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	Hours per week: Tutorial	Hours per week: Practical	Contact Hours	Credits
Professional Elective-III				3	0	0	3	3
1	20EE7T01	PEC-III	Power Electronic Control of Electric Drives					
	20EE7T02		High Voltage Engineering					
	20EE7T03		Smart Grid Technologies					
	20EE7T04		Advanced control systems					
Professional Elective -IV				3	0	0	3	3
2	20EE7T05	PEC-IV	Digital Signal Processing					
	20EE7T06		Special electrical machines					
	20EE7T07		HVDC & FACTS					
	20EE7T08		Evolutionary Algorithms and Applications					
Professional Elective -V				3	0	0	3	3
3	20EE7T09	PEC-V	IoT Applications in Electrical Engineering					
	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	Hours per week: Tutorial	Hours per week: 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	3D Printing	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).

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

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

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 (H2-O2, CH3OH-O2, 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

B.TECH II SEMESTER	BSC	L	T	P	C
		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**,** 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

	L	T	P	C
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

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

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

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

B.TECH III SEMESTER

	L	T	P	C
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

		L	T	P	C
B.TECH IV SEMESTER	**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

		L	T	P	C
B.TECH IV SEMESTER	**PCC**	**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

	L	T	P	C
HSMC	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	PCC	L	T	P	C
		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

	L	T	P	C
PCC	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.

		L	T	P	C
B.TECH IV SEMESTER	**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

	L	T	P	C
SC	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

MC	L	T	P	C
	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., 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, 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

	L	T	P	C
PCC	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**

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3	0	0	3

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
3	0	0	3

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**

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3	0	0	3

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

	L	T	P	C
PEC	3	0	0	3

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

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

B.TECH V SEMESTER **PCC**

L	T	P	C
0	0	3	1.5

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.

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

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

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.

B.TECH VI SEMESTER **PCC**

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3	0	0	3

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	L	T	P	C
		3	0	0	3

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

	L	T	P	C
PCC	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	L	T	P	C
		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

	L	T	P	C
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

	L	T	P	C
B.TECH VI SEMESTER 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 VII 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 VII 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 VII 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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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**
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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	L	T	P	C
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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.

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B.TECH VII SEMESTER	**PEC**	**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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HSMC	3	0	0	3

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 **SC**

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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., 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	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

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

	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
	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**
		3	**0**	**0**	**3**

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

	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

	L	T	P	C
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.

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.

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B.TECH VI SEMESTER	**OEC**	**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
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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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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

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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**

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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**

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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

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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

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
	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

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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

OEC	L	T	P	C
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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**

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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**

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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**

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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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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

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 **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 **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

		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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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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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**

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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**
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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**

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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.

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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

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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

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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

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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

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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 networksand 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.