMS: Electrochemical Batteries, Lead-Acid Batteries, Nickel Based Batteries, Lithium Based Batteries, Ultra Capacitors- Basic Principles and Performance, Ultrahigh-speed flywheels- Basic Principle and Power Capacity, Fly Wheel technologies.

UNIT-IV:

DESIGN OF SERIES HYBRID ELECTRIC VEHICLE DRIVES: Design of Series Hybrid Electric Vehicle Drive- Control Strategies, Sizing of Major Components and Case Study for designing for various parameters.

DESIGN OF PARALLEL HYBRID ELECTRIC VEHICLE DRIVES: Design of Parallel Hybrid Electric Vehicle Drive- Control Strategies of Drive Train and Design of Drive Train Parameters.

UNIT-V:

FUEL CELL ELECTRIC VEHICLES: Operating principles of fuel cells, Fuel and oxidant consumption, Fuel cell system characteristics, Fuel cell technologies- Proton Exchange membrane fuel cells, Alkaline Fuel cells, Phosphoric acid fuel cells, Molten carbonate fuel cells, Solid oxide fuel cells, Fuel supply- Hydrogen storage-Hydrogen production, Ammonia as hydrogen carrier, Non-Hydrogen fuel cells, Fuel Cell Hybrid Vehicle Drive Train.

Text Books:

1) MehrdadEhsani, YiminGao, Ali Emadi, 2nd edition, Modern Electric, Hybrid Electric and Fuel cell vehicles, CRC Press, Taylor and Francis Group, 2010.
2) Chris Mi, M.AbulMasrur and David WenzhongGao, 1st Edition, Hybrid Electric Vehicles, John Wiley & Sons, Ltd, 2011.

B. TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EC7T10 DATA COMMUNICATIONS (OPEN ELECTIVE-III)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To focus on information sharing and networks.
2. To Introduce flow of data, categories of network, different topologies.
3. To focus on different coding schemes.
4. To brief the students regarding protocols and standards.
5. To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices, etc.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1: Know basic knowledge of data Communication
CO2: Know basic knowledge of Analog & Digital Signals
CO3: Understand the basic knowledge of Analog Transmission
CO4: know Different types of transmission media
CO5: Focus on DTE-DCE Interface

SYLLABUS

UNIT-I:

Introduction to data communication and networking: Reason to study data communication, Data Communication, Networks, Protocols and Standards, Standards Organizations. Line Configuration, Topology, Transmission Modes, Categories of Networks Internet works. Study of OSI and TCP/IP protocol suit: The Model, Functions of the layers, TCP/IP Protocol Suites

UNIT-II:

Study of Signals: Analog and Digital, Periodic and Aperiodic Signals, Analog Signals, Time and Frequency Domains, Composite Signals, Digital Signals. Study of Digital transmission: Digital to Digital Conversion, Analog to Digital Conversion.

UNIT-III:

Study of Analog transmission: Digital to Analog Conversion, Analog to Analog Conversion. Study of Multiplexing: Many to one/one to Many, Frequency division Multiplexing, Wage division Multiplexing, Time division Multiplexing, Multiplexing applications.

UNIT-IV:

Types of transmission media: Guided Media, Unguided Media, Transmission Impairments, Performance Wavelength, Shannon Capacity, Media Comparison, PSTN, Switching. Error Detection and Correction: Types of Errors, Detection, Parity Check, Vertical Redundancy Check, Longitudinal Redundancy Check, Cyclic Redundancy Check, Checksum, Error Correction.

UNIT-V:

Study of DTE-DCE in brief: Digital data transmission, DTE-DCE Interface, Modems, 56K Modems, Cable Modems. Introduction to networks and devices: Network classes, Repeaters, Hub, Bridges, Switches, Routers, Gateways Routers, Routing Algorithms, Distance Vector Routing, Link State Routing.

Text Books:

1. Data communication & Networking by Bahrouz Forouzan.
2. Computer Networks by Andrew S. Tanenbaum

Reference Books:

1. Data and Computer Communications by William Stallings
2. Kleinrock, Leonard. Queueing Systems, Vol 1: Theory. New York, NY: Wiley J., 1975. ISBN: 0471491101.

B. Tech VII Semester **OEC**

L	T	P	C
3	0	0	3

20EC7T11 MECHATRONICS (OPEN ELECTIVE III)

Course Objective: The main objective of this course is

- To introduce the integrative nature of Mechatronics.
- To describe the basic programming, different components and devices of mechatronics systems.

Course Outcomes:
At the end of this course the student will able to:

CO1: Basic concepts of mechatronics

CO2: To design mechatronics system with the help of Microprocessor

CO3: To design PLC and other electrical and Electronics Circuits

CO4: To understand the concept of solid state Devices

CO5: To know Dynamic models & controllers

SYLLABUS

UNIT-I:

Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors.

UNIT-II:

Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontrollers – Block diagram

UNIT-III:

Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC, Basic programming in PLC.

UNIT-IV:

Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning, operational amplifiers, noise reduction, filtering.

UNIT-V:

Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trend

TEXT BOOKS:

1. Bolton, ―Mechatronics‖, Printice Hall, 2000
2. Ramesh S Gaonkar, ―Microprocessor Architecture, Programming, and Applications with the 8085‖, 5th Edition, Prentice Hall, 2008.

REFERENCE BOOKS:

1. Mechatronics System Design / Devdas shetty/Richard/Thomson.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

BIOMEDICAL INSTRUMENTATION.
20EC7T12 (OPEN ELECTIVE III)

Course Objectives:

1. To introduce student to basic biomedical engineering technology
2. To understand the anatomy & physiology of major systems of the body in designing equipment for medical treatments.
3. To impart knowledge about the principle and working of different types of bio-medical electronic equipment/devices.

Course- Outcomes:
After going through this course the student will able

CO1.To understand Physiological System of the Body and Bioelectric Potentials.

CO2.To understand Electrodes, Transducer and Sensors used in Biomedical field.

CO3 To understand the problem and identify the necessity of equipment for diagnosis and therapy.

CO4 To understand the importance of electronics engineering in medical field.

CO5 To understand the importance of telemetry in patient care

SYLLABUS

UNIT-1: INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT-II: ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.

UNIT-III: CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV: PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids, Laparoscope, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention,

UNIT-V: DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring**.**

Text Books:

1. Bio-Medical Instrumentation‖, Cromwell , Wiebell, Pfeiffer
2. Hand Book of Bio-Medical Instrumentation‖, Instrumentation‖, Kandahar. McGraw-Hill

References

1. Introduction to Bio-Medical Equipment Technology‖, 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. “Bio-Medical Electronics and Instrumentation”, Onkar N. Pandey, Rakesh Kumar, Katson Books.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

20CS7T10 ARTIFICIAL NEURAL NETWORKS. (OPEN ELECTIVE III)

Course Objectives:

- To deal with the historical developments of artificial intelligence leading to artificial neural networks (ANN).
- To introduce the basic concepts and models of ANN for solving real world problems.

Course Outcomes:

At the end of this course the student will be able to:

CO1- Understand biological neuron & artificial neuron and basic building blocks of ANN.

CO2-Understand different single layer/multiple layer Perceptron learning algorithms.

CO3- Understand and analyze Adaline and Madeline Networks and their applications

CO4- Learning algorithms based on basic gradient descent, backpropagation and their modifications.

CO5- Understand self-organization learning, ART, Radial basis Functions.

SYLLABUS

UNIT - I: Introduction to Artificial Neural Networks:

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT - II: Fundamental Models of Artificial Neural Networks:

Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS)Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.

Perceptron Networks: Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks

UNIT – III: Adaline and Madaline Networks:

Introduction, Adaline, Madaline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

UNIT - IV: Feedback Networks:

Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets.

Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT - V: Self Organizing Feature Map:

Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

Adaptive Resonance Theory: Introduction, ART Fundamentals, ART 1, ART2.

TEXT BOOKS:

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL : 2005.

REFERENCES:

1. “Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

CYBER SECURITY
20CS7T11 (OPEN ELECTIVE III)

Course Objective:

- Understand the importance of Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

Course Outcomes:

CO1: Understand and classify various forms of Cybercrimes

CO2: Interpret the reasons for Cyber offence

CO3: Detect and analyze vulnerabilities in Mobile and Wireless devices

CO4: Analyze tools used to perform cyber crimes

CO5: Understand cyber security Laws

SYLLABUS:

UNIT-I: Introduction, Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes

UNIT-II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT-III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT-IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-V: Cybercrimes and Cyber security:

The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

SOFTWARE TESTING METHODOLOGIES
20CS7T12 (OPEN ELECTIVE III)

Course Objectives:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To Understand different levels of Testing
- Apply Black Box and White Box Testing Techniques
- To learn how to plan a test project, design test cases and data, conduct testing operations, and generate a test report.
- To understand software test automation problems and solutions.

Course Outcomes:

CO1: Have an ability to apply software testing knowledge and engineering methods.

CO2: Ability to identify the needs of software test automation, and define a test tool to support test automation.

CO3: Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

CO4: Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

CO5: Apply techniques and skills to use modern software testing tools to support software testing projects.

SYLLABUS

UNIT-I: Software Testing:

Introduction, Evolution, Dichotomies, Goals & Typical Objectives of Testing, Model for testing, Software Testing Principles, **Software Testing Terminology and Methodology:** Software Testing Terminology, Errors, Defects, Failures, Root Causes and Effects, Software Testing Life Cycle, Software Testing Methodology.

UNIT-II: Verification and Validation:

Verification & Validation Activities, Categories of Test Techniques: Dynamic Testing,

Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing,

White-Box Testing: Need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT-III: Static Testing:

Inspections, Structured Walkthroughs, Technical reviews, Benefits of Static Testing, Static Vs Dynamic Testing.

Levels of Testing: Unit testing, Integration Testing,. Function testing, System testing and Acceptance testing.

Regression testing: Progressive Vs Regressive testing, Objectives of regression testing, Regression testing techniques

UNIT-IV: Test Management:

Test Organization, Test Planning, Test Design and Test case specifications, Structure of a Testing Group, Reasons for the growth of a Test suite, Test suite Minimization, Test suite prioritization, Types of test case prioritization, prioritization techniques, Measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models

Debugging: Debugging process, Debugging Techniques, Correcting Bugs, Debuggers

UNIT-V: Automation and Testing Tools:

Need for automation, Testing Tool Considerations, Test Tool Classification, Benefits and Risks of Test automation, Special Considerations for Test execution and Test Management Tools, Principles for tool selection, Testing tools- success factors, Guidelines for automated testing, overview of some commercial testing tools.

Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web **engineering**, testing of web based systems, Testing mobile systems.

TEXT BOOKS:

1. Software testing techniques - Baris Beizer, International Thomson computer press, second edition. (Unit 1)
2. Software Testing, Principles and Practices, Naresh Chauhan, Oxford Publishers(Unit 2,3,4,5)

REFERENCES:

Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

1. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
2. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

INTERNET OF THINGS
20IT7T10 (OPEN ELECTIVE III)

Course Objectives:

- Understand the architecture of Internet of Things and connected world.
- Explore on use of various hardware, communication and sensing technologies to build IoT applications
- Develop the real time IoT applications to make smart world.
- Understand challenges and future trends in IoT.

Course Outcomes:

CO1: Design and Deployment of IoT.

CO2: Design and comparing M2M with IoT.

CO3: Understand Platform design and modeling of IoT

CO4: Apply IoT in different devices using Python

CO5: Implement IoT and cloud platforms.

SYLLABUS

UNIT-I: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT Enabling Technologies, IoT levels and deployment, domains Specific IoTs.

UNIT-II: IoT and M2M :

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

UNIT-III: IoT Platforms Design Methodology:

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data Structures, control flow, functions, modules, packages, file handling. Raspberry PI with Python, other IoT devices.

UNIT-IV: IoT Protocols:

Messaging Protocols- MQ Telemetry Transport (MQTT), Constrained Application Protocol (CoAP) Transport Protocols-Light Fidelity (Li-Fi), Bluetooth Low Energy (BLE) IoT Protocols: Addressing and Identification: Internet Protocol Version 4 (IPV4), Internet Protocol Version 6(IPV6), Uniform Resource Identifier (URI)

UNIT-V: IoT Physical Servers And Cloud Offerings: Introduction to cloud storage models and communication APIs, WAMP –Auto Bahn for IoT, Xively cloud for IoT, case studies illustrating IoT design –home automation, smart cities, smart environment.

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things: A Hands-on-Approach”, VPT, 1st Edition, 2014. (Units1,2,3,5)
2. Matt Richardson, Shawn Wallace, “Getting Started with Raspberry Pi”, O’Reilly (SPD), 3rd Edition, 2014. (Unit 3)
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram “ Internet of Things” Wiley (Unit 4).

REFERENCE BOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons2014.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

COMPUTER VISION
20IT7T11 (OPEN ELECTIVE III)

Course Objectives:

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand motion analysis.
- To study some applications of computer vision algorithms

Course Outcomes:

CO1: Implement fundamental image processing techniques required for computer vision.

CO2: Perform shape analysis.

CO3: Apply Hough Transform for line, circle, and ellipse detections.

CO4: Apply 3D vision techniques.

CO5: Develop applications using computer vision techniques

SYLLABUS

UNIT - I:

IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology –texture.

UNIT - II: SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT – III: HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT - IV: 3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

.**UNIT - V: APPLICATIONS**

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

TEXT BOOKS:

1.D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.

2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.
2. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
3. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
4. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

FUZZY SETS
20HS7T01 (OPEN ELECTIVE III)

COURSE OBJECTIVES:

1) Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
2) Explain different types operations performed on fuzzy sets.
3) Provide the knowledge of Arithmetic operations on fuzzy numbers.
4) Emphasis on different kinds of crisp and fuzzy relations
5) Enable students to know the validity of arguments by fuzzy logic.

COURSE OUTCOMES:

CO1: Understand basic knowledge of fuzzy sets and fuzzy logic.
CO2: Apply various kinds of operations on fuzzy sets.
CO3: Understand the concepts of fuzzy arithmetic to solve fuzzy equations.
CO4: Illustrate the properties of fuzzy sets to design modeling software system.
CO5: Apply fuzzy logic to solve the problems in neural networks.

SYLLABUS

UNIT-I

Fuzzy Sets(all theorems without proofs): Introduction, Crisp sets, Fuzzy sets: Basic types and basic concepts, additional properties of α-cuts, representations of Fuzzy sets, extension principle for Fuzzy sets.

UNIT-II

Operations on Fuzzy Sets(all theorems without proofs): Types of operations, Fuzzy complements, Fuzzy intersections: t-norms, Fuzzy unions: t-conorms, Combinations of operations, Aggregation operations.

UNIT-III

Fuzzy Arithmetic(all theorems without proofs): Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations.

UNIT-IV

Fuzzy Relations(all theorems without proofs): Crisp versus Fuzzy relations, Projection and cylindrical extensions, Binary Fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations, Fuzzy compatibility relations, Fuzzy ordering relations, Fuzzy morphisms.

UNIT-V

Fuzzy Logic(all theorems without proofs): Classical logic: an over view, multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic hedges, Inference from conditional Fuzzy propositions, Inference from conditional and qualified propositions, Inference from quantified propositions.

TEXT BOOKS:

1. George J. Klir& Bo Yuan, Fuzzy Sets & Fuzzy Logic, Pearson Education, PHI, 1995.
2. H. J. Zimmermann, Fuzzy Set Theory and its Applications, 4th edition, Springer.

REFERENCES:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd edition, Wiley, 2010.
2. John Yen & Reza Langari, Fuzzy Logic, Pearson.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

DIGITAL MEDIA MANAGEMENT

20MB7T01 (OPEN ELECTIVE III)

Course Objective

Digital marketing channels that can helps the students to understand the increased business visibility and brand awareness. Moreover, having a professional presence on social media helps them to reach a broader target audience to secure more leads and convert them into loyal customers.

SYLLABUS

Unit – I

Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

Unit – II

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How different segments use Digital Media –

Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

Unit – III

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Writing the Marketing Plan and Implementing the Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget.

Unit – IV

Search Engine Marketing and Online Advertising: Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

Unit – V

Social Media Marketing: Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

TEXT BOOKS

1 Richard Gay, Alan Charles worth and Rita Essen, Online Marketing, Oxford University Press, 2016.

REFERENCES

1. Dave Chaffey, Fiona Ellis-Chadwick, Richard Mayer, Kevin Johnston. Internet Marketing Strategy, Implementation and Practice,3rd Ed .Prentice Hall.
2. Rob Stokes e-Marketing: The essential guide to marketing in a digital world. 5th Ed. Quirk e-Marketing (Pty) Ltd.

B. TECH VII SEMESTER

		L	T	P	C
	OEC	3	0	0	3

20MB7T02 **ENTREPRENEURSHIP DEVELOPMENT (OPEN ELECTIVE III)**

SYLLABUS

UNIT –I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.

2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International

3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20AD7T10 **DATA ANALYSIS AND VISUALIZATION WITH PYTHON (OPEN ELECTIVE III)**

Pre-requisite:

Course Objective: *This course* explains vital data science concepts and teaches you how to accomplish the fundamental tasks that occupy data scientists. You'll explore data visualization, graph databases, the use of NoSQL, and the data science process. You'll use the Python language and common Python libraries as you experience firsthand the challenges of dealing with data at scale.

Course Outcomes: At the end of the course, student will be able to

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

Unit-1:

Preliminaries: What Kinds of Data?, Why Python for Data Analysis?, Python as Glue, Solving the “Two-Language” Problem, Why Not Python?, Essential Python Libraries, Installation and Setup.

Python Language Basics, IPython, and Jupyter Notebooks: The Python Interpreter, IPython Basics, Python Language Basics.

NumPy Basics: Arrays and Vectorized Computation:

The NumPy ndarray: A Multidimensional Array Object, Universal Functions: Fast Element-Wise Array Functions, Array-Oriented Programming with Arrays, File Input and Output with Arrays, Linear Algebra, Pseudorandom Number Generation.

Unit-2:

Introduction to pandas Data Structures: Series, DataFrame, Index Objects

Essential Functionality: Reindexing, Dropping Entries from an Axis, Indexing, Selection, and Filtering, Integer Indexes, Arithmetic and Data Alignment, Function Application and Mapping, Sorting and Ranking, Axis Indexes with Duplicate Labels, Summarizing and Computing Descriptive Statistics: Correlation and Covariance, Unique Values, Value Counts, and Membership.

Unit-3:

Data Loading, Storage, and File Formats Reading and Writing Data in Text Format: Reading Text Files in Pieces, Writing Data to Text Format, Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping

Binary Data Formats: Using HDF5 Format, Reading Microsoft Excel Files

Data Cleaning and Preparation:

Handling Missing Data: Filtering Out Missing Data, Filling In Missing Data

Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, Computing Indicator/Dummy Variables

Unit-4:

Data Wrangling: Join, Combine, and Reshape:

Hierarchical Indexing: Reordering and Sorting Levels, Summary Statistics by Level, Indexing with a DataFrame's columns.

Combining and Merging Datasets: Database-Style DataFrame Joins, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap.

Reshaping and Pivoting: Reshaping with Hierarchical Indexing, Pivoting "Long" to "Wide" Format, Pivoting "Wide" to "Long" Format.

Unit-5:

Plotting and Visualization

A Brief matplotlib API Primer: Figures and Subplots, Colors, Markers, and Line , Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, matplotlib Configuration.

Plotting with pandas and seaborn: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots, Facet Grids and Categorical Data, Other Python Visualization Tools.

Text Book:

"Python for Data Analysis" Data Wrangling With Pandas, Numpy, And Ipython Second Edition by Wes McKinney, Oreilly Publications.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

20AM7T10 NoSQL DATABASES (OPEN ELECTIVE III)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains define, compare and use the four types of NoSQL Databases, demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases, explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases, ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes: At the end of the course, student will be able to

CO1: Identify the type of NoSQL database to implement based on business requirements

CO2: Apply NoSQL data modeling from application specific queries

CO3: Understand NoSQL Storage Architecture

CO4: Use Atomic Aggregates and denormalization as data modeling techniques to optimize query processing

CO5: Apply indexing and ordering of data sets

SYLLABUS

Unit-1:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented
Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

Unit-2:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

Unit-3:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value
Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

Unit-4:

NoSQL Stores: Similarities between Sql and Mongodb Query Features, Accessing Data

From Column-Oriented Databases like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution in Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

Unit-5:

Indexing and Ordering Data Sets: Essential Concepts behind a Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Reference Books:

1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional,2012.

2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications,2013.

3) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN:978-0-470-94224-6

4) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE7T15 WASTE WATER TREATMENT
(OPEN ELECTIVE-IV)

Course Objectives: To study about waste water treatment

Course Outcomes: Able to provide waste management techniques

SYLLABUS

UNIT–I:

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

UNIT–II:

Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems, Industrial waste water discharges into streams. Lakes and oceans- consequent problems.

UNIT–III:

Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries, Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods. Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT-IV:

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT–V:

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

Text Books:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

Reference Books:

1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

B.TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

20CE7T16 REPAIR AND REHABILITATION OF CONCRETE STRUCTURES

(OPEN ELECTIVE-IV)

Course Objectives:

- Familiarize Students with deterioration of concrete in structures
- Equip student with concepts of NDT and evaluation
- To evaluate the performance of the materials for repair
- To strategize different repair and rehabilitation of structures.

Course Outcomes:

CO1: Explain deterioration of concrete in structures

CO2: Carryout analysis using NDT and evaluate structures

CO3: Students must gain knowledge on quality of concrete

CO4: Examine how the Concrete repair industry equipped with variety of repair Material s and techniques .

SYLLABUS

UNIT–I:

Maintenance and Repair Strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT-II:

Causes of Damage To Structures Causes of Distress in Structures - Extrinsic and Intrinsic causes for damage of structures; Effect of Chemical and Marine Environment on structures.

UNIT-III:

Semi Destructive Tests for Damage Assessment Core Test, LOK test, CAPO test, Penetration Tests Non-Destructive Tests for Damage Assessment Rebound Hammer Test, Ultrasonic Pulse Velocity test, Resistivity Test, Carbonation Test, Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

UNIT-IV:

Materials for Repair: Criteria for durable concrete repair, selection of repair materials, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete, FRP sheets.

UNIT-V:

Techniques for Repair: Crack repair techniques – Crack Stitching, Mortar and dry pack, vacuum concrete, Shotcreting, Epoxy injection, Mortar repair for cracks Methods of Strengthening: Repairs to overcome low member strength – Jacketing, blanketing

Text Books:

1. 'Maintenance & Repair of Civil Structures' by B.L. Gupta & Amit Gupta.
2. 'Rehabilitation of Concrete Structures' by B. Vidivelli, Standard Publishers.
3. 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation' by V. K. Raina

Reference Books:

1. 'Concrete Structures- protection Repair and Rehabilitation' by R. Doodge Woodson, BH Publishers
2. ShettyM.S., "Concrete Technology – Theory and Practice", S. Chand and Company, 2008.
3. Dov Kominetzky. M. S., "Design and Construction Failures", Galgotia Publications Pvt.Ltd., 2001
4. Ravishankar.K., Krishnamoorthy. T. S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
5. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008,
6. Gambhir. M. L., "Concrete Technology", McGraw Hill, 2013

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE7T15 POWER QUALITY
(OPEN ELECTIVE-IV)

Course Objective:

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

Course Outcome:

At the end of this course the student should be able to

CO1: Differentiate between different types of power quality problems.

CO2: Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.

CO3: Analyze power quality terms and power quality standards.

CO4: Explain the principle of voltage regulation and power factor improvement methods.

CO5: Explain the power quality monitoring concepts and the usage of measuring instruments.

SYLLABUS

Unit-I

Introduction to Power Quality: Terms and definitions of transients, Long Duration Voltage Variations: Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching DC offset; waveform distortion; voltage fluctuation; power frequency variations.

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction-capacitor switching

transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics, measurement of harmonics, THD; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices" Kluwer Academic Publishers
3. Sankaran, " Power Quality" CRC Press.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis) Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE7T16 ELECTRIC VEHICLES

(OPEN ELECTIVE-IV)

Course Objective:

- To study the different drive train configurations of electric vehicles
- To propose the various propulsion and energy storage systems for EHVs
- To know the sizing of propulsion motors and other systems involved in EH vehicles
- To carry out different design case studies of EHv and BEVs

Course Outcomes: At the end of the course, the student will be able to:

CO1: Assess the performance, societal and environmental impact of EHVs having known their past history

CO2: Implement various drive train topologies and control strategies in Electric and Hybrid vehicles

CO3: Recommend, Design/Size and Control different electric propulsion units and other components of EHVs and BEVs

CO4: Appropriately select the energy storage system and strategize its management in EHVs

CO5: Define Ancillary Service Management and explain different ancillary services.

SYLLABUS

UNIT-I INTRODUCTION TO ELECTRIC VEHICLES:

History of electric vehicles (EV) and hybrid electric vehicle (EHV), need and importance of EV and HEV, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Power/energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics.

UNIT-II HYBRID ELECTRIC DRIVE-TRAINS: Basic architecture and concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

UNIT-III ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, and Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV BATTERY ENERGY STORAGE SYSTEMS:

Battery Basics - Lead-Acid Battery -Cell Discharge Operation - Cell Charge Operation-Construction-Battery Parameters - Battery Capacity-Discharge Rate - State of Charge- State of Discharge- Depth of Discharge-Technical Characteristics - Practical Capacity -Battery Energy -Constant Current Discharge -Specific Energy - Battery Power -Specific Power -Batteries for EV applications.

UNIT-V MODELLING OF EV/HEV:

Modelling and analysis of EV/HEV drive train sizing of motor, and design of traction power electronics, various vehicle subsystems.

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2010.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,2009.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

REFERENCES:

1. Jefferson, C.M., Barnard and R.H., Hybrid Vehicle Propulsion, WIT Press, Boston, 2002
2. Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012
3. SerefSoylu “Electric Vehicles - The Benefits and Barriers”, InTech Publishers, Croatia, 2011
4. Jack Erjavec and Jeff Arias, “Alternative Fuel Technology – Electric, Hybrid and Fuel Cell Vehicles”, Cengage Learning Pvt. Ltd., New Delhi, 2007
5. Seth Leitman, “Build Your Own Electric Vehicle” McGraw hill, New York, USA, 2013

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T12 **MICRO-ELECTRO- MECHANICAL SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Calculus and Differential Eq., Fundamentals of Physics (Mechanics, Optics, Electricity and magnetism), Fundamentals of Inorganic Chemistry.

Course Objective: The main objective of this course is to introduce the integrative nature of Micro Electro Mechanical systems. To describe the different components and devices of Micro Electro Mechanical systems.

Course Outcomes: At the end of the course, student will be able to

CO1:	Explain MEMS and Principles of sensing and actuation
CO2:	Explain Thermal Sensors and Actuators & Magnetic Sensors and Actuators
CO3:	Explain Micro-Opto-Electro Mechanical Systems
CO4:	Explain Radio Frequency (RF) MEMS & Micro Fluidic Systems
CO5:	Explain Chemical And Bio Medical Micro Systems

SYLLABUS

UNIT-I:

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT-II:

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, magnetic MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT-III: MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS:

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT-IV:

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

UNIT-V: CHEMICAL AND BIO MEDICAL MICRO SYSTEMS:

Sensing mechanism & principle, membrane transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (Enose), mass sensitive chemosensors, fluroscence detection, calorimetric spectroscopy.

Text Books:

1. MEMS, NitaigourPremchandMahalik, TMH Publishing co.

References:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. Bio-MEMS (Micro systems), Gerald Urban, Springer.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T13 **SOLAR ENERGY SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: To impart knowledge on non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

Course Outcomes: At the end of the course, student will be able to

CO1: Significance of renewable energy and describe the principles of solar radiation. Analyze various solar collectors.

CO2: Know the various storage methods and application of solar energy.

CO3: Understand the concept of converting wind energy into electrical energy using both horizontal and vertical axis wind machines.

CO4: Know biomass disasters, functional operation of geothermal systems. Generalize the operation of ocean, tidal and wave energy systems.

CO5: understand the operating principle of direct energy conversion systems .and to recognize the need and ability to engage in lifelong learning for further developments in this field.

SYLLABUS

UNIT-I: FUNDAMENTALS OF SOLAR RADIATION:

Energy conservation principle, Energy scenario (world and India), Solar angles, Solar time, Solar radiation: Outside earth's atmosphere, Earth surface, measurements of solar radiation: Pyrometer, Sunshine recorder, Pyro heliometer.

UNIT-II: ENERGY STORAGE SYSTEMS:

Energy –Environment-Economy Necessity of energy storage, Specifications of energy storage devices, energy storage Methods-Mechanical Energy Storage-Thermal Energy Storage-Sensible Heat Storage-Solid media storage.

UNIT-III: SOLAR COLLECTORS:

Classifications, comparison of concentrating and non-concentrating types – Liquid flat plate collectors, Evacuated tube collectors. Modified flat plate collectors: Compound parabolic concentrator(CPC), Cylindrical parabolic Concentrator, Fixed mirror solar concentrator, Paraboloid Dish Collector.

UNIT-IV: SOLAR THERMAL DEVICES:

Solar water heater, Solar space heating and cooling systems, Solar industrial heating systems, Solar refrigeration and air conditioning systems, Solar Desalination – Solar cooker: domestic, community – Solar pond – Solar drying.

UNIT-V: SOLAR PHOTOVOLTAIC SYSTEMS:

Solar cell fundamentals, Energy band model of semiconductors, Working Principle of photovoltaic cell, solar cell classification, solar cell technologies, solar PV systems-classification. Solar cell –module-array Construction.

Text Books:

1. Goswami D.Y., Kreider, J. F. and Francis., "Principles of Solar Engineering', Taylor and Francis, 2000.
2. Chetan Singh Solanki, "Solar Photovoltatics – Fundamentals, Technologies and Applications", PHI Learning Private limited, 2011.
3. Sukhatme S.P., Nayak.J.P, 'Solar Energy – Principle of Thermal Storage and collection", Tata McGraw Hill, 2008.
4. Solar Energy International, "Photovoltaic – Design and Installation Manual" – New Society Publishers, 2006.
5. Roger Messenger and Jerry Vnetre, "Photovoltaic Systems Engineering", CRC Press, 2010.

Reference Books:

1. B.H.Khan "Non – conventional Energy Resources" Tata McGraw Hill education Pvt. Ltd.
2. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons .

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

INTRODUCTION TO EMBEDDED SYSTEMS
20EC7T13 (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained
3. Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed
4. Embedded system implementation and testing tools are introduced and discussed.
   Technology capabilities and limitations of the hardware, software components
5. Design Methodologies

Course Outcomes:

At the end of the course, student will be able to

CO1: Understand the basic concepts of an embedded system and able to know an embedded system design Approach to perform a specific function.

CO2: The various embedded firmware design approaches on embedded environment.

CO3: Identify the unique characteristics of real-time systems

CO4: Design, implement and test an embedded system.

CO5: Define the unique design problems and challenges of real-time systems

SYLLABUS

UNIT-I: Introduction to Embedded systems

What is an embedded system Vs. General Computing system, history, classification, major application areas, and purpose of embedded systems, Core of embedded system, Characteristics and Quality Attributes of Embedded systems

UNIT-II: Embedded Hardware Design

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real-time clock, Application specific and Domain specific embedded systems-Examples

UNIT-III:

Embedded Firmware design approaches, Embedded Firmware Development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA,Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV:

Factors to be considered in selecting a controller, 8051 Architecture, RTOS and Scheduling Operating basics, types, RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Types of multitasking, Non preemptive Scheduling, Preemptive Scheduling.

UNIT-V: Design and Development

Embedded system development Environment – IDE, Simulators, Emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry

Text books:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.

2. Embedded Systems, Rajkamal, TMH, 2009.

References:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE

2. Embedded Systems: A Contemporary Design Tool Paperback by James K. Peckol

B. Tech VII Semester

OEC	L	T	P	C
	3	0	0	3

20EC7T14 INTERNET OF THINGS (OPEN ELECTIVE –IV)

COURSE OBJECTIVES:
The main objectives of this course are given below:

At the end of the course, student will be able to

1. To introduce the terminology, technology and its applications
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language which is used in many IoT devices
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To introduce the implementation of web-based services on IoT devices

COURSE OUTCOMES:

At the end of this course the student will able to:

At the end of the course, student will be able to

CO1: Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.

CO2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on Bwireless, energy, power, and sensing modules

CO3: Market forecast for IoT devices with a focus on sensors

CO4: Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

SYLLABUS

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Sensors, Actuators,
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II: IoT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT-III: IoT Physical Devices and Endpoints

Introduction to Arduino and Raspberry Pi- Installation,
Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT-IV: Controlling Hardware-

Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors

Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

UNIT-V: IoT Physical Servers and Cloud Offerings–

Introduction to Cloud Storage models and
communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

B. TECH VII SEMESTER	OEC	L	T	P	C
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20EC7T15 ANALOG AND DIGITAL IC APPLICATIONS (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, student will be able to

1. To understand the analysis & design of different types of active filters using op-amps
2. To learn the internal structure, operation and applications of different analog ICs
3. In this course, students can study Integrated circuits for all digital operational designs like adder, subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM.
4. Design and to develop the internal circuits for different digital operations and simulate them using hardware languages using integrated circuits.
5. Understand the concepts of Latches and Flip-Flops and Design of Counters using Digital ICs, modeling of sequential logic integrated circuits using VHDL

Course Outcomes:

At the end of the course, student will be able to

CO1: Design circuits using operational Amplifier for various applications

CO2: Understand the concept of A/D & D/A Converters

CO3: Analyze and design amplifiers and active filters using Op-amp.

CO4: Understand the concepts of Combinational logic circuits in digital system

CO5: Understand the concepts of sequential logic circuits in digital system

SYLLABUS

UNIT-I: OPERATIONAL AMPLIFIER

The Ideal Operational Amplifier; Operational Amplifier Internal Circuit. Op-Amp parameters & Measurement, DC Characteristics, input & output off set voltages & currents, slew rate, CMRR, PSRR, drift, AC Characteristics and Compensation Techniques.

UNIT-II: OPERATIONAL AMPLIFIER APPLICATIONS

Basic Op-Amp Applications; Inverting and Non-inverting amplifier,. Integrator and differentiator, Difference amplifier, Instrumentation Amplifier; AC Amplifier; V to I and I to V Converters. Op-Amp Circuits using Diodes, Sample and Hold Circuit, Comparator, Regenerative Comparator (Schmitt Trigger).

D-A AND A-D CONVERTERS Introduction; Series Op-Amp Regulator; Basic DAC Techniques Weighted Resistor DAC,R-2R DAC ; AD Converters, Flash ADC and Successive approximation Converter.

UNIT-III: FILTERS USING OP-AMP & 555 TIMERS

Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Description of Functional Diagram of 555 Timer; Monostable Operation; Astable Operation and its Applications and PLL, Applications PLL. VCO and its applications.

UNIT-IV: Digital Design Using HDL

Design flow, program structure, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Objects and Classes, Subprograms, Comparison of VHDL and Verilog HDL.

UNIT-V: Combinational And sequential Logic Design

Combinational Logic Design: Adders & Sub tractors, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Barrel Shifter, Simple Floating-Point Encoder, Dual Priority Encoder.

Sequential Logic Design: Flip-Flops, Counters, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Register. Linear feedback shift register and applications.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGrawHill,4th Edition,2005
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.

REFERENCES:

1. "Fundamentals of Digital logic design with VHDL". Stephen Brown & Zvonko Vranesic, Tata McGraw Hill, 2nd edition.2004
2. Designing with TTL Integrated Circuits: Robert L. / John R. Morris & Miller.

B. TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
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20CS7T13 DATA ANALYTICS (OPEN ELECTIVE –IV)

Course Objectives:

1. To understand Data Analytics lifecycle and Business Challenges.
2. To understand Analytical Techniques
3. To understand various tools and technologies to handle big data

Course Outcomes:

CO1: Understand big data and data analytics life cycle.
CO2: Explore various supervised learning methods.
CO3: Explore various unsupervised learning methods.
CO4: Understand and apply ARIMA model on time series data.
CO5: Learn various technology and tools in big data analytics.

SYLLABUS

UNIT-I

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the new big data Ecosystem, Examples of Big Data Analytics. Data Analytics Life Cycle: Data Analytics life cycle Overview, Discovery, Data Preparation, Model,Planning, Model Building, Communicate Results, Operationalize, Case Study.

UNIT-II

Supervised Learning: Decision Trees – Overview of Decision Trees, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree. Naive Bayes: Baye's Theorem, Naïve Baye's Classifier, Diagnostics of Classifiers.
Regression –Linear Regression, Logistic Regression.

UNIT-III

Unsupervised Learning: Association Rule Mining–Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules. Cluster Analysis – Overview of Clustering, k-means

UNIT IV

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model
Text Analysis: Text Analysis Steps, Example, Collecting Raw Data, Representing Text, TFIDF, Categorizing Documents by Topics, Determining Sentiments, Gaining Insights.

UNIT-V

Technology and Tools: MapReduce and Hadoop- Analytics for Unstructured Data, The Hadoop Ecosystem In-DataBase Analytics: SQL Essentials, In-Database Text Analysis, Advanced SQL.

TEXT BOOKS:

1. David Dietrich, Barry Hiller, “Data Science and Big Data Analytics”, EMC education services, Wiley publications, 2012.

REFERENCE BOOKS:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with
advanced analytics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O‟
Reilly, 2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

B. Tech VII Semester **OEC**

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20CS7T14 BLOCK CHAIN TECHNOLOGY (OPEN ELECTIVE –IV)

Course Objectives

By the end of the course, students will be able to

- Understand how major block chain systems work.
- To securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

Course Outcomes

CO 1: Understand the design principles of Bitcoin and Ethereum.

CO 2: Understand and apply Nakamoto consensus.

CO 3: Analyze the differences between proof-of-work and proof-of-stake consensus.

CO 4: Understand cryptocurrency

CO 5: Understand cryptocurrency Regulations

SYLLABUS

Unit I: Basics:

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Unit II: Blockchain:

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Unit III: Distributed Consensus:

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV: Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Unit V: Cryptocurrency Regulation:

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.

Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Text Book

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,”Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

B. TECH VII SEMESTER **OEC**

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20CS7T15 SOFTWARE PROJECT MANAGEMENT (OPEN ELECTIVE –IV)

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

CO1: Apply the process to be followed in the software development life-cycle models.

CO2: Apply the concepts of project management & planning.

CO3: Implement the project plans through managing people, communications and change

CO4: Conduct activities necessary to successfully complete and close the Software projects

CO5: Implement communication, modeling, and construction & deployment practices in software development.

SYLLABUS

UNIT I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

TEXT BOOKS:

1. Software Project Management, Walker Royce, Pearson Education, 2005.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

REFERENCES:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
3. Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

B. TECH VII SEMESTER **OEC**

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20IT7T13 CLOUD COMPUTING (OPEN ELECTIVE –IV)

Course Objectives:

- Explain the technology and principles involved in building a cloud environment
- To implement Virtualization
- Understand various types of cloud and its services
- Contrast various programming models used in cloud computing

Course Outcomes:

CO1: Describe the principles of parallel and distributed computing and evaluation of cloud computing from existing technologies

CO2: Illustrate Virtualization for Data-Center Automation.

CO3: Explain and characterize different cloud deployment models and service models

CO4: Program data intensive parallel applications in cloud.

CO5: Understand commercial cloud computing technologies such as AWS, AZURE and AppEngine

SYLLABUS

UNIT-I: Introduction:

Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Microsoft Aneka.

UNIT-II: Virtualization:

Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen, VMware, Microsoft Hyper – V.

UNIT-III: Cloud Computing Architecture:

Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy.

UNIT-IV: Data Intensive Computing: Map-Reduce Programming:

What is Data-Intensive Computing? Characteristics, Challenges, Historical Perspective. Technologies for Data Intensive Computing: Storage Systems, Programming Platforms.

Cloud Applications: Scientific Applications, Healthcare: ECG Analysis in the Cloud, Social Networking, Media Applications, Multiplayer Online Gaming.

UNIT-V: Cloud Platform in Industry and Cloud Applications:

Cloud Platforms in Industry: Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

TEXTBOOKS:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud Computing McGraw Hill Education.

REFERENCES:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. Cloud computing: Principles and paradigms. Vol. 87. John Wiley & Sons, 2010.
3. Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox. Distributed and cloud computing: from parallel processing to the internet of things. Morgan Kaufmann, 2013.

B. TECH VII SEMESTER **OEC**

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20IT7T14 BUSINESS INTELLIGENCE (OPEN ELECTIVE –IV)

Course Objectives:

- Introduce the concepts and components of Business Intelligence (BI)
- Evaluate the technologies that make up BI (data warehousing, OLAP)
- Identify the technological architecture that makes up BI systems

Course Outcomes:

CO1: Understand concepts and components of Business Intelligence.

CO2: Explain the complete life cycle of BI development.

CO3: Illustrate technology and processes associated with Business Intelligence framework.

CO4: Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

CO5: Ability to design expert system using AI tools.

SYLLABUS

UNIT-I:

Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence

Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

UNIT-II:

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics. **Getting started with business intelligence:** Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

UNIT-III:

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete BI professional, Popular BI tools.

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart,OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

UNIT-IV:

Business Intelligence Applications:

Marketing models: Relational marketing, Sales force management,

Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.

Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices

UNIT-V:

Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management

Artificial Intelligence and Expert Systems:

Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems

TEXT BOOKS:

1. Fundamental of Business Intelligence" Grossmann W, Rinderle-Ma Springer, 2015
2. "Fundamentals of Business Analytics" – By R N Prasad and SeemaAcharya, Publishers: Wiley India.

REFERENCE BOOKS:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : TheCompleteProject Lifecycle for Decision Support Applications, Addison WesleyInformation Technology
2. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann.

B. Tech VII Semester **OEC**

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20HS7T02 POLYMER CHEMISTRY (OPEN ELECTIVE –IV)

PREREQUISITES: Chemistry I and Chemistry II of AICTE syllabus

Course Outcomes

CO1: After studying this course, the learners are expected to: Relate polymer properties to their structure and conformation

CO2: Analyse different mechanisms of polymer formation and use this information in the synthesis of different polymers.

CO3: Distinguish between enthalpic and entropic contributions to polymerisation/crystallization.

CO4: Distinguish between absolute and relative methods for molecular weight determination.

CO5: Determine the flow properties of polymer melts and solutions.

CO6: Interpret experimental data and determine parameters such as polymerization ratesand copolymer composition.

CO7: Estimate the solubility of a given polymer in various solvents and blends.

CO8: Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.

CO9: Assess the effect of synthetic polymers on the environment.

SYLLABUS

Unit 1. Definitions, origin, nomenclature, classification and types of macromolecules; molecular weight (MW) and its distribution; Determination of molecular weight – methods for measuring number average, weight average, viscosity average MW; gel permeation chromatography; spectroscopic techniques to determine chemical composition and molecular microstructure, thermal transitions; melting temperature and glass transition temperature. Colligative properties, osmotic pressure, light scattering, refractive index, viscosity, small angle X-ray scattering (6)

Unit 2tep-Growth Polymerization: Reactivity of functional groups; kinetics; molecular weight in open and closed system cyclization vs. linear polymerization, cross-linking and gel point; process condition; step-copolymerization, examples of step polymers (3)

Unit 3. Free radical Polymerization: Nature of chain polymerization and its comparison with step polymerization; radical vs. ionic polymerizations; structural arrangements of monomer units; kinetics of chain polymerization; molecular weight and its distribution; chaintransfer, inhibition, retardation, auto-acceleration; energetic characteristics; techniques of radical polymerization – bulk, solution, emulsion, suspension polymerization; examples of polymers made by radical chain polymerization (4). Ionic Polymerization: Propagation and termination of cationic polymerization, anionic and ring opening polymerization, active polycarbanions (2)

Unit 4. Copolymerization: types of copolymers, copolymer compositions, reactivity ratio; radical and ionic co-polymerizations; Block and Graft copolymer synthesis, examples (2). Thermodynamics of polymer solutions; Flory-Huggins theory, theta conditions; solubility parameters; fractionation of macromolecules, osmotic pressure, lower criticalsolution temperature (3)

Unit 5. Naturally occurring polymers, biodegradability, biosynthesis, polymers frombio/renewable resources (2)

Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography, Electron beam, X-ray and ion sensitive resists, Conducting polymers, types, properties and applications, electroluminescence, molecular basis of electrical conductivity, Photonic applications and non-linear optics, optical information storage (3)

Text Books:

1. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur
2. Polymer chemistry and Physics of Modern Materials, 2nd edn, J. M. G. Cowie, Stanley Thornes, UK, 1998
3. Contemporary Polymer Chemistry, 3rd edn. H. R. Allcock, F. W. Lampe and J. E.Mark, Pearson
4. Polymers: Chemistry and Physics of Modern Materials, J.M.G. Cowie, CRC Press
5. Introduction to Physical Polymer Science, L. H. Sperling, Wiley
6. Introduction to Soft matter, I. W. Hamley, John Wiley and Sons, 2007
7. Polymer Chemistry, 2nd edn, P. C. Hiemenz and T. P. Lodge, CRC Press (2007)

B. TECH VII SEMESTER **OEC**

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20MB7T03 TOTAL ENGINEERING QUALITY MANAGEMENT (OPEN ELECTIVE –IV)

Course Objective

To understand the Engineering and Management aspects of Planning, Designing, Controlling and Improving Quality in Manufactured products.

Course Outcome

1. To understand the fundamentals of quality
2. To understand the role of TQM tools and techniques in elimination of wastages and reduction of defects
3. To develop quality as a passion and habit
4. To Facilitate the understanding of Quality Management principles and process.
5. The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

SYLLABUS

UNIT I

Quality Gurus And TQM Kitemarks: Definition, Need & Evolution of TQM – Contributions of Quality Guru's – Edward Deming – Joseph Juran – Philip Crosby – Genichi Taguchi – Walter Shewart – Criteria for Deming's Prize.

UNIT II

Product Design & Analysis : Dimensions of product and service quality, Basic Design Concepts and TQM – Design Assurance – Design Validation –Failure Mode Effect Analysis – Fault Tree Analysis – Design for Robustness – Value Analysis.

UNIT III

Process Improvement & Modern Production Management Tools

Control Charts – Process Capability, -Bench Marking, Six Sigma Approach – Total Productive Maintenance – Just-In-Time – Lean Manufacturing Paradigms.

UNIT IV

Quality Improvement Tools & Continuous Improvement

Traditional Q-7Tools, New Q-7 Tools, Quality Function Deployment (QFD), Kaizen 5S, Poka-Yoke, Failure Mode and Effects Analysis(FMEA) – Stages, Types, Taguchi Quality Loss Function(QFD) – Total Productive Maintenance (TPM).

UNIT V

Quality Management Systems ISO 9000, ISO 9001: 2008, QS 9000, ISO 14000, TS16949:2002 and EMS14001 certifications of quality systems- Elements, Documentation, Quality Auditing — Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.

TEXT BOOKS

1. Total Engineering Quality Management, Sunil Sharma, 1st Edition, MacMillan India Limited.
2. Total Quality Management, Poornima M. Charantimath, 2nd Edition, Pearson Education.
3. Dale H. Besterfiled, et at., “Total quality Management”, Pearson Education Asia, Third Edition, Indian Reprint 2006.

REFERENCES

1. “Quality and Performance Excellence”, James R Evans, Edition, 7th Edition, Cengage Learning.
2. “Quality Management”, Howard S Gitlow, Alan J Oppenheim, Rosa Oppenheim, David M Levine,3rd Edition , Tata McGraw Hill Limited.
3. “Fundamentals of Quality Control & Improvement”, Amitava Mitra, 3rd Edition, Wiley Publications, 2012.
4. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 8th Edition, First Indian Edition, Cengage Learning, 2012.

B. TECH VII SEMESTER **OEC**

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20MB7T04 **STRESS MANAGEMENT (OPEN ELECTIVE –IV)**

OBJECTIVES

This course examines different sources from where individuals experience a stress response. Through diligent individual and group study, students will be able to learn to apply stress management principles in order to achieve high levels of performance and understand the role of relationships to the management of stress and health.

Course Outcomes

1. Understand the physiological systems that are affected by stressors and the long-term effects and illnesses that can result from stressors.
2. Understand the specific applications of stress as it relates to the workplace and different target groups.
3. Create effective stress management plans for individual clients and for workplace environments. Enhancing significance of training and development, performance evaluation

SYLLABUS

UNIT I: UNDERSTANDING STRESS

Meaning – Symptoms – Work Related Stress – Individual Stress – Reducing Stress - Sources of stress –Consequence of stress-Burnout-symptoms of Burnout- Stress vs Burnout-Model of stress-strategies for coping stress (individual and organizational strategies)

UNIT II: TIME MANAGEMENT

Techniques – Importance of Planning the day –developing concentration – Prioritizing, Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say “No.”

UNIT III:CAREER PLATEAU

Career plateau – Identifying Career plateaus – Structural and Content - Plateauing – Making a fresh start – Importance of Sabbaticals – Counseling out – Executive leasing – Sustaining a marketable Career.

UNIT IV:CRISIS MANAGEMENT

Implications – People issues – Structure issues – Environmental issues –Learning to keep calm - Preventing interruptions – Controlling crisis – Pushing new ideas – Empowerment – Work place Humour, Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit.

UNIT V: SELF DEVELOPMENT

Improving personality – Leading with Integrity – Enhancing Creativity – Effective Decision Making – Sensible Communication – The Listening Game – Managing Self – Mediation for peace – Yoga for Life

TEXT BOOKS

1. Bhatia R.L., The Executive Track: An Action Plan for Self Development Wheeler Publishing, New Delhi

2. Charavathy. S.K, "Human Values for Manager", McGraw Hill/Henely Management Series

REFERENCES

1. Jeffr Davison, Managing Stress, Prentice Hall of India, New Delhi

2. Jerrold S Greenberg, Comprehensive Stress Management, Jain Books, 2009

B. TECH VII SEMESTER **OEC**

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20AD7T11 NATURAL LANGUAGE PROCESSING (OPEN ELECTIVE –IV)

Pre-requisite: Nil

Course Educational Objective: The Objective of the course is to make learn the basic elements of C programming, control structures, derived data types, Modular programming, user defined structures, basics of files and its I/O operations.

Course Outcomes: At the end of this course, the student will be able to

CO1: Familiar with the basic components of NLP.

CO2: Applying N-gram models to predict a sequence of text.

CO3: Build a basic language understanding system using preliminary concepts of NLTK library.

CO4: Exposure on advanced techniques for understanding patterns in text

CO5: Understand the semantics of linguistic components in a natural dialogue

Syllabus

UNIT – I:

Introduction

Knowledge in Speech and Language Processing; Ambiguity; Models and Algorithms; Language, Thought and Understanding; History Regular Expressions Regular Expression; Words; Corpora; Text Normalization; Minimum Edit Distance

UNIT – II

N-gram Language Models

N-Grams; Evaluating Language Models, Generalization and Zeros, Smoothing: Laplace Smoothing; Add-k Smoothing; Backoff and Interpolation; Kneser-Ney Smoothing

UNIT – III

Natural language processing tools in Python (NLTK Package)

Part-I: Introduction to NLTK; Tokenizing; Filtering Stop words; Stemming; Tagging parts of speech; Lemmatizing; Chunking; Chinking

Part-II: Using Named Entity Recognition (NER); Getting Text to Analyze; Using a Concordance; Making a Dispersion Plot;

UNIT – IV

Information Extraction:

Relation Extraction Algorithms; Using Patterns to extract relations; Relation extraction via supervised learning; Semi supervised relation extraction via

bootstrapping; Distant Supervision for Relation Extraction; Evaluation of Relation Extraction; Extracting Times; Extracting Events and their Times; Template Filling

UNIT – V

Word Senses and WordNet

• Defining Word Senses; How many senses do words have?

• Relations between senses

WordNet: Sense relations in WordNet; Word Sense Disambiguation; Alternate WSD algorithms and Tasks

Text Books:

1. Daniel Jurafsky, James H. Martin ,"Speech and Language Processing" , Third Edition, PHI, 2020.
2. https://realpython.com/nltk-nlp-python/#getting-text-to-analyze

Reference Books:

1. Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, 2011
2. Applied Text Analysis with Python: Enabling Language-Aware Data Products with Machine Learning, Benjamin Bengfort, Rebecca Bilbro, 2018
3. Speech and Language Processing, 2nd Edition, Daniel Jurafsky, James H. Martin, 2009

B. TECH VII SEMESTER	OEC	L	T	P	C
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20AM7T11 DEEP LEARNING (OPEN ELECTIVE –IV)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This* ***course*** explains understanding basics of deep neural networks, CNN architectures of deep neural networks, concepts of Artificial Neural Networks, basics of Data science in Deep learning, applications of deep learning in AI and Data Science

Course Outcomes: At the end of the course, student will be able to

CO1: Explain the basics in deep neural networks

CO2: Apply Convolution Neural Network for image processing

CO3: Explain the basics of Artificial Intelligence using deep learning

CO4: Apply deep learning algorithms for data science

CO5: Apply deep learning algorithms for variety applications

SYLLABUS

Unit-1:

DEEP NETWORKS BASICS

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization – Machine Learning Basics: Capacity – Over fitting and under fitting – Hyper parameters and validation sets -- Estimators -- Bias and variance -- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization -- Optimization .

Unit-2:

CONVOLUTIONAL NEURAL NETWORKS

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.

Unit-3:

DEEP LEARNING ALGORITHMS FOR AI

Artificial Neural Networks – Linear Associative Networks – Perceptrons -The Back propagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Auto encoders - Deep Backprop Networks- Auto encoders

Unit-4:

DATA SCIENCE AND DEEP LEARNING

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

Unit-5:

APPLICATIONS OF DEEP LEARNING

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion -NLP tasks - dimensionality estimation - time series forecasting - building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016

2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019

3. Vance, William, Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science (Hardcover - 2020), Joiningthedotstv Limited

4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022

5. Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018.

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B.TECH HONORS		**HN**	**4**	**0**	**0**	**4**
20MEHN01	**ADVANCED MECHANICS OF SOLIDS (Honors Engineering Course)**					

Pre-requisite: Mechanics of Solid

Course Objective: The students will acquire the knowledge:

1. To understand theories of stress and strain and Stress –strain temperature relations
2. To determine failure criteria and elastic deflections for statically indeterminate members and structures
3. To study the effect of unsymmetrical bending and curved beam theory
4. To determine the effect of Torsion with Linear elastic solution and Prandtl elastic membrane (Soap Film) Analogy
5. To solve the problems for determining contact stresses and deflections of bodies with point contact.

Course Outcomes: At the end of the course, student will be able to

CO1: Interpret failure criteria and elastic deflections for statically indeterminate members and structures.

CO2: Summarize the effect of unsymmetrical bending

CO3: Understand the effect of curved beam theory

CO4: Find the effect of Torsion with Linear elastic solution and Prandtl elastic membrane (Soap-Film) Analogy.

CO5: Solve the problems for determining contact stresses and deflections of bodies with point contact.

SYLLABUS

UNIT-I:Introduction

Theories of stress and strain, Definition of stress at a point, stress notation, principal stresses, other properties, differential equations of motion of a deformable body, deformation of a deformable body, strain theory, principal strains, strain of a volume element, small displacement theory. Stress –strain temperature relations: Elastic and non-elastic response of a solid, first law of thermodynamics, Hooke's Law, Anisotropic elasticity, Hooke's Law, Isotropic elasticity, initiation of Yield, Yield criteria.

UNIT-II:FAILURE CRITERIA:

Modes of failure, Failure criteria, Excessive deflections, Yield initiation, fracture, Progressive fracture, (High Cycle fatigue for number of cycles N > 106, buckling. Application of energy methods: Elastic deflections and statically indeterminate members and structures: Principle of stationary potential energy, Castiglione's theorem on deflections, Castiglione's theorem on deflections for linear load deflection relations, deflections of statically determinate structures.

UNIT-III:UNSYMMETRICAL BENDING:

Bending stresses in Beams subjected to Non-symmetrical bending; Deflection of straight beams due to non-symmetrical bending. Curved beam theory: Winkler Bach formula for circumferential stress – Limitations – Correction factors –Radial stress in curved beams – closed ring subjected to concentrated and uniform loads stresses in chain links.

UNIT-IV:TORSION :

Linear elastic solution; Prandtl elastic membrane (Soap-Film) Analogy; Narrow rectangular cross Section ;Hollow thin wall torsion members ,Multiply connected Cross Section.

UNIT-V:CONTACT STRESSES:

Introduction; problem of determining contact stresses; Assumptions on which a solution for contact stresses is based; Expressions for principal stresses; Method of computing contact stresses; Deflection of bodies in point contact; Stresses for two bodies in contact over narrow rectangular area (Line contact), Loads normal to area; Stresses for two bodies in line contact, Normal and Tangent to contact area.

Text Books:

1. Advanced Mechanics of materials by Boresi& Sidebottom-Wiely International.
2. Theory of elasticity by Timoschenko S.P. and Goodier J.N. McGraw-Hill Publishers 3rd Edition
3. Advanced Mechanics of Solids, L.S Srinath

Reference Books:

1. Advanced strength of materials by Den Horton J.P.

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B.TECH HONORS		**HN**	**4**	**0**	**0**	**4**
20MEHN02	**FRACTURE MECHANICS (Honors Engineering Course)**					

Pre-requisite : Mechanics of Solids

Course Objective:

1. To examine the concept of failure in members with pre-existing flaws.
2. The purpose of this course is for the student to acquire basic skills, to work professionally as an engineer.
3. This means applying fracture mechanics theory and to calculate stress areas and the "energy release rate" around crack tips and crack growth due to fatigue.
4. Failure of structural components will be examined from both the mechanics and micro structural points of view.

Course Outcomes: At the end of the course, student will be able to

CO1: Have a solid foundation in the theory, concepts and principles of fracture mechanics

CO2: Be gaining the physical intuition necessary to idealise a complicated practical problem.

CO3: Possess the analytical and computational tools needed to solve the idealised problem.

CO4: Have acquired the judgment required to interpret the results of these solutions.

CO5: Be able to use these solutions to guide a corresponding design, manufacture, or failure analysis.

SYLLABUS

UNIT-I: Introduction

Prediction of mechanical failure. Macroscopic failure modes; brittle and ductile behaviour. Fracture in brittle and ductile materials – characteristics of fracture surfaces; inter-granular and intra-granular failure, cleavage and micro-ductility, growth of fatigue cracks, The ductile/brittle fracture transition temperature for notched and unnotched components. Fracture at elevated temperature.

UNIT-II: Griffiths analysis

Concept of energy release rate, G, and fracture energy, R. Modification for ductile materials, loading conditions. Concept of R curves. Linear Elastic

Fracture Mechanics, (LEFM). Three loading modes and the state of stress ahead of the crack tip, stress concentration factor, stress intensity factor and the material parameter the critical stress intensity factor, crack tip plasticity, effect of thickness on fracture toughness.

UNIT-III:

Elastic-Plastic Fracture Mechanics; (EPFM).The definition of alternative failure prediction parameters, Crack Tip Opening Displacement, and the J integral. Measurement of parameters and examples of use.

UNIT-IV: Fatigue:

Definition of terms used to describe fatigue cycles, High Cycle Fatigue, Low Cycle Fatigue, mean stress R ratio, strain and load control. S-N curves. Goodman's rule and Miners rule. Micro mechanisms of fatigue damage, fatigue limits and initiation and propagation control, leading to a consideration of factors enhancing fatigue resistance. Total life and damage tolerant approaches to life prediction.

UNIT-V: Creep deformation:

the evolution of creep damage, primary, secondary and tertiary creep. Micro mechanisms of creep in materials and the role of diffusion. Ashby creep deformation maps. Stress dependence of creep – power law dependence. Comparison of creep performance under different conditions – extrapolation and the use of Larson-Miller parameters. Creep-fatigue interactions.

Text books:

1. T.L. Anderson, Fracture Mechanics Fundamentals and Applications, 2nd Ed. CRC press, (1995)
2. B. Lawn, Fracture of Brittle Solids, Cambridge Solid State Science Series 2nd ed1993.

Reference Books:

1. J.F. Knott, Fundamentals of Fracture Mechanics, Butterworths (1973)
2. J.F. Knott, P Withey, Worked examples in Fracture Mechanics, Institute of Materials.
3. H.L.Ewald and R.J.H. Wanhill Fracture Mechanics, Edward Arnold, (1984).
4. S. Suresh, Fatigue of Materials, Cambridge University Press, (1998)
5. L.B. Freund and S. Suresh, Thin Film Materials Cambridge University Press,(2003).

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B.TECH HONORS		**HN**	**4**	**0**	**0**	**4**
20MEHN03	**ADVANCED MACHINE DESIGN (Honors Engineering Course)**					

Pre-requisite: Design of Machine Elements

Course Objective:

- To study design concepts in order to enhance the basic design.
- To study behavior of mechanical components under fatigue and creep.
- To study statistical techniques and its applications in mechanical design.

Course Outcomes: At the end of the course, student will be able to

CO1	Ability to analyze behavior of mechanical elements under different loads
CO2	Understand the design of different transmission elements of automobile
CO3	Ability to analyze mechanical elements critically
CO4	Understand the Surface Failures
CO5	Understand the Economic Factors Influencing Design

SYLLABUS

UNIT-I: DESIGN PHILOSOPHY

Design process, Problem formation, Introduction to product design, various design models-Shigley model, Asimov model and Norton model, Need analysis, Strength considerations -standardization. Creativity and Creative techniques, Material selection in machine design, design for safety and Reliability, concept of product design

UNIT-II: FAILURE THEORIES

Static failure theories, Distortion energy theory, Maximum shear stress theory, Coulomb-Mohr's theory, Modified Mohr's theory, Fracture mechanics theory., Fatigue mechanisms, Fatigue failure models, Design for fatigue strength and life, creep: Types of stress variation, design for fluctuating stresses, design for limited cycles, multiple stress cycles,

UNIT-III: FATIGUE FAILURE THEORIES

cumulative fatigue damage, thermal fatigue and shock, harmful and beneficial residual stresses, Yielding and transformation.

UNIT-IV: SURFACE FAILURES

Surface geometry, mating surfaces, oil film and their effects, design values and procedures, adhesive wear, abrasive wear, corrosion wear, surface fatigue, different contacts, dynamic contact stresses, surface fatigue failures, surface fatigue strength.

UNIT-V: ECONOMIC FACTORS INFLUENCING DESIGN

Economic analysis, Break-even analysis, Human engineering considerations, Ergonomics, Design of controls, Design of displays. Value engineering, Material and process selection in value engineering, Modern approaches in design. Team work and Ethics in engineering design: Team formation, functioning, discharge, team dynamics, Ethical issues considered during engineering design process

Text Book(s)

1. Machine Design An Integrated Approach by Robert L. Norton, Prentice-Hall New Jersey, USA.
2. Mechanical Engineering Design by J.E. Shigley and L.D. Mitchell published by McGraw-Hill
3. International Book Company, New Delhi.

References

1. Fundamentals of machine elements by Hamrock, Schmidt and Jacobian, 2nd edition, McGraw- Hill International edition.
2. Product design and development by Karl T. Ulrich and Steven D. Eppinger. 3rd edition, Tata McGraw Hill.
3. Product Design and Manufacturing by A.K. Chitale and R.C. Gupta, Prentice Hall
4. Engineering Design / George E Dieter / McGraw Hill /2008
5. Fundamentals of machine elements/ Hamrock, Schmid and Jacobian/ 2nd edition /McGraw-Hill International edition.

B.TECH HONORS		HN	L	T	P	C
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20MEHN04	TRIBOLOGY (Honors Engineering Course)					

Pre-requisite: Fluid Mechanics – Friction, Lubrication and Design of Bearings

Course Objective:

The Students will acquire the knowledge

1. To learn basic concepts of friction and wear mechanisms, lubrication and Lubrication systems
2. To learn the selection process for rolling element bearings
3. To learn the design of the various types of hydrostatic bearings
4. To learn the design of the various types of hydrodynamic bearings
5. To learn the operating principles of various mechanical seals, failure of bearings and dry rub bearings

Course Outcomes: At the end of the course, student will be able to

CO1: Build the basic concepts of friction and wear mechanisms, lubrication and Lubrication systems

CO2: Illustrate the selection process for rolling element bearings

CO3: Understand the design of the various types of hydrostatic bearings

CO4: Analyze the design of the various types of hydrodynamic bearings

CO5: Illustrate the operating principles of various mechanical seals, failure of bearings and dry rub bearings

SYLLABUS

UNIT-I: INTRODUCTION

Nature of surfaces and contact-Surface topography-friction and wear mechanisms, wear maps, effect of lubricants- methods of fluid film formation. Lubrication: Choice of lubricants, types of oil, Grease and solid lubricants- additives-lubrication systems and their selection.

UNIT-II: SELECTION OF ROLLING ELEMENT BEARINGS

Nominal life, static and dynamic capacity-Equivalent load, probabilities of survival-cubic mean load- bearing mounting details, pre loading of bearings, conditioning monitoring using shock pulse method.

UNIT-III: HYDROSTATIC BEARINGS

Thrust bearings – pad coefficients- restriction- optimum film thickness journal bearings – design procedure –Aerostatic bearings; Thrust bearings and Journal bearings – design procedure.

UNIT-IV: HYDRODYNAMIC BEARINGS:

Fundamentals of fluid formation – Reynold's equation; Hydrodynamic journal bearings – Sommerfield number- performance parameters – optimum bearing with maximum load capacity – Friction – Heat generated and Heat dissipated. Hydrodynamic thrust bearings; Raimondi and Boyd solution for hydrodynamic thrust bearings- fixed tilting pads, single and multiple pad bearings-optimum condition with largest minimum film thickness.

UNIT-V: SEALS

Different type-mechanical seals, lip seals, packed glands, soft piston seals, Mechanical piston rod packing, labyrinth seals and throttling bushes, oil flinger rings and drain grooves – selection of mechanical seals. Failure of Tribological components: Failure analysis of plain bearings, rolling bearings, gears and seals, wear analysis using soap and Ferrography. Dry rubbing Bearings: porous metal bearings and oscillatory journal bearings – qualitative approach only.

Text Books:

1. Rowe WW& O' Dionoghue, "Hydrostatic and Hybrid bearing design " Butterworths &Co. Publishers Ltd,1983.
2. Collacott R.A," Mechanical Fault diagnosis and condition monitoring", Chapman and Hall, London 1977.
3. Bernard J.Hamrock, "Fundamentals of fluid film lubricant", McGraw-Hill Co.,1994.

References:

1. Neale MJ, (Editor) " Tribology hand Book" Neumann Butterworths, 1975.
2. Connor and Boyd JJO (Editors) " Standard hand book of lubrication engineers " ASLE, McGraw Hill Book & Co.,1968
3. Shigley J, E Charles," Mechanical Engineering Design", McGraw Hill Co.

B.TECH HONORS		**HN**	**L**	**T**	**P**	**C**
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20MEHN05	**MEASUREMENTS IN HEAT TRANSFER (Honors Engineering Course)**					

Pre-requisite: Fluid Mechanics and Heat Transfer

Course Objective:

The Students will acquire the knowledge

1. To introduce students to a selection of currently used measuring devices in heat transfer
2. To provide the students with hands on experience on carrying out a pressure and flow measurement.
3. To provide the students with hands on experience on carrying out a temperature and thermal radiation measurement.

Course Outcomes: At the end of the course, student will be able to

CO1:	Understand various basic electrical and sensing devices used in heat transfer.
CO2:	Illustrate the measurement of pressure using different types of measuring devices.
CO3:	Design and analyze various flow measuring devices
CO4:	Understand the principle of various temperature and thermal radiation measuring devices used in heat transfer.

SYLLABUS

UNIT-I:

Basic electrical measurements and sensing devices - Transducers, The variable - Resistance transducers, The differential transformer (LVDT), Capacitive transducers, Piezoelectric transducers, Photoelectric effects, Photoconductive transducers, Photovoltaic cells, Ionization transducers, Magnetometer search coil: Hall-effect transducers.

UNIT-II:

Pressure measurement: Dynamic response considerations, Mechanical pressure - Measurement devices, Dead-weight tester, Bourdon-tube pressure gauge, Diaphragm and bellows gauges, The Bridgman gauge, Low-pressure measurement. The Mcleod gauge, Pirani thermal-conductivity gauge, The Knudsen gauge, The ionization gauge, The alphatron.

UNIT-III:

Flow measurement: Positive displacement methods flow - Obstruction methods, Practical consideration for obstruction meters, The sonic nozzle. Flow measurement by drag effects, Hotwire and hot-film anemometers, Magnetic flow meters, Flow- visualization methods, The shadowgraph, The schlieren, The interferometer, The Laser Doppler Anemometer (LDA), Smoke methods, Pressure probes, Impact pressure in supersonic flow

UNIT-IV:

Measurement of temperature: Temperature scales. The ideal-gas thermometer, Temperature measurement by mechanical effect. Temperature measurement by electrical effects, Temperature measurement by radiation, Effect of heat transfer or temperature measurement, Transient response of thermal systems, Thermocouple compensation, Temperature measurements in high-speed flow.

UNIT-V:

Thermal and transport Property measurement: Thermal conductivity measurements, Thermal conductivity of liquids and gases, Measurement of viscosity, Gas diffusion, Calorimetry, Convection heat-transfer measurements. Humidity measurements, Heat-flux meters.

Thermal radiation measurements: Detection of thermal radiation, Measurement of emissivity, Reflectivity and transmissivity measurements, Solar radiation measurements.

Text Books:

1. Experimental Methods for Engineers by Holman, J.P.
2. Mechanical Measurements by Thomas G. Beckwith, N. Newis Buck.

Reference Books:

1. Measurements in Heat Transfer by Eckert and gold stein.

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B.TECH HONORS		**HN**	**4**	**0**	**0**	**4**

20MEHN06 **ADVANCED MECHANICS OF FLUIDS (Honors Engineering Course)**

Pre-requisite: Fluid Mechanics & Hydraulic Machinery

Course Objective: The course is intended to

1. Establish an understanding of the fundamental concepts of fluid mechanics.
2. Understand and apply the potential flow equations to basic flows.
3. Understand and apply the differential equations of fluid mechanics including the ability to apply and understand the impact of assumptions made in the analysis.
4. Understand the boundary layer concepts with respect to fluid flow.
5. Understand and apply the compressible flow equations.

Course Outcomes: At the end of the course, student will be able to

CO1: Understanding the concept of fluid and the models of fluids.

CO2: Understanding the basic physical meaning of general equations.

CO3: Understanding the concept of stream function and potential function.

CO4: Ability to derive the equation for viscous flow, including laminar flow and turbulent flow.

CO5: Ability to address such problems in engineering, and to solve the problems

SYLLABUS

UNIT-I:

Inviscid Flow of Incompressible Fluids: Lagrangian and Eulerain Descriptions of fluid motion- Path lines, Stream lines, Streak lines, stream tubes – velocity of a fluid particle, types of flows, Equations of three-dimensional continuity equation- Stream and Velocity potential functions.

Basic Laws of fluid Flow: Condition for irrotationality, circulation & vorticity Accelerations in Carte systems normal and tangential accelerations, Euler's, Bernoulli equations in 3D– Continuity and Momentum Equations

UNIT-II: VISCOUS FLOW

Derivation of Navier-Stoke's Equations for viscous compressible flow – Exact solutions to certain simple cases: Plain Poiseuille flow - Coutte flow with and without pressure gradient - Hagen Poiseuille flow - Approximate solutions – Creeping motion (Stokes) – Oseen's approximation.

UNIT-III: BOUNDARY LAYER THEORY

Prandtl's contribution to real fluid flows – Prandtl's boundary layer theory - Boundary layer thickness for flow over a flat plate –- Von-Karman momentum integral equation - Blasius solution- Laminar boundary layer – Turbulent Boundary Layer — Expressions for local and mean drag coefficients for different velocity profiles. – Total Drag due to Laminar & Turbulent Layers – Problems.

UNIT-IV:

Introduction to Turbulent Flow: Fundamental concept of turbulence – Time Averaged Equations – Boundary Layer Equations - Prandtl Mixing Length Model - Universal Velocity Distribution Law: Van Driest Model –Approximate solutions for drag coefficients – More Refined Turbulence Models – k- epsilon model - boundary layer separation and form drag – Karman Vortex Trail, Boundary layer control, lift on circular cylinders

Internal Flow: Smooth and rough boundaries – Equations for Velocity Distribution and frictional Resistance in smooth rough Pipes – Roughness of Commercial Pipes – Moody's diagram.

UNIT-V:

Compressible Fluid Flow – I: Thermodynamic basics – Equations of continuity, Momentum and Energy - Acoustic Velocity Derivation of Equation for Mach Number – Flow Regimes – Mach Angle – Mach Cone – Stagnation State

Compressible Fluid Flow – II: Area Variation, Property Relationships in terms of Mach number, Nozzles, Diffusers – Fanno and Releigh Lines, Property Relations – Isothermal Flow in Long Ducts – Normal Compressible Shock, Oblique Shock

Text Books:

1. Fluid Mechanics and Fluid Machines by S K Som and G Biswas, TMH
2. Fluid Mechanics by Joseph H Spurk and Nuri Aksel, Springer
3. Compressible Fluid Dynamics by B K Hodge and Keith Koenig, Pearson
4. Fluid Mechanics by Potter, Cengage Learning.
5. Fluid Mechanics and Hydraulic Machines by Dr. R.K. Bansal.

References:

1. Fluid Mechanics by Jog, Cambridge
2. Fluid Mechanics and Machinery by Khan, Oxford
3. Fluid Mechanics by Cohen and Kundu, Elsevier, 5th edition
4. Fluid Mechanics by William S Janna, CRC Press
5. Dynamics & Theory and Dynamics of Compressible Fluid Flow by Shapiro.
6. Fluid Dynamics by William F. Hughes & John A. Brighton, TMH

B.TECH HONORS		HN	L	T	P	C
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20MEHN07	ENERGY STORAGE SYSTEMS (Honors Engineering Course)					

Pre-requisite: Thermodynamics, Thermal Engineering.

Course Objective:

To provide the insights on different types of energy storage systems, principles of energy storage and applications.

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the need and scope of energy storage systems.

CO2: Comprehend the different types of energy storage systems.

CO3: Describe the direct energy storage and conversion systems.

CO4: Apply fundamental design principles for sizing of battery storage.

CO5: Understand the hybrid energy storage systems and future technologies.

SYLLABUS

UNIT-I: INTRODUCTION

Necessity of energy storage, different types of energy storage, mechanical, chemical, electrical, electrochemical, biological, magnetic, electromagnetic, thermal, comparison of energy storage technologies.

UNIT-II: ENERGY STORAGE SYSTEMS

Thermal Energy storage, sensible and latent heat, phase change materials, Energy and Exergy analysis of thermal energy storage, Electrical Energy storagesuper-capacitors, Magnetic Energy storage-Superconducting systems, Mechanical-Pumped hydro, flywheels and pressurized air energy storage, Chemical-Hydrogen production and storage.

UNIT-III:

DIRECT ENERGY STORAGE SYSTEMS: Introduction, Characteristic features of energy storage system, Photovoltaic energy storage, Electrochemical Energy Storage- Battery, primary, secondary and flow batteries. DIRECT ENERGY

CONVERSION SYSTEMS: Principle of direct energy conversion using fuel cells, thermodynamics of fuel cells, Types of fuel cells, AFC, PEMFC, MCFC, and SOFC, Microbial fuel cell and its performance.

UNIT-IV: DESIGN AND APPLICATIONS OF ENERGY STORAGE:

Renewable energy storage-Battery sizing and stand-alone applications, stationary (Power Grid application), Small scale applicationPortable storage systems and medical devices.

UNIT-V: MOBILE STORAGE APPLICATIONS:

Electric vehicles (EVs), types of EVs, batteries and fuel cells, future technologies, hybrid systems for energy storage.

Text Books:

1. Energy Storage - Technologies and Applications by Ahmed Faheem Zobaa, In Tech.
2. Fundamentals of Energy Storage by J. Jensen and B. Sorenson, Wiley-Interscience, New York.
3. Handbook of battery materials by C. Daniel, J. O. Besenhard, Wiley VCH Verlag GmbH & Co. KgaA.
4. Electric & Hybrid Vehicles by G. Pistoia, Elsevier B. V.
5. Thermal energy storage: Systems and Applications by Dincer I. and Rosen M. A., Wiley pub.

References:

1. Energy Storage: Fundamentals, Materials and Applications, by Huggins R. A., Springer.
2. Fuel cell Fundamentals by R. O'Hayre, S. Cha, W. Colella and F. B. Prinz, Wiley Pub.
3. Chemical and Electrochemical Energy System by R. Narayan and B. Viswanathan, University Press.
4. Battery Systems Engineering by C. D. Rahn and C. Wang, Wiley Pub. Electrochemical Energy Storage for Renewable sources and grid balancing by P. T. Moseley and J. Garche, Elsevier Science.
5. Compressed air energy storage by F. P. Miller, A. F. Vandome, M. B. John, VDM publishing.

B.TECH HONORS		**HN**	**L**	**T**	**P**	**C**
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20MEHN08	**ADVANCED THERMODYNAMICS (Honors Engineering Course)**					

Pre-requisite: Thermodynamics

Course Objective: The students will acquire the knowledge:

The present course on Advanced Engineering Thermodynamics deals with review on laws of thermodynamics, thermodynamics relations, exergy involvement in thermal systems, reactive mixtures, and propulsion systems.

Course Outcomes: At the end of the course, student will be able to

CO1: Distinguish the laws of thermodynamics applied to thermal systems.

CO2: Apply the thermodynamics laws to solve various thermal system problem

CO3: Analyse the thermodynamic properties of various thermal systems

CO4: Compare the exergy and irreversibility of closed and open thermal systems.

CO5: Describe the working of advanced power cycles.

SYLLABUS

UNIT-I:

THERMODYNAMICS – Introduction, Review of Zeroth, First, Second and third law of thermodynamics.

THERMODYNAMIC RELATIONS: Introduction – Reciprocity and cyclic relations – The Maxwell's relations – The Gibbs and Helmholtz relations - The Clapeyron Equation, General relations for du, dh, ds - Co-efficient of volumetric expansion - Isothermal compressibility.

UNIT-II:

KINETIC THEORY OF GASES: Kinetic theory of gases- introduction, basic assumptions, mean free path, molecular flux, collisions with a moving wall,- intermolecular forces, The Vander Waals equation of state.

UNIT-III:

NON REACTIVE MIXTURES: Review of basic thermodynamics of ideal gas mixtures, Stoichiometry, Fundamentals of combustion kinetics, General characteristics of combustion flame and detonation.

REACTIVE GAS MIXTURES: Introduction- Fuels and Combustion-theoretical and actual combustion processes- Enthalpy of formation and Enthalpy of reaction- First and Second law analysis of reacting systems- Applications.

UNIT-IV:

EXERGY AND IRREVERSIBILITY: Introduction - Availability of heat - Availability of a closed system - Availability of open system - Applications. Irreversibility for closed and open system – Effectiveness-Applications.

UNIT-V:

ADVANCED POWER CYCLES: Atkinson cycle, Lenoir cycle, second law analysis of vapour and gas power cycles, Working of Binary vapour, Cogeneration, and combined gas power cycles Applications.

Textbooks

1. Sonntag, Borgnakke, Van Wyllan, Fundamentals of Thermodynamics: 5th Edition John Wiley and Sons, 2010.
2. P.K.Nag, Engineering Thermodynamics: 4th Edition 2008, TMH.

References

1. Yunus A. Cengel& Michael Boles, Thermodynamics (An Engineering Approach) 7th Edition 2011, TMH.
2. E.Rathakrishnan, Fundamentals of Engineering Thermodynamics 2nd Edition, EEE, PHI Publishers, 2010.
3. J.P.Holman, Thermodynamics, 9th Edition, 2012, TMH.

B.TECH HONORS	**HN**	**L**	**T**	**P**	**C**
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20MEHN09 **METROLOGY AND COMPUTER AIDED INSPECTION (Honors Engineering Course)**

Course Outcomes: At the end of the course, student will be able to

CO1: Explain the significance of calibration, traceability and uncertainty

CO2: Identify measurement errors and suggest suitable techniques to minimize them

CO3: Analyze the methods and devices for dimensional metrology.

CO4: Design limit gauges

CO5: Assess surface roughness and form errors by computer aided inspection techniques.

SYLLABUS

UNIT-I:

INTRODUCTION: Metrology concepts- Abbe's principle-need for high precision measurements- problems associated with high precision measurements.Standards for length measurement- Shop floor standards and their classification- Light interference- Method of coincidence- Slip gauge calibration-measurement errors.

UNIT-II:

Various tolerances and their specifications, gauging principles, selective assembly, comparators. Angular measurements - principles and Instruments, Gear and Thread measurements

UNIT-III:

Surface and form metrology- Flatness, roughness, waviness, roundness, cylindricity, etc.

Computer Aided Metrology- principles and interfacing, software metrology.

UNIT-IV:

COMPUTER AIDED LASER METROLOGY: Laser metrology- Applications of lasers in precision measurements- Laser interferometer, speckle measurements, laser scanners.

Coordinate Measuring Machine- Non contact CMM Electro optical sensors for dimensional metrology- Non contact sensors for surface finish measurements

UNIT-V:
IMAGE PROCESSING FOR METROLOGY: Overview, Computer imaging systems, Image Analysis, Pre-processing, Human vision system, Image model, Image enhancement, grey scale models, histogram models, Image Transforms – Examples.

TEXT BOOKS:

1. A text-book of Metrology, M. Mahajan, DhanpatRai& Co, 2009.
2. Engineering Metrology, R. K. Jain, Khanna Publishers, 19/e, 2005.

REFERENCES:

3. Engineering Metrology, K. J. Hume, Mc Donald & Co (Publishers), London, 1970.
4. Metrology for Engineers, J.F.W. Galyer and C.R.Shotbolt, ELBS Edition, 5/e, 1993.
5. Engineering Metrology, Thomas. G. G, Butterworth PUB.1974.

B.TECH HONORS		**HN**	**L**	**T**	**P**	**C**
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20MEHN10	**LEAN MANUFACTURING (Honors Engineering Course)**					

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the concepts in Lean Manufacturing.

CO2: Understand the tools and methods of Lean Manufacturing.

CO3: Analyze the issues in Lean implementation.

CO4: Distinguish Lean with TPS, ERP and ISO 9001:2000.

SYLLABUS

UNIT-I: INTRODUCTION TO LEAN MANUFACTURING:
Objectives of lean manufacturing-key principles and implications of lean manufacturing- traditional Vs lean manufacturing.

UNIT-II: LEAN MANUFACTURING CONCEPTS:
Value creation and waste elimination- main kinds of waste- pull production-different models of pull production-continuous flow-continuous improvement / Kaizen- worker involvement -cellular layout- administrative lean.

UNIT-III: LEAN MANUFACTURING TOOLS AND METHODOLOGIES:
Standard work -communication of standard work to employees -standard work and flexibility -visual controls-quality at the source- 5S principles preventative maintenance-total quality management-total productive maintenance changeover/setup time -batch size reduction -production leveling.

UNIT-IV: VALUE STREAM MAPPING:
The as-is diagram-the future state map-application to the factory simulation scenario-line balancing -Poke Yoke -Kanban – overall equipment effectiveness.

UNIT-V:

Just in time manufacturing: Introduction - elements of JIT - uniform production rate – pull versus push method- Kanban system - small lot size - quick, inexpensive set-up – continuous improvement. Optimised production technology.

One-piece flow: Process razing techniques – cells for assembly line – case studies. Implementing lean: Road map-senior management Involvement-best practices.

Reconciling lean with other systems: Toyota production system-lean six sigma-lean and ERP lean with ISO9001:2000.

Text Books:

1. James P. Womack, Daniel T. Jones, and Daniel Roos, “The Machine that Changedthe World: the Story of Lean Production”, Simon and Schuster, 1996.
2. Jeffrey K. Liker, “Becoming Lean”, Industrial Engineering and Management Press,1997.
3. James P. Womack and Daniel T. Jones, “Lean Thinking”, Free Press-Business andEconomics, 2003.
4. Rother M. and Shook J., “Learning to See”, The Lean Enterprise Institute, Brookline,2003.
5. George, Michael. L. “Lean Six Sigma: Combining Six Sigma Quality with LeanSpeed”, Tata McGraw Hill Education, New Delhi, 2002.
6. Larson, Alan,“Demystifying Six Sigma : A Company-Wide Approach to Continuous Improvement”, Jaico, Mumbai, 2007.

References:

1. Askin R G and Goldberg J B, Design and Analysis of Lean Production Systems, JohnWiley and Sons Inc., 2003.
2. Micheal Wader, Lean Tools: A Pocket Guide to Implementing Lean Practices,Productivity and Quality Publishing Pvt Ltd, 2002.
3. Richard B Chase F Robert Jacobs and Nicholas J Aquilano, Operations Management for Competitive Advantage, 10th Edition, McGraw Hill/Irwin, 2003.
4. Masaaki Sato, The Toyota Leaders – An Executive Guide, Vertical Inc, New York, 2008.

B.TECH HONORS		HN	L	T	P	C
			4	0	0	4
20MEHN11	FLEXIBLE MANUFACTURING SYSTEMS (Honors Engineering Course)					

Course Outcomes: At the end of the course, student will be able to

CO1: Classify and distinguish FMS and other manufacturing systems.

CO2: Analyze processing stations and material handling systems used in FMS environments.

CO3: Design and analyze FMS using simulation and analytical techniques.

CO4: Develop management and control systems for tools, material handling and configurations in FMS.

CO5: Analyze the production management problems in planning, loading, scheduling, routing and breakdown in a typical FMS.

SYLLABUS

UNIT-I: UNDERSTANDING OF FMS:

Evolution of Manufacturing Systems, FMS: Definition, objective and Need, FMS: components, Merits, Demerits and Applications, Flexibility in Pull and Push type.

UNIT-II:

Classification of FMS Layout: FMS: Layouts and their Salient features, Single line, dual line, loop, ladder, robot centre type etc.

Salient features of processing stations: Processing stations- Machining Centers, Turning centre, Coordinate measuring machine (CMM), Washing/ Deburring station.

UNIT-III:

MHS; An introduction: Material Handling System Conveyor, Robots, Automated Guided Vehicle (AGV), Automated Storage Retrieval System (ASRS).

UNIT-IV:

Management Technology: Tool Management, tool magazine, Tool preset, identification, Tool monitoring and fault detection, FMS: Configuration planning and routing, FMS: Production Planning and Control, FMS: Scheduling and loading.

UNIT-V:

Design of FMS: Performance Evaluation introduction, Analytical model of FMS, Simulation model of FMS.

Text Books:

1. William W Luggen, "Flexible Manufacturing Cells and System" Prentice Hall of Inc New Jersey, 1991
2. Reza A Maleki "Flexible Manufacturing system" Prentice Hall of Inc New Jersey, 1991

References:

1. John E Lenz "Flexible Manufacturing" marcel Dekker Inc New York, 1989.
2. Groover,M.P "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India Pvt.Ltd. New Delhi 2009

B.TECH HONORS	**HN**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**

20MEHN12 **ROBOTICS & CONTROL (Honors Engineering Course)**

Course Outcomes: At the end of the course, student will be able to

CO1: Classify robots based on joints and arm configurations.

CO2: Design application specific End Effectors for robots.

CO3: Compute forward and inverse kinematics of robots and determine trajectory plan.

CO4: Program robot to perform typical tasks including Pick and Place, Stacking and Welding.

CO5: Design and select robots for Industrial and Non-Industrial applications.

SYLLABUS

UNIT-I:

Robotics classification, Sensors-Position sensors, Velocity sensors, Proximity sensors, Touch and Slip Sensors, Force and Torque sensors.

UNIT-II: GRIPPERS AND MANIPULATORS :

Gripper joints, Gripper force, Serial manipulator, Parallel Manipulator, selection of Robot-Selection based on the Application

UNIT-III:

Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, Direct and Inverse Kinematics for industrial robots for Position and orientation. Differential Kinematics and static- Dynamics-Lagrangian Formulation, Newton-Euler Formulation for RR & RP Manipulators,

UNIT-IV:

Trajectory planning-Motion Control- Interaction control, Rigid Body mechanics, Control architecture- position, path velocity and force control systems, computed torque control, adaptive control, and Servo system for robot control.

UNIT-V:

Programming of Robots and Vision System- overview of various programming languages Application of Robots in production systems- Application of robot in welding, machine tools, material handling, and assembly operations parts sorting and parts inspection.

Text Books:

1. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G., Robotics control, Sensing, Vision and Intelligence, McGraw-Hill Publishing company, New Delhi, 2003.
2. Klafter, R.D., Chmielewski, T.A., and Negin. M, Robot Engineering-An Integrated Approach, Prentice Hall of India, New Delhi, 2002.

Reference Books:

1. Craig, J.J., Introduction to Robotics Mechanics and Control, Addison Wesley, 1999.

B.TECH HONORS		**HN**	**L**	**T**	**P**	**C**
			4	**0**	**0**	**4**
20MEHN13	**QUALITY ENGINEERING IN MANUFACTURING (Honors Engineering Course)**					

Course Objectives: The Students will acquire the knowledge

1. To Interpret quality engineering in production design, Loss Function and Quality Level in production process
2. To explain tolerance design for Ntype. L-type and S-type characteristics and tolerance allocation
3. To interpret ANOVA techniques and need for ANOVA with multiple level factors.
4. To make use of orthogonal arrays for typical test strategies and interpolate experimental results
5. To explain six sigma DMAIC methodology and tools for process improvement in services and small organizations

Course Outcomes: At the end of the course, student will be able to

CO1: Interpret quality engineering in production design, Loss Function and Quality Level in production process

CO2: Illustrate tolerance design for N-type. L-type and S-type characteristics and tolerance allocation

CO3: Interpret ANOVA techniques and need for ANOVA with multiple level factors

CO4: Make use of orthogonal arrays for typical test strategies and interpolate experimental results

CO5: Understand six sigma DMAIC methodology and tools for process improvement in services and small organizations

SYLLABUS

UNIT-I:

QUALITY VALUE AND ENGINEERING: An overall quality system, quality engineering in production design, quality engineering in design of production processes. Loss Function and Quality Level: Derivation and use of quadratile loss function, economic consequences of tightening tolerances as a means to improve quality, evaluations and types tolerances.(N type,S type and L-type)

UNIT-II:

TOLERANCE DESIGN AND TOLERANCING: Functional limits, tolerance design for N type. L-type and S-type characteristics, tolerance allocation fbr multiple components. Parameter and Tolerance Design: Introduction to parameter design, signal to noise ratios, Parameter design strategy, some of the case studies on parameter and tolerance designs.

UNIT-III:

ANALYSIS OF VARIANCE (ANOVA): Introduction to ANOVA, Need for ANOVA, NO way ANOVA, One-way ANOVA, Two-way ANOVA, Critique of F-test, ANOVA for four level factors, multiple level factors.

UNIT-IV:

ORTHOGONAL ARRAYS: Typical test strategies, better test strategies, efficient test strategies, steps in designing, conducting and analyzing an experiment. Interpolation of Experimental Results: Interpretation methods, percent contributor, estimating the mean.

UNIT-V:

SIX SIGMA AND THE TECHNICAL SYSTEM: Six sigma DMAIC methodology, tools for process improvement, six sigma in services and small organizations, statistical foundations, statistical methodology.

Text Books:

1. Taguchi Techniques for Quality Engineering / Phillip J. Ross / McGraw Hill/ Intl. II Edition,1995.

References:

1. Quality Engineering in Production systems by G. Taguchi, A. Elsayed et al, McGraw Hill Intl.Pub 1989.
2. Taguchi Methods explained: Practical steps to Robust Design / Papan P. Bagchi I Prentice Hall Pvt.Ltd. New Delhi

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B.TECH HONORS		**HN**	**4**	**0**	**0**	**4**
20MEHN14	**PRECISION ENGINEERING (Honors Engineering Course)**					

Course Objectives: The Students will acquire the knowledge

1. Understand the BIS code fits and tolerances for geometrical dimensioning and tolerance (GD & T).
2. Understand the principal application of different measuring instruments.
3. Summarize the application of latest manufacturing techniques (Nano).

Course Outcomes: At the end of the course, student will be able to

CO1: Describes the General concept of accuracy, dimensional wear of cutting tools, location of rectangular prism alignment tests.

CO2: Understand the Influence of static stiffness, thermal effects, compliance of workpiece, Influence of vibration on accuracy

CO3: Explains Top down and bottom up approach, development of Nanotechnology, precision and micro-machining, Stereo microlithography.

CO4: Describes Nano Measuring Systems such as mechanical measuring systems, optical measuring systems.

CO5: Explores various types of Lithography, ion Beam lithography, optical lithography, LIGA process, dip pen lithography, deep UV.

SYLLABUS

UNIT-I: ACCURACY AND ALIGNMNET TEST

Accuracy and alignment tests: General concept of accuracy, Spindle rotation accuracy, test methods, displacement accuracy, dimensional wear of cutting tools, accuracy of NC systems, clamping errors, setting errors, location of rectangular prism, cylinder, basic type of tests, measuring instruments used for testing machine tools, alignment tests, straightness, flatness, parallelism, squareness, Circularity, cylindricity.

UNIT-II: INFLUENCE OF STATIC STIFFNESS,THERMAL EFFECTS

Influence of static stiffness, thermal effects: Static stiffness, nature of deformation in a machine tool, overall stiffness of a lathe, compliance of work piece, errors due to the variation of the cutting force and total compliance, accuracies due to thermal effects, methods of decreasing thermal effects-Influence of vibration on accuracy.

UNIT-III: PRECISION MACHINING

Top down and bottom up approach, development of Nanotechnology, precision and micro-machining, diamond turning of parts to nanometer accuracy. Stereo microlithography, machining of micro-sized components, mirror grinding of ceramics, ultra precision block gauges.

UNIT-IV: NANO MEASURING SYSTEMS

In-process measurement of position of processing point, post process and online measurement of dimensional features, mechanical measuring systems, optical measuring systems, electron beam measuring systems, pattern recognition and inspection systems.

UNIT-V: LITHOGRAPHY

Nano Lithography: Photolithography, nano lithography, photolithography, electron beam lithography, ion Beam lithography, optical lithography, LIGA process, dip pen lithography, deep UV.

Text Books:

1. Murthy.R.L, ―Precision Engineering in Manufacturing‖, New Age International, New Delhi, 2005.
2. Norio Taniguchi, ―Nanotechnology‖, Oxford university press, Cambridge, 1996.

References:

1. Lee Tong Hong, ―Precision Motion control, Design and Implementation‖, Springer Verlag, U.K.2001
2. Liangchi Zhang, ―Precision Machining of Advanced Materials‖, Trans Tech Publications Ltd., Switzerland, 1st Edition, 2001.
3. HiromuNakazawa, ―Principles of Precision Engineering‖, Oxford university press, 1st Edition, 1994.

B.TECH HONORS		**HN**	**L**	**T**	**P**	**C**
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20MEHN15	**AUTOMATION IN MANUFACTURING (Honors Engineering Course)**					

Course Objectives: The Students will acquire the knowledge

1. To know about the Automation and types of Automations in the industries
2. To understand the different automated flow lines in the Industries.
3. To perform one or more processing and/or assembly operations on a starting raw material, part, or set of parts.
4. To perform a sequence of automated or mechanized assembly operations Flexible manufacturing system (FMS)—a highly automated machine cell that produces part.
5. To know product families often consists of workstations comprising CNC machine tools.

Course Outcomes: At the end of the course, student will be able to

CO1:	Students will understand the process of automation and types
CO2:	Students will get exposure to workstation, which refers to the location in the factory where some well-defined task or operation is accomplished by an automated machine.
CO3:	Worker-and-machine combination or a worker using hand tools
CO4:	Understand the Automated Material handling equipments and types
CO5:	Student gets exposure on portable power tools

SYLLABUS

UNIT-I:

Introduction: Types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools, Mechanical Feeding and to changing and machine tool control transfer the automation.

UNIT-II:

Automated flow lines: Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.

Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

UNIT-III:

Assembly system and line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT-IV:

Automated material handling: Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.

Automated storage systems: Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

UNIT-V:

Fundamentals of Industrial controls: Review of control theory, logic controls, sensors and actuators, Data communication and LAN in manufacturing.

Business process Re-engineering: Introduction to BPE logistics, ERP, Software configuration of BPE.

Text Books:

1. Automation, production systems and computer integrated manufacturing/ Mikell.P Groover/PHI/3rd edition/2012,

References:

1. CAD/CAM/CIM/ P. Radha Krishnan & S. Subrahamanyarn and Raju/New Age International Publishers/2003.
2. System Approach to Computer Integrated Design and Manufacturing/ Singh/John Wiley /96.
3. Computer Aided Manufacturing/Tien-Chien Chang, Richard A. Wysk and Hsu-Pin Wang/Pearson/ 2009
4. Manufacturing and Automation Technology / R Thomas Wright and
5. Michael Berkeihiser /Good Heart/Willcox Publishers

B.TECH HONORS	HN	L	T	P	C
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20MEHN16 **MATERIALS CHARACTERIZATION TECHNIQUES (Honors Engineering Course)**

Course Objectives: The Students will acquire the knowledge

1. To understand the use the various Structure analysis tools likeX-ray diffraction
2. To apply the microscopy techniques in materials characterization.
3. To understand the concepts of thermal analysis technique.
4. To analyze the knowledge on magnetic characterization techniques.
5. To illustrate optical and electronic characterization techniques.

Course Outcomes: At the end of the course, student will be able to

CO1:	Understand the use the various Structure analysis tools like X-ray diffraction
CO2:	Apply the microscopy techniques in materials characterization..
CO3:	Understand the concepts of thermal analysis technique
CO4:	Analyze the knowledge on magnetic characterization techniques
CO5:	Illustrate optical and electronic characterization techniques.

SYLLABUS

UNIT-I:

Introduction to materials and Techniques, Structure analysis tools: X-ray diffraction: phase identification, indexing and lattice parameter determination, Analytical line profile fitting using various models, Neutron diffraction, Reflection High Energy Electron Diffraction, and Low Energy Electron Diffraction.

UNIT-II:

Microscopy techniques: Optical microscopy, transmission electron microscopy (TEM), energy dispersive Xray microanalysis (EDS), scanning electron microscopy (SEM), Rutherford backscattering spectrometry (RBS), atomic force microscopy (AFM) and scanning probe microscopy (SPM).

UNIT-III:

Thermal analysis technique: Differential thermal analysis (DTA), Differential Scanning Calorimetry (DSC), Thermogravimetric analysis (TGA); Electrical characterization techniques: Electrical resistivity, Hall effect, Magneto resistance.

UNIT-IV:

Magnetic characterization techniques: Introduction to Magnetism, Measurement Methods, Measuring Magnetization by Force, Measuring Magnetization by Induction method, Types of measurements using magnetometers: M-H loop, temperature dependent magnetization, time dependent magnetization, Measurements using AC susceptibility, Magneto-optical Kerr effect, Nuclear Magnetic Resonance, Electron Spin Resonance

UNIT-V:

Optical and electronic characterization techniques: UV-VIS spectroscopy, Fourier transform infrared spectroscopy, Raman spectroscopy, X-ray photoelectron spectroscopy.

Text Books:

1. Characterization of Materials (Materials Science andTechnology:A Comprehensive Treatment, Vol 2A & 2B,
2. Semiconductor Material and Device Characterization, 3rdEdition, D. K. Schroder, Wiley-IEEE Press (2006).
3. Materials Characterization Techniques, S Zhang, L. Li andshok Kumar, CRC Press (2008).

References:

1. Physical methods for Materials Characterization, P. E. J.Flewitt and R K Wild, IOP Publishing (2003).
2. Characterization of Nanophase materials, Ed. Z L Wang,Willet-VCH (2000).

B.TECH MINOR	**MN**	**L**	**T**	**P**	**C**
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20MEMN01 ENGINEERING MECHANICS (Minor Engineering Course)

UNIT – I

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition ofequilibrium.

UNIT II

Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction, Wedges.

Analysis of plane trusses-Method of Joints, Method of Sections.

UNIT – III

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT – IV

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation– Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation –

Rolling Bodies.

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TEXT BOOKS:

1. S.Timoshenko & D.H.Young, Engineering Mechanics, 4thEdn, McGraw Hillpublications.

2. S S Bhavikati, Engineering Mechanics,–New Age InternationalPublishers

REFERENCES:

1. I.H.Shames, Engineering Mechanics, statics and dynamics ,PearsonPubl.

2.A Nelson, Engineering Mechanics statics and dynamics, McGraw Hillpublications

3. A KTayal, Engineering Mechanics Statics and Dynamics, Umesh Publishers.

4. R.K.Bansal, Engineering Mechanics ,LaxmiPublications

5. KL Kumar,Engg. Mechanics- -Tata McGraw Hillpublications

B.TECH MINOR		MN	L	T	P	C
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20MEMN02	THERMAL ENGINEERING (Minor Engineering Course)					

Unit I

Basic Concepts Of Thermodynamics: Introduction- Macroscopic and Microscopic approaches-System, Properties of System, State, Path, Process and cycles, path and Point Functions. Thermodynamic Equilibrium, Law s of Thermodynamics

Unit II

Thermodynamic Cycles: Introduction, Carnot cycle, Basic Rankine Cycle, Diesel Cycle, Brayton Cycle, Bell-Coleman cycle.

Unit III

Internal Combustion Engines: Classification of IC Engines, Basic Engine Components- Working principles of 2-Stroke and 4-Stroke engines, Applications of I.C Engines. ENGINE SYSTEMS: Introduction, Need of Fuel supply system, ignition system, lubrication and cooling systems, supercharging and turbo charging of IC engines.

Unit IV

STEAM TURBINE POWER PLANT COMPONENTS: Introduction, steam turbine power plant Components, Methods to improve efficiency of steam power cycle. GAS TURBINE POWER PLANT COMPONENTS: Introduction, Gas turbine plant and Its Components, Classification of Gas Turbine plants and its applications.

Unit V

HEAT TRANSFER: Basic Modes of Heat Transfer- Basic laws of Heat transfer- - Steady and unsteady state heat Transfer, Applications of heat transfer. ELECTRONIC COOLING SYSTEM: Introduction, Need of electronic cooling, Air and liquid cooling systems, cooling of printed circuit boards (PCBs).

Text Book(s):

1. P.K.Nag, Engineering Thermodynamics, 5/e, Tata McGraw Hill,2013.
2. R.K.Rajput, Thermal Engineering, Laxmi publications, 5th Edition, 2005.

References

1. Arora &Domkundwar, A course in Power Plant Engineering- DhanpatRai&Company 5th Revised Reprint Edition, 2004.

2. R.C.Sachdeva - Fundamentals of Engineering Heat and Mass Transfer — New Age Science Publishers, 3nd Edition, 2009.

B.TECH MINOR		MN	L	T	P	C
			3	1	0	4
20MEMN03	PRODUCTION TECHNOLOGY (Minor Engineering Course)					

UNIT – I

CASTING: Steps involved in making a casting. Patterns – Types of patterns – Materials used for patterns, pattern allowances, Gating ratio and design of Gating systems. Risers – Types, function and design, casting design considerations. Gases in metals. Solidifications. General defects in castings. Basic principles and applications of Centrifugal casting, Die casting and Investment casting-advantages, disadvantages and applications.

UNIT – II

WELDING: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, Manual metal arc welding, Submerged arc welding, Inert Gas welding- TIG & MIG welding-advantages, disadvantages and applications. Welding defects – causes and remedies – destructive and non- destructive testing of welds. Introduction to brazing & soldering.

UNIT – III

METAL FORMING: Hot working and Cold working, Strain hardening and Annealing. Bulk forming processes: Forging - Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing. Introduction to powder metallurgy – compaction and sintering, advantages and applications.

UNIT – IV

SHEET METAL FORMING: - Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools. High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electrohydraulic forming, rubber pad forming, advantages and limitations.

UNIT – V

Plastics and Polymers: Introduction, Types of plastics and Composites based on plastics.

Processing of Plastics:

Thermoplastics: Blow and Injection molding**,**

Thermosets: Liquid Molding Process, Reaction injection molding, Resin transfer molding

Text Books:

1. P.N. Rao, Manufacturing Technology -Vol I- 1st edition, Tata McGraw Hill Education and 2013

2.Mikell P. Groover. Fundamentals of Modern Manufacturing Materials, Processes, and Systems -John Wiley publications, 4th edition and 2010.

References:

1.A.Ghosh&A.K.Malik – Manufacturing Science - East West Press Pvt. Ltd, 2nd edition and 2010.

2.Allyn and Bacon - Process and materials of manufacture- PHI publisher, 4th Edition, 1990.

3. R.K. Jain - Production Technology, Khanna Publisher 1st edition and 2015.

4.P C Sharma- Production Technology - S. Chand, 1st edition and 2006.

5.H.S. Shaun - Manufacturing Processes- Pearson publication, 1st edition, 2012.

6.J.P. Kaushish - Manufacturing Processes- PHI publication, 1st edition and 2010.

7.Charles A. Harper, Edward M. Petrie, Plastics Materials and Processes: A Concise Encyclopedia, John Wiley Publications.

B.TECH MINOR		**MN**	**L**	**T**	**P**	**C**
			3	**1**	**0**	**4**
20MEMN04	**FUNDAMENTALS OF ENGINEERING DESIGN (Minor Engineering Course)**					

UNIT- I

INTRODUCTION – Design philosophy – Introduction - Basic concept of machine design – Types of design - Types of design based on methods - Factors to be considered in machine design – Problems. Engineering Materials – Introduction – Ferrous, non-ferrous materials – Non metals, Mechanical properties of common engineering materials. Design and manufacturing – Introduction – Types of limits, fits - Preferred numbers - Common manufacturing processes.

UNIT - II

SYSTEM OF FORCES: Introduction, Basic terminology in Mechanics, laws of Mechanics, characteristics of force, system of forces-types, Resolution and Composition of forces, Resultant of coplanar concurrent force system, Resultant of coplanar non-concurrent force system-moment of a force and couple. EQUILIBRIUM OF SYSTEM OF FORCES: Free Body Diagram, Lami's theorem, Equilibrium of a rigid body subjected to coplanar concurrent forces and non-concurrent forces, Equilibrium of connected bodies.

UNIT - III

SIMPLE STRESSES: Introduction – load, stress, strain, types of stress and strain, stress-strain diagram, factor of safety, types of modulus, poison's ratio, relation between different types of modulus, stresses due to axial loads. BENDING AND TORSIONAL STRESSES: Bending stress in straight beams, bending equation, Torsion, torsional shear stress, torsion equation, Theories of failure, problems.

UNIT – IV

ANALYSIS OF COMBINED STRESSES: State of plane stress at a point in stressed body, Normal and Tangential stresses on inclined planes - Principal stresses and their planes - Plane of maximum shear - Mohr‘s circle of stresses. SHAFT DESIGN-Introduction, materials used for shafts, manufacturing of shafts, types of shafts, stresses in shafts.

UNIT - V

BELT AND ROPE DRIVES: Introduction - Selection of belt drive- Types of belt drives materials- Velocity ratio- Slip -Creep - Tensions for flat belt drive& V-belt drive -Angle of contact Centrifugal tension- Maximum tension – Rope drives. GEARS: Introduction, Terminology, Types, Law of gearing- Profile for gears- Involute action Path of contact, Arc of contact, Contact ratio- Velocity of sliding –Interference and Undercutting.

TEXT BOOKS

1.S.S. Bhavikatti, Engineering Mechanics, 4thedition, New Age International (P) Ltd, 2012.

2. Sadhu Singh, ―Strength of Materials‖, Khanna Publishers, 10thEdition, 2013.

3. Rattan S.S, ―Theory of Machines‖, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011.

4. Bhandari V.B, Design of Machine Elements, 3rdEdition, Tata McGraw Hill 2010.

REFERENCES

1. Manoj K Harbola, Engineering Mechanics, 2nd edition, Cengage Learning, 2012.

2. S.Ramamrutham, ―Strength of Materials‖, 14thEdition, DhanpatRai& Sons, 2011.

3. Sadhu Singh ―Theory of Machines‖, 3rd Edition, Pearson Education, 1997.

4. Shigley J.E and Mischke C. R., Mechanical Engineering Design, 6thEdition, Tata McGraw Hill, 2003

B.TECH MINOR		**MN**	**L**	**T**	**P**	**C**
			3	**1**	**0**	**4**
20MEMN05	**PRODUCTION PLANNING AND CONTROL (Minor Engineering Course)**					

UNIT – I

Introduction : Definition – Objectives of production Planning and Control – Functions of production planning and control – Elements of production control – Types of production – Organization of production planning and control department – Internal organization of department.

UNIT – II

Forecasting – Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – qualitative methods and quantitative methods.

UNIT – III

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P–Systems and Q-Systems. Introduction to MRP I,MRP II & ERP, LOB (Line of Balance), JIT and CANBAN system.

UNIT –IV

Routing – Definition – Routing procedure –Route sheets – Bill of material – Factors affecting routing procedure. Schedule –definition – Difference with loading

UNIT – V

Scheduling Policies – Techniques, Standard scheduling methods, line balancing, Aggregate planning, Expediting, controlling aspects.

Dispatching – Activities of dispatcher – Dispatching procedure – follow up – definition – Reason for existence of functions – types of follow up.

TEXT BOOKS :

1.Samuel Eilon, Elements of Production Planning and Control.

2. Partik Jonsson Stig-Arne Mattsson, Manufacturing, Planning and Control, Tata McGraw Hill.

REFERENCES:

1. S.N. Chary, Operations Management.

2. Martin K. Starr and David W. Miller, Inventory Control Theory and Practice.

3. Kumar Reddy,Reliability Engineering & Quality Engineering,Galgotia Publications, Pvt., Limited.

4.John E. Biegel, Production Control A Quantitative Approach.

5. Moore, Production Control.

B.TECH MINOR		**MN**	**L**	**T**	**P**	**C**
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20MEMN06 **MATERIALS TECHNOLOGY (Minor Engineering Course)**

UNIT-I

ENGINEERING MATERIALS: Introduction, classification of engineering materials and their mechanical properties. Bonds in solids: Ionic bond, covalent bond and metallic bond. Mechanism of crystallization of metals, grain and grain boundaries, Effect of grain boundaries on the properties of metals and alloys – Determination of grain size. CONSTITUTION OF ALLOYS: Necessity of alloying, Solid Solutions-Interstitial Solid Solution and Substitution Solid Solution, Hume Rothery rules.

UNIT-II

EQUILIBRIUM DIAGRAMS: Experimental methods of construction of equilibrium diagrams, Classification of equilibrium diagrams- isomorphous, eutectic, partial eutectic equilibrium diagrams. Equilibrium cooling and heating of alloys, lever rule, coring. Study of Cu-Ni and Bi-Cd equilibrium diagrams.

UNIT-III

FERROUS METALS AND ALLOYS: Study of Iron-Iron carbide equilibrium diagram. Transformations in the solid state – allotropy, eutectic, eutectoid, peritectoid reactions. STEEL: Classification of steels, structure, properties and applications of plain carbon steels, low carbon steel, medium carbon steel and high carbon steel.

CAST IRONS: Structure, properties and applications of white cast iron, malleable cast iron, grey cast iron, spheroidal graphite cast iron. NON FERROUUS MATERIALS: Properties and applications of aluminium and copper.

UNIT-IV

HEAT TREATMENT OF ALLOYS: Annealing, normalizing and hardening. Construction of TTT diagram for eutectoid steel. Hardenability-determination of harden ability by jominy end quench test. Surface hardening methods and age hardening treatment and applications.

UNIT-V

NON-METALLIC MATERIALS: Introduction and classification of non metallic materials. Classification of Polymers on basis of Thermal behavior (Thermoplastics & Thermosetting). Properties and applications of polymers. COMPOSITES: Introduction of composite, Characteristics of composites, Constituents of composite, Types and applications of composites.

TEXT BOOKS

1. V.D.Kotgire, S.V.Kotgire, Material Science and Metallurgy, Everest Publishing House, 24thEdition, 2008.
2. Sidney H. Avener, Introduction to Physical Metallurgy, Tata McGraw-Hill, 3rdEdition, 2011.

REFERENCES

1. Richard A.Flinn, Paul K.Trojan, Engineering Materials and Their Applications, Jaico Publishing House, 4thEdition, 1999.
2. William and callister, Materials Science and engineering, Wiley India private Ltd., 2011.
3. U.C Jindal and AtishMozumber, Material since and metallurgy, Pearson education- 2012.

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20MEMN07	**BASICS OF MECHANICAL ENGINEERING (Minor Engineering Course)**					

Unit-I

Heat and Work: Heat and Work, Point and Path function. Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM I, Problems on heat and work for various processes.

First law of thermodynamics, application of steady flow energy equation to various components of a power plant (boiler, turbine, condenser and pump), Carnot engine.

UNIT-II

Introduction to cycles: Power cycle: Introduction to 2 stroke and 4 stroke engine, Otto cycle, Diesel cycle, problems on Otto and Diesel cycle

Refrigeration cycle: Refrigerant, Vapour compression refrigeration (VCR) cycle, Problems on VCR cycle, vapour absorption refrigeration cycle, domestic refrigerator, window and split AC.

Unit-III

Hydro Prime Movers: Hydraulic Turbines: Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine, Performance and characteristic curves.

Hydro Power: Components of hydro-electric power plant, Estimation of water power potential, Estimation of load on turbines: load curve, load factor, capacity factor, utilization factor, diversity factor, load-duration curve, firm power, secondary power, prediction of load.

Unit-IV

Introduction to Engg. Mechanics – Basic Concepts. Systems of Forces: Coplanar Concurrent Forces– Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. LamisTheorm, analysis of plane trusses.

Unit-V

Stresses and strains: kinds of – stress-strains, elasticity and plasticity, Hooks law, stress –strain diagrams, modules of elasticity, Poisson's ratio, linear and volumetric strain, relation between E, N, and K, bars of uniform strength, compound bars and temperature stresses.

Types of supports– loads – Shear force and bending moment for cantilever and simply supported beams without overhanging for all types of loads.

Text books:

1. PK Nag, Engineering Thermodynamics, 4th Edn , TMH.
2. Dr. P.N. Modi& Dr. S.M. Seth,Hydraulics & Fluid Mechanics Including Hydraulics Machines,Rajsons Publications, 21st Ed., 2017.
3. S.Timoshenko&D.H.Young, Engg. Mechanics, 4th Edn, McGraw Hill publications.
4. S SBhavikatti, Strength of materials,Lakshmi publications.

References:

1. S Trymbaka Murthy, A Textbook of Elements of Mechanical Engineering, University Press(India) Pvt Ltd, 4th Edition, 2006.

B.TECH MINOR		**MN**	**L T P C** **3 1 0 4**
20MEMN08	**AUTOMOBILE ENGINEERING (Minor Engineering Course)**		

UNIT - I

Introduction to vehicle structure and engine components: Vehicle construction - Chassis and body - Specifications - Engine - Types - Construction - Location of engine - Cylinder arrangement - Construction details - Cylinder block - Cylinder head - Cylinder liners - Piston – piston rings - Piston pin - Connecting rod - Crankshaft - Valves. Lubrication system - Types - Oil pumps - Filters - Cooling system - Types - Water pumps - Radiators - Thermostats - Anti-freezing compounds.

UNIT - II

Ignition, fuel supply and emission control system: Ignition system - Coil and Magneto - Spark plug - Distributor – Electronic ignition system - Fuel system - Carburetor - Fuel pumps - Fuel injection systems - Mono point and Multi point – Unit injector – Nozzle types - Electronic Fuel Injection system (EFI) – GDI, MPFI, DTSI-Automobile Emissions - Source of formation – Effects on human health and environment - Control techniques - Exhaust Gas Recirculation (EGR) - Catalytic converter - Emission tests and standards (Indian and Europe)

UNIT - III

Transmission system: Clutches - Function - Types - Single plate, Multiple plate and Diaphragm Clutch – Fluid coupling - Gearbox - Manual - Sliding - Constant - Synchromesh - Overdrive – Automatic transmission - Torque converter - Epicyclic and Hydromatic transmission – Continuously variable transmission - Universal joint - Propeller shaft - Hotchkiss drive – Final drive - Rear axle assembly - Types -Differential - Need - Construction – Non-slip differential – Differential locks - Four wheel drive.

UNIT - IV

Steering, suspension and braking system: Principle of steering - Steering Geometry and wheel alignment - Steering linkages – Steering gearboxes - Power steering - front axle - Suspension system - Independent and Solid axle

– coil, leaf spring and air suspensions - torsion bar - shock absorbers – Wheels and Tires - Construction - Type and specification - Tire wear and causes - Brakes - Needs – Classification –Drum and Disc Mechanical - Hydraulic and pneumatic - Vacuum assist – Retarders – Anti-lock Braking System(ABS).

UNIT - V

Automobile electrical systems, instrumentation and advances in automobile engineering: Battery-General electrical circuits-Dash board instrumentation - Passenger comfort – Safety and security - HVAC - Seat belts - Air bags - Automotive Electronics - Electronic Control Unit (ECU) - Variable Valve Timing (VVT) - Active Suspension System (ASS) - Electronic Brake Distribution (EBD) – Electronic Stability Program(ESP) Traction Control System (TCS) - Global Positioning System (GPS) - X-by-wire - Electric - Hybrid vehicle.

TEXTBOOKS:

1. William.H.Crouse, Automotive Mechanics, 10/e Edition, McGraw-Hill, 2006.
2. David A. Corolla, Automotive Engineering: Powertrain, Chassis System and Vehicle Body, Butterworth-Heinemann Publishing Ltd., 2009.
3. Richard Stone, Jeffrey K. Ball, Automotive Engineering Fundamentals, SAE International, 2004.

REFERENCES:

1. Bosch, Automotive Hand Book, 6/e SAE Publications, 2007.
2. K. Newton and W. Steeds, The motor vehicle, 13/e Butterworth-Heinemann Publishing Ltd.
3. Kirpal Singh, Automobile Engineering, Vol.1&2, Standard Publications.