CIVIL ENGINEERING
COURSE STRUCTURE
B. TECH I SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contac tHours	Credits
				Lecture	Tutorial	Practical		
1	20CE1T01	BSC	Linear Algebra and Differential Equations	3	-	-	3	3
2	20CE1T02	BSC	Engineering Physics	3	-	-	3	3
3	20CE1T03	HSMC	English	3	-	-	3	3
4	20CE1T04	ESC	Building Materials & Construction	3	-	-	3	3
5	20CE1T05	ESC	Engineering Graphics	1	-	4	5	3
6	20CE1L06	HSMC LAB	English Communication Skills Lab	-	-	3	3	1.5
7	20CE1L07	BSC LAB	Engineering Physics Lab	-	-	3	3	1.5
8	20CE1L08	ESC LAB	Civil Engineering Workshop	-	-	3	3	1.5
Total number of credits								**19.5**

B. TECH II SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE2T01	BSC	Transform Techniques	3	-	-	3	3
2	20CE2T02	BSC	Engineering Chemistry	3	-	-	3	3
3	20CE2T03	ESC	Engineering Mechanics	3	-	-	3	3
4	20CE2T04	ESC	Building Planning and Drawing	3	-	-	3	3
5	20CE2T05	ESC	Problem Solving Through C	3	-	-	3	3
6	20CE2L06	BSC LAB	Engineering Chemistry Lab	-	-	3	3	1.5
7	20CE2L07	ESC LAB	Computer Aided Building Drawing Lab	-	-	3	3	1.5
8	20CE2L08	ESC LAB	Problem Solving Through C Lab	-	-	3	3	1.5
9	20CE2M09	MC	Environmental Science	2	-	-	2	-
Total number of credits								**19.5**

B. TECH III SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE3T01	BSC	Numerical Methods and Vector calculus	3	-	-	3	3
2	20CE3T02	PCC	Strength of Materials	3	-	-	3	3
3	20CE3T03	PCC	Fluid Mechanics	3	-	-	3	3
4	20CE3T04	PCC	Concrete Technology	3	-	-	3	3
5	20CE3T05	PCC	Surveying	3	-	-	3	3
6	20CE3L06	PCC LAB	Strength of Materials Lab	-	-	3	3	1.5
7	20CE3L07	PCC LAB	Surveying Field Work	-	-	3	3	1.5
8	20CE3L08	PCC LAB	Concrete Technology Lab	-	-	3	3	1.5
9	20CE3S09	SC	AUTO CAD 2D&3D	-	-	4	4	2
Total number of credits								**21.5**

B. TECH IV SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week			Total Contact Hours	Credits
				Lecture	Tutorial	Practical		
1	20CE4T01	BSC	Complex Variables and Statistical Methods	3	-	-	3	3
2	20CE4T02	ESC	Engineering Geology	3	-	-	3	3
3	20CE4T03	PCC	Hydraulics and Hydraulic Machinery	3	-	-	3	3
4	20CE4T04	PCC	Structural Analysis-1	3	-	-	3	3
5	20CE4T05	HSMC	Managerial Economics and Financial Analysis	3	-	-	3	3
6	20CE4L06	PCC LAB	Engineering Geology Lab	-	-	3	3	1.5
7	20CE4L07	PCC LAB	Fluid Mechanics and Hydraulic Machinery Lab	-	-	3	3	1.5
8	20CE4L08	PCC LAB	Advanced Surveying Lab	-	-	3	3	1.5
9	20CE4S09	SC	Revit Architecture	-	-	4	4	2
10	20CE4M10	MC	Constitution of India	2	-	-	-	-
Total number of credits								**21.5**
Internship 2 Months (Mandatory) during summer vacation								
Honors/ Minor Course				**4**	**0**	**0**	**4**	**4**

B. TECH V SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week: Lecture	Tutorial	Practical	Total Contact Hours	Credits
1	20CE5T01	PCC	Geotechnical Engineering-1	3	-	-	3	3
2	20CE5T02	PCC	Transportation Engineering -1	3	-	-	3	3
3	20CE5T03	PCC	Design and Drawing of Reinforced Concrete Structures	3	-	-	3	3
4	**Open Elective–I**			3	-	-	3	3
5	**Professional Elective–I**			3	-	-	3	3
	20CE5T06	PEC	Structural Analysis – 2					
	20CE5T07	PEC	Rural Water Supply and Environmental Sanitation					
	20CE5T08	PEC	Geo synthetics					
	20CE5T09	PEC	Interior Designs and Decorations					
6	20CE5L10	PCC LAB	Geotechnical Engineering Lab	-	-	3	3	1.5
7	20CE5L11	PCC LAB	Transportation Engineering Lab	-	-	3	3	1.5
8	20CE5L12	SC	STAAD PRO LAB	-	-	4	4	2
9	20CE5M13	MC	Essence of Indian Traditional Knowledge	2	-	-	2	-
10	20CE5I14	I	Summer Internship	-	-	-	-	1.5
Total number of credits								**21.5**
Honors/ Minor Course				**4**	**0**	**0**	**4**	**4**

B. TECH VI SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week: Lecture	Tutorial	Practical	Total Contact Hours	Credits
1	20CE6T01	PCC	Design and Drawing of Steel Structures	3	-	-	3	3
2	20CE6T02	PCC	Water Resources Engineering-1	3	-	-	3	3
3	20CE6T03	PCC	Environmental Engineering	3	-	-	3	3
4	**Professional Elective-II**			3	-	-	3	3
	20CE6T04	PEC	Geotechnical Engineering -2					
	20CE6T05	PEC	Air pollution and Control					
	20CE6T06	PEC	Urban Transportation Planning					
	20CE6T07	PEC	Ground water development and Management.					
5	**Open Elective–II**			3	-	-	3	3
6	20CE6L10	PCC LAB	Environmental Engineering Lab	-	-	3	3	1.5
7	20CE6L11	PCC LAB	Design and Drawing of Irrigation Structures	-	-	3	3	1.5
8	20CE6L12	PCC LAB	Geographical Information Systems Lab	-	-	3	3	1.5
9	20CE6S13	SC	Soft Skills	-	-	4	4	2
10	20CE6M14	MC	Disaster Management	2	-	-	-	-
11	20CE6P15	P	Community Service Project	-	-	-	-	4
Total number of credits								**25.5**
Internship 2 Months (Mandatory) during summer vacation								
Honors/ Minor Course				**4**	**0**	**0**	**4**	**4**

B. TECH VII SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week Lecture	Hours per week Tutorial	Hours per week Practical	Total Contact Hours	Credits
1	**Professional Elective-III**			3	-	-	3	3
	20CE7T01	PEC	Transportation Engineering-2					
	20CE7T02		Solid and Hazardous Management					
	20CE7T03		Bridge Engineering					
	20CE7T04		Ground Improvement Techniques.					
2	**Professional Elective-IV**			3	-	-	3	3
	20CE7T05	PEC	Water Resources Engineering-2					
	20CE7T06		Finite Element Methods					
	20CE7T07		Pavement Design					
	20CE7T08		Port and Harbour Structures					
3	**Professional Elective-V**			3	-	-	3	3
	20CE7T09	PEC	Estimation, Specification and Contracts					
	20CE7T10		Pre stressed Concrete					
	20CE7T11		Geo environmental Engineering					
	20CE7T12		Water Harvesting and Conservation.					
4	**Open Elective–III**			3	-	-	3	3
5	**Open Elective–IV**			3	-	-	3	3
6	20CE7T17	HSMC	Universal Human Values 2 Understanding Harmony	-	-	3	3	3
7	20CE7S18	SC	ETABS	1	-	2	3	2
8	20CE7I19	I	Industrial Internship					3
Total number of credits								**23**
Honors/ Minor Course				4	0	0	4	4

B. TECH VIII SEMESTER

S. No	Course Code	Course Category	Course Title	Hours per week Lecture	Hours per week Tutorial	Hours per week Practical	Total Contact Hours	Credits
1	20CE8P01	PROJ	Project	-	-	-		8
Total number of credits								**8**

OPEN ELECTIVE –I:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE5T04	Architecture and Town Planning	3	0	0	3	CE
2	20CE5T05	Elements of Civil Engineering	3	0	0	3	CE
3	20EE5T04	Basics of Control Systems	3	0	0	3	EEE
4	20EE5T05	Special Electrical Machines	3	0	0	3	EEE
5	20ME5T04	Design Thinking & Product Innovation	3	0	0	3	ME
6	20ME5T05	Nanotechnology	3	0	0	3	ME
7	20EC5T04	Linear System Analysis	3	0	0	3	ECE
8	20EC5T05	Digital Logic Design	3	0	0	3	ECE
9	20EC5T06	Solid State Devices	3	0	0	3	ECE
10	20CS5T07	Introduction to Artificial Intelligence	3	0	0	3	CSE
11	20CS5T08	Operating System	3	0	0	3	CSE
12	20CS5T09	Software Engineering	3	0	0	3	CSE
13	20IT5T07	Computer Networks	3	0	0	3	IT
14	20IT5T08	Computer Graphics	3	0	0	3	IT
15	20HS5T01	Quantitative Aptitude and Reasoning	3	0	0	3	BED
16	20MB5T01	Principles of Management	3	0	0	3	DMS
17	20MB5T02	Technology Management	3	0	0	3	DMS
18	20AD5T07	Foundations of Data Science	3	0	0	3	AIDS
19	20AM5T07	Introduction to Machine Learning	3	0	0	3	AIML

OPEN ELECTIVE –II:

S. No.	Course Code	Course Name	L	T	P	C	Offered by
1	20CE6T08	Remote Sensing and GIS	3	0	0	3	CE
2	20CE6T09	Environmental Impact Assessment	3	0	0	3	CE
3	20EE6T08	Renewable Energy Sources	3	0	0	3	EEE
4	20EE6T09	Energy Audit, Conservation and Management	3	0	0	3	EEE
5	20ME6T07	Industrial Robotics	3	0	0	3	ME
6	20ME6T08	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 CE Department (except for CE Students).
- Honors engineering subjects are offered to CE Students.
- The head of the department will float the list of allowed MOOC electives in each academic year, based on the list floated by MOOCs (SWAYAM/NPTEL).

HONORS COURSES

S. No.	Course code	Course Name	L	T	P	C
Pool-1 (Structural Engineering)						
1	20CEHN01	Pre- Stressed Concrete	4	0	0	4
2	20CEHN02	Theory of Elasticity	4	0	0	4
3	20CEHN03	Earthquake Resistant Design of Structures	4	0	0	4
4	20CEHN04	Precast and Prefabricated Structures	4	0	0	4
Pool-2 (Geo-technical Engineering)						
5	20CEHN05	Rock Mechanics	4	0	0	4
6	20CEHN06	Earth and Rock fill Dams	4	0	0	4
7	20CEHN07	Reinforced Soil Structures	4	0	0	4
8	20CEHN08	Advanced Foundation Engineering	4	0	0	4
Pool-3 (Transportation Engineering)						
9	20CEHN09	Pavement Construction and Evaluation	4	0	0	4
10	20CEHN10	Urban Transportation Planning	4	0	0	4
11	20CEHN11	Traffic Analysis	4	0	0	4
12	20CEHN12	Intelligent Transportation System	4	0	0	4
Pool-4 (Hydraulics and Water Resources Engineering)						
13	20CEHN13	River Management	4	0	0	4
14	20CEHN14	Hydraulic Structures	4	0	0	4
15	20CEHN15	Advanced Hydrology	4	0	0	4
16	20CEHN16	Environmental Impact Assessment for Water Resource Projects	4	0	0	4

MINOR COURSES

S. No.	Course code	Course Name	L	T	P	C	Offered by
1	20CEMN01	Building Materials & Construction	3	1	0	4	CE
2	20CEMN02	Concrete Technology	3	1	0	4	CE
3	20CEMN03	Surveying	3	1	0	4	CE
4	20CEMN04	Traffic Engineering	3	1	0	4	CE

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

20CE1T01 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

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

Course Objective: Objective of the course is to impart

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

Course Outcomes:

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

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

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

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

CO4: Determine the solutions of linear differential equations

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

SYLLABUS

UNIT-I: Linear systems of equations:

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

UNIT-II: Eigen values & Eigen vectors:

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

UNIT-III: Ordinary Differential Equations of first order:

Linear equations, Bernoulli's equation, Exact differential equations. Equations reducible to exact equations, **Applications:** Orthogonal Trajectories, Newton's Law of cooling, Rate of decay & growth., R-L series circuits.

UNIT-IV: Linear Differential Equations higher order:

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

UNIT-V: Partial Differentiation:

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

Text Books:

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

Reference Books:

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

B.TECH I SEMESTER **BSC**

L	T	P	C
3	0	0	3

20CE1T02 ENGINEERING PHYSICS

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

Course Objective: Objective of the course is to impart

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

Course Outcomes:

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

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

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

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

CO4: *Impart* knowledge of architectural acoustics and Study of Ultrasonics.

CO5: *Classify* crystal systems and analyze the crystalline structure using various X-ray diffraction techniques .

SYLLABUS

UNIT-I: Wave Optics:

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

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

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

UNIT-II: Lasers and Fiber Optics:

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

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

UNIT-III: Magnetic and Dielectric Materials:

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

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

UNIT-IV: Acoustics and Ultrasonics:

Acoustics: Introduction – requirements of acoustically good auditorium– Reverberation – Reverberation time– Sabine's formula - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

Ultrasonics: Introduction - Properties - Production by magnetostriction and piezoelectric methods – Detection - Non Destructive Testing – pulse echo system through transmission and reflection modes - Applications.

UNIT-V: Crystallography and X-ray diffraction:

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC.

X-ray diffraction: Miller indices – separation between successive (hkl) planes-Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods – powder pattern of bulk, nano materials of ZnO and calculation of lattice cell by Scherrer's formula.

Text books:

1. Engineering Physics – Dr. M.N. Avadhanulu& Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford University press.
3. Engineering Physics by P.K.Palanisamy SciTech publications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics – M.R.Srinivasan, New Age Publications
3. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
4. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press

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

20CE1T03 ENGLISH

Course Objective:

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

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

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

CO2 ask and answer general questions on familiar topics

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

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

CO5 form sentences using proper grammatical structures and correct word forms

SYLLABUS

UNIT-I A Drawer full of happiness (Detailed Study)
Deliverance (Non-detailed Study)

UNIT-II Nehru's letter to his daughter Indira on her birthday(Detailed Study)
Bosom Friend (Non-detailed Study)

UNIT-III	Stephen Hawking-Positivity 'Benchmark' (Detailed Study) Shakespeare's Sister(Non-detailed Study)
UNIT-IV	Liking a Tree, Unbowed: Wangari Maathai-biography (Detailed Study) Telephone Conversation(Non-detailed Study)
UNIT-V	Stay Hungry-Stay foolish (Detailed Study) Still I Rise(Non-detailed Study)

Text Books

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

Reference Books

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

B.TECH I SEMESTER

ESC	L	T	P	C
	3	0	3	3

20CE1T04 BUILDING MATERIALS AND CONSTRUCTION

Course Objectives:

- To learn about the nature, properties, classification and manufacturing process of building materials and familiarize with various methods of masonry construction.
- To understand the knowledge of building components, finishings.

SYLLABUS

UNIT - I: Stones, Bricks and Masonry Stones and Bricks

Properties of building stones, Relation to their structural requirements; Classification of stones, Stone quarrying, Precautions in blasting; Dressing of stone; Composition of good brick earth, various methods of manufacture of bricks; Comparison between clamp burning and kiln burning; Qualities of a good brick.

Masonry: Types of Masonry, Rubble and Ashlar masonry; English Bond, Flemish Bond and Rat Trap Bond; Cavity walls and Partition walls.

UNIT - II: Wood, Lime and Cement

Wood: Classification of various types of wood used in buildings, Structure of wood, Properties - Seasoning and Defects in timber.

Lime and Cement: Various ingredients of lime, Constituents of lime, Classification of lime.

Cement: composition, cement manufacturing process, various types of cements, their properties and uses; Various field and laboratory tests for Cement.

UNIT - III: Aggregates

Classification of aggregate, Coarse and Fine aggregates; Particle shape and Texture, Bond and Strength of Aggregate; Specific gravity; Bulk density

; Porosity and Absorption, Moisture content of Aggregate– Bulking of sand.

UNIT - IV: Building Components

Lintels, Arches, Vaults, Types of Stair cases; Different types of floors - Concrete, Mosaic and Terrazzo floors. Pitched, Flat and curved Roofs, Lean-to-Roof ; Coupled roofs, Trussed roofs- King and Queen Post Trusses, RCC flat and Shell roofs.

UNIT - V: Finishings

Damp proofing and Water proofing- materials used; Plastering, Pointing, Whitewashing and Distempering; Painting – Constituents of paints – Types of paints; Painting of new/old Wood Surface – Varnish – Form work and scaffolding.

Text books

1. Building materials,S K Duggal,third Edition – New Age International Publishers.
2. Building Construction,B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, third Edition - Laxmi Publications (P) ltd., New Delhi.

Reference Books

1. Construction Technology,R.Chudly– Volumes I and II 2nd Edition, Longman,UK, 1987.
2. Engineering Materials, S.C.Rangwala, Fourth Edition, Charotar Publications.
3. Building Construction,P.C.Varghese,SecondEdition, Prentice-Hall of India private Ltd,New Delhi.
4. The Text Book of Building Construction,S.P.Arora and S.P.Bindra, Dhanapati Rai, second Edition Publishers.
5. SP-7:2016 National Building Code of India 2016 (NBC 2016).

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

20CE1T05 : ENGINEERING GRAPHICS

Objective:

- To introduce the students to use orthographic projections, projections of points & simple lines.
- To make the students draw the projections of the lines inclined to both the planes.
- To make the students draw the projections of the plane inclined to both the planes.
- To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
- To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Course Outcomes:

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

CO1: Understand the concepts of projections and draw projections for simple entities such as points and lines.

CO2: Draw orthographic projections of planes and simple solids.

CO3: Understand the concept of sections and sectional views.

CO4: Develop the surfaces for various simple solids and understand the concept of intersection of two solids.

CO5: Analyze the 2D drawings and convert to 3D isometric views.

CO6: Learn computer aided drafting with AutoCAD and draw simple 2D part drawings and orthographic views using the software.

SYLLABUS

UNIT I

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

UNIT II

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders-Simple positions

UNIT III

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one plane.

Sections of Solids: Sections and sectional views of Right regular solids-Prisms, Pyramids, Cones and Cylinder.

UNIT IV

Interpenetration of right regular solids: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

Development of Surfaces: Development of Surfaces of right regular solids-Prisms, Pyramids, Cones and Cylinder

UNIT V

Conversion of orthographic views to isometric view for Simple Solids such as prism, pyramid, cylinder and cone; Conversion of isometric view to orthographic views.

Computer Aided Drafting: Introduction to AutoCAD, Geometric commands, Modify commands, Annotation, Layers, display control and Properties tool bars. Creation of simple 2D part drawings and orthographic views.

Text books:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers

Reference books:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers
2. Engineering Graphics by PI Varghese, McGrawHill Publishers

3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age
4. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

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

20CE1L06 ENGLISH COMMUNICATION SKILLS LAB

Course Objectives:

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

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

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

CO2: Learn the methods of enhancing vocabulary

CO3: Acquaint himself/herself with nuances of Phonetics

LIST OF EXPERIMENTS

1 Greetings and Introductions

2 Requesting Permission & Giving Directions

3 Inviting/Complaining/Congratulating

4 Root Words

5 Phonetics-Sounds and Symbols

6 Pronunciation Rules

References:

1. Strengthen Your Steps, Maruti Publications

2. Interact, Orient Blackswan

3. Word Power Made Easy, Pocket Books

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

20CE1L07 ENGINEERING PHYSICS LAB

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

Course Objective: Objective of the course is to impart

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

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

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

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

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

LIST OF EXPERIMENTS

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

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

Reference Books

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

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

20CE1L08 CIVIL ENGINEERING WORKSHOP

Course objectives:

- To outline the process of identification of various building components and their estimation
- To provide knowledge on operation of the various survey instruments used for linear and angular measurements.
- To explain the concept of measurement of discharge and velocity in a pipe and density of water
- To demonstrate automatic weather station

LIST OF EXPERIMENTS

1. Demonstration on usage of chain
2. Ranging – offsets – chain-age
3. To find the area of an irregular polygon using chain by using horizontal measurements
4. Determination of bearings and included angles with prismatic compass.
5. Demonstration on various Building materials used in construction
6. Estimation of quantity of bricks, concrete, wood, paint for the given single room building
7. Masonry work hands – on practice work deferent types of bonds in brick masonry
8. Identification of quality of brick through physical tests
9. Identification of soil based on their physical properties

10. Setting out of building: The student is required to set out a building (Single room only) as per the given building plan using tape and cross staff.

11. Demonstration on Installation of simple sanitary fittings and fixtures like Tap, T-joint, Elbow, bend, threading etc.

12. Finding the discharge velocity in a water pipe line also find density of water

13. Computation of Centre of gravity and moment of inertial of (i) I-section and (ii) Channel section.

14. Welding (arc welding and gas welding)

15. Carpentry (Demonstration)

16. Identify deferent types of roads in the campus and write the physical characteristics of layers

17. Demonstration on making of cement mortar/concrete for the given nominal mix

18. Study of given Topo -sheet

REFERENCE BOOKS:

1. Laboratory Manual for Basic Civil Engineering workshops

B.TECH II SEMESTER **BSC**

L	T	P	C
3	0	0	3

20CE2T01 TRANSFORM TECHNIQUES

Pre-requisite: Linear Algebra and Differential Equations

Course Objective: Objective of the course is to impart

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

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

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

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

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

CO4: Illustrate the methods to solve the boundary value problems

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

SYLLABUS

UNIT-I: Special functions:

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

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

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

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

UNIT-III: Fourier Series & Fourier Transforms:

Euler's formulae (without proof), Conditions of Fourier expansion, Functions having points of discontinuity, Change of inerval, Even and odd functions, Half-range series.

Fourier Integral theorem (without proof), Fourier cosine & sine integral, complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, properties of Fourier transforms (without proof), Convolution theorem(without proof), finite & infinite Fourier sine & cosine transforms.

UNIT-IV: Partial Differential Equations:

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

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

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

Text Books:

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

Reference Books:

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

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

20CE2T02 ENGINEERING CHEMISTRY

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

Course Objective: Objective of the course is to impart

- ***Importance*** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- ***Express*** the increases in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
- ***Classify and discuss*** the materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries. Lubrication is also ***summarized***.
- ***Relate*** the need of fuels as a source of energy to any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence introduced.
- ***Explain*** the importance and usage of water as basic material in almost all the industries;
- ***Interpret*** drawbacks of steam boilers and also how portable water is supplied for drinking purposes.

Course Outcomes:

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

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

CO2: ***Utilize*** the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and c***ategorize*** the reasons for corrosion and study methods to control corrosion.

CO3: ***ynthesize*** nanomaterials for modern advances of engineering technology.

ummarize the techniques that detect and measure changes of state of reaction.

lustrate the commonly used industrial materials.

CO4: ***ifferentiate*** petroleum, petrol, synthetic petrol and have knowledge how they are produced.

Study alternate fuels and a***nalyse*** flue gases.

CO5: ***Analyze*** the suitable methods for purification and treatment of hard water and brackish water.

SYLLABUS

UNIT-I: Polymer Technology:

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

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

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

Composite materials: Fiber reinforced plastics – GFRP and Aramid FRP

Conducting polymers: Intrinsic and extrinsic conducting polymers

Biodegradable polymers: preparation and applications

UNIT-II: Electrochemical Cells And Corrosion:

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

Part II: ***Corrosion:*** Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress

corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (cathodic protection), Protective coatings (cathodic coatings, anodic coatings, electroplating and electroless plating)

UNIT-III: Chemistry Of Materials:

Part- A: *Nano materials:-* Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]) with example (TiO_2), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Part-B: *Refractories:* - Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.

***Lubricants:* -** Definition, mechanism of lubricants, properties (definition and importance).

***Cement:* -** Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR), deterioration of cement.

UNIT-IV: Fuels:

Introduction, calorific value, higher calorific value, lower calorific values, problems using Dulong's formula, proximate and ultimate analysis of coal sample and their significance, numerical problems, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch and Bergius), petrol knocking, diesel knocking, octane and cetane ratings, anti-knocking agents, Introduction to alternative fuels (Bio-diesel, ethanol, methanol, natural gas, liquefied petroleum gas, compressed natural gas).

UNIT-V: Water Technology:

Hardness of water, determination of hardness by complexometric method, boiler troubles (priming and foaming, scale formation, boiler corrosion,

caustic embrittlement), internal treatments, softening of hard water (zeolite process and related sums, ion exchange process), potable water and its specifications, break point chlorination-desalination (reverse osmosis and electro dialysis).

Standard Books:

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

Reference:

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

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

20CE2T03 ENGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

Course outcomes:

1. The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters.
2. The student should be able to determine centroid for lines, areas and center of gravity for volumes and their composites.
3. The student should be able to determine area and mass movement of inertia for composite sections
4. The student should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum.

SYLLABUS

UNIT – I

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces.

Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

UNIT II

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction, Wedges.

Analysis of plane trusses-Method of Joints, Method of Sections.

UNIT – III

Objectives : The students are to be exposed to concepts of centre of gravity.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT – IV

Objectives: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives: The students are to be exposed to rigid motion kinematics and kinetics

Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration

– Motion of Rigid Body – Types and their Analysis in Planar Motion

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation– Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TEXT BOOKS :

1. Engineering Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.
2. Engineering Mechanics- S S Bhavikati –New Age International Publishers

REFERENCES :

3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Engineering Mechanics, Fedinand . L. Singer, Harper – Collins.
5. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications
6. Engineering Mechanics- A K Tayal
7. Engieering Mechanics , R.K.Bansal, Laxmi Publications
8. Engg. Mechanics- KL Kumar-Tata McGraw Hill publications

B.TECH II SEMESTER **ESC**

L	T	P	C
3	0	0	3

20CE2T04 BUILDING PLANNING AND DRAWING

Course Objectives:

- Initiating the student to different building bye-laws and regulations.
- Imparting the planning aspects of residential buildings and public buildings.
- Giving training exercises on various signs and bonds and different building units.
- Imparting the skills and methods of planning of various buildings.

SYLLABUS

UNIT I: Building Byelaws and Regulations

Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations height of buildings- wall thickness – lightening and ventilation requirements.

Sign Conventions and Bonds

Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond - odd and even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

UNIT II: Residential Buildings

Minimum standards for various parts of buildings requirements of different rooms and their grouping.

Characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions

UNIT III: Public Buildings

Planning of educational institutions, hospitals, dispensaries, office buildings, banks.

Industrial buildings, hotels and motels, buildings for recreation, Landscaping requirements.

UNIT IV: Doors, Windows, Ventilators And Roofs

Panelled door, panelled and glazed door, glazed windows, panelled windows, swing ventilators, fixed ventilators.

Coupled roof, collar roof, King Post truss, Queen Post truss Sloped and flat roof .

UNIT V: Planning and Designing Of Buildings.

Draw the Plan, Elevation and Sections of a Residential Buildings from the given line diagram.

Draw the Plan, Elevation and Sections of a Public Buildings from the given line diagram.

Text Books:

1. Planning, designing and Scheduling, Gurucharan Singh and Jagadish Singh

2. Building planning and drawing by M. Chakravarthi.

3. 3. ‘A’ Series & ‘B’ Series of JNTU Engineering College, Anantapur,

References:

1. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.

2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.

3. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, New Delhi.

4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai.

5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, Mcgraw Hill Education (P) India Ltd. New Delhi.

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

20CE2T05 PROBLEM SOLVING THROUGH C

Pre-requisite:

Course Objective:

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

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

CO1: Understand the basic concepts of programming

CO2: Understand and Apply loop construct for a given problem

CO3: Demonstrate the use pointers

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

CO5: Understand File I/O operations

SYLLABUS

UNIT-I:

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

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

UNIT-II:

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

UNIT-III:

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

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

UNIT-IV:

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

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

UNIT-V:

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

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

Text Books:

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

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

References:

1. Pradepdey, Manas Ghosh, “Fundamentals of Computing and programming in C”, First Edition, Oxford University Press, 2009.
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh Edition,

Pearson Publication.
3. E Balagursamy, “Programming in C, Sixth Edition, Tata McGraw Hill.
4. Ajay Mittal, “Programming in C A practical Approach”, Pearson education

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

20CE2L06 ENGINEERING CHEMISTRY LAB

Pre-requisite: Acquire some experimental skills.

Course Objective: Objective of the course is to impart

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

Course Outcomes:

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

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

LIST OF EXPERIMENTS

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method

10 Determination of the concentration of strong acid vs strong base (by conductometric method).

11 Determination of strong acid vs strong base (by potentiometric method).

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

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

14 Estimation of Vitamin C.

15 Determination of phosphoric content in soft drinks.

16 Adsorption of acetic acid by charcoal.

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

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

20CE2L07: COMPUTER AIDED BUILDING DRAWING LAB

Course Objectives:

- The objective of this lab is to teach the student basic drawing fundamentals in various civil engineering applications, specially in building drawing.

Course Outcomes:

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

- Master the usage of Auto cad commands for drawing 2D & 3D building drawings required for different civil engineering applications.

LIST OF EXPERIMRNTS

1. Introduction to computer aided drafting .
2. Software for CAD – Introduction to different softwares.
3. Practice exercises on CAD software .
4. Drawing of plans of buildings using software a) Single storied buildings b) Multi storied buildings .
5. Developing sections and elevations for a) Single storied buildings b) Multi storied buildings.
6. Detailing of building components like Doors, Windows, Roof Trusses etc. using CAD softwares .
7. 7. Exercises on Development of working drawings of buildings (Residential ,Industrial ,Public buildings).

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh – Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.

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

20CE2L08 PROBLEM SOLVING THROUGH C LAB

Course Objectives:

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

Course Outcomes:

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

Exercise 1:

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

Exercise 2:

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

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute

the area of the various geometrical shape.

3. Write a C program to calculate the factorial of a given number.

Exercise 4:

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

Exercise 5:

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

Exercise 6:

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

Exercise 7:

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

Exercise 8:

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

Exercise 9:

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

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and

*(value at address) operator.

2. Write a program in C to add two numbers using pointers.

Exercise 11:

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

Exercise 12:

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

Exercise 13:

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

Exercise 14:

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

Exercise 15:

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

Exercise 16:

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

B.TECH II SEMESTER

	L	T	P	C
MC	2	0	-	-

20CE2M09 ENVIRONMENTAL SCIENCE

Course objective:

To understand the importance of Environment and the importance of biodiversity

Course outcomes:

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

SYLLABUS

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

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

Concept of an ecosystem - Structure of an ecosystem- function of an ecosystem- Food chains, food webs- ecological pyramids- Energy flow in the ecosystem- Ecological succession- Nutrient cycling- 1^{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**
20CE3T01	**NUMERICAL METHODS AND VECTOR CALCULUS**		

Course objectives:

Pre Requisites: Mathematics

Objectives: Understand the basic numerical methods to solve simultaneous linear equations. To quantify the knowledge of numerical methods to solve ordinary differential equations

Course Outcomes: after the completion of the course student should be able to

CO1: Determine the solution of transcendental equations by different numerical methods. Provide the interpolation techniques which analyze the data of an unknown function.

CO2: Illustrate the numerical methods to determine solutions for a class of ordinary differential equations involving irregularly shaped boundaries

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

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

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

Syllabus:

UNIT I: Numerical Solution of Equations:

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

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

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

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

UNIT IV: Multiple Integrals:

Double integrals in Cartesian & polar coordinates, Change of order of integration, Triple integrals, Change of variables (Cartesian to Polar, Rectangular coordinates to Cylindrical & Rectangular coordinates to Spherical polar coordinate systems). **Applications:** Area enclosed by plane curves, Volume of solids.

Unit-V: Vector Differentiation & Vector Integration:

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

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

Text Books:

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

Reference Books:

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

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

20CE3T02 STRENGTH OF MATERIALS

Pre Requisites: Engineering Mechanics

Objectives: The subject provide the knowledge of simple stress strains flexural stresses in members, shear stresses and deflection in beams so that the concepts can be applied to the Engineering problems.

Course Outcomes: after the completion of the course student should be able to

CO1: Gain a broad understanding of behavior of materials
CO2: Identify forces to be resisted by member
CO3: Analyze stresses in member
CO4: Determine deformations of simple members

SYLLABUS

UNIT – I

SIMPLE STRESSES AND STRAINS:

Simple Stresses and strains – Elastic constants – Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member – Composite Bars – Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress – Mohr's circle method.

UNIT – II

SHEAR FORCE AND BENDING MOMENT:

Types of loads, supports, beams – concept of shearing force and bending moment – Relationship between intensity of load, Shear Force and Bending moment – Shear Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment.

UNIT – III

FLEXURAL STRESSES:

Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

SHEAR STRESSES:

Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT – IV

DEFLECTION OF BEAMS:

Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, Uniformly varying load-Mohr's theorems – Moment area method – application to simple cases.

UNIT – V

Torsion, Shafts & Springs, Theories of Failures: Torsion of circular and hollow shafts, Elastic Theory of torsion, Stresses and Deflection in circular solid and hollow shafts. Combined bending moment and torsion of shafts – Strain energy due to torsion- Modulus of Rupture – Power transmitted to shaft- shaft in series and parallel- Closed and open coiled helical springs- Leaf springs.

Text Books:

1) Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd.

2) Strength of Materials by R.K Rajput, S.Chand & Company Ltd.

References:

1) Strength of Materials by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

2) Mechanics of Structures Vol –I by H.J.Shah and S.B.Junnarkar, Charotar Publishing

House Pvt. Ltd.

3) Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.

4) Strength of Materials by S.S.Rattan, Tata McGraw Hill Education Pvt. Ltd.

5) Fundamentals of Solid Mechancis by M.L.Gambhir, PHI Learning Pvt. Ltd

6) Strength of Materials and Structures by John Case *et al.*, Butterworth-Heinemann.

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

20CE3T03 FLUID MECHANICS

Pre Requisites: Engineering Mechanics

Objectives: This subject introduces the basic concepts of fluids, their behavioural properties, analyzing the fluid flows using primary equations. This subject further deals with various flow measuring devices and concepts of boundary layer flows.

Course Outcomes: after the completion of the course student should be able to

CO1: Understanding the behavior of fluids and its properties.
CO2: Able to identify and understand the static fluid systems.
CO3: Able to identify and understand the dynamic fluid systems.
CO4: Able to analyze the flow parameters and design different fluid flow systems

SYLLABUS

UNIT I

INTRODUCTION : Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers. Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems.

UNTI – II

FLUID KINEMATICS: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows : Steady, unsteady, uniform, non uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis.

UNIT – III

FLUID DYNAMICS and Measurement of Flow: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, (Navier – stokes equations (Explanationary) Momentum equation and its application – forces on pipe bend. Pitot tube, Venturi meter and orifice meter – classification of orifices, flow over rectangular, triangular and trapezoidal and stepped notches - –Broad crested weirs

UNIT - IV

CLOSED CONDUIT FLOW: Reynold's experiment – Characteristics of Laminar & Turbulent flows. Laws of Fluid friction – Darcy's equation, ,variation of friction factor with Reynold's number – Moody's Chart, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Pipe network problems Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

UNIT – V

BOUNDARY LAYER THEORY: Approximate Solutions of Navier Stoke's Equations – Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers (no derivations) BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K.Som & G.Biswas (Tata Mc.Grawhill publishers Pvt. Ltd.)
3. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer, Oxford University Press, New Delhi

REFERENCES:

1. Fluid Mechanics by J.F.Douglas, J.M. Gaserek and J.A.Swaffirld (Longman)
2. Fluid Mechanics by Frank.M. White (Tata Mc.Grawhill Pvt. Ltd.)
3. Fluid Mechanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi
4. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) ltd., New Delhi

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

20CE3T04 **CONCRETE TECHNOLOGY**

Course Objectives: Lot of advantages are taking place in the concrete technology as par with development taking place in the engineering. The present day industry needs the knowledge of concrete technology thoroughly. The subject is designed to give the basic knowledge as well as latest developments in concrete technology.

Course Outcomes: After the completion of the course student should be able to

CO1: Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.

CO2: Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties

CO3: Use advanced laboratory techniques to characterize cement-based materials.

CO4: Perform mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete

UNIT I

CEMENT: Portland cement – chemical composition – Types of Cements– Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

UNIT - II

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT – III

FRESH CONCRETE: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT - IV

HARDENED CONCRETE : Water / Cement ratio – Abram's Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT

ELASTICITY, CREEP &SHRINKAGE: Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT – V

MIX DESIGN: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

SPECIAL CONCRETES: Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

Text books:

1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition

2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004

References:

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

2. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi

3. Concrete: Micro structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers

B.TECH III SEMESTER	**PCC**	**L T P C**	
20CE3T05	**SURVEYING**		**3 0 0 3**

Pre Requisites: Engineering Mechanics

Objectives: The first step in engineering practice is surveying and the soundness of the any civil engineering work is dependent on the reliability and accuracy of the surveying.

There ore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

Course Outcomes: after the completion of the course student should be able to

CO1: Gain a broad understanding of Land Survey

CO2: Get accustoms with the angular and linear measurements.

CO3: Trained with recording the field information and necessary plot.

CO4: Contemporary issues and developments.

Unit-I:

Introduction and Basic Concepts

Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip.

Unit-II

Leveling and Contouring

Leveling- Basics definitions, types of levels and leveling staves, temporary adjustments, methods of leveling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Plan Table Surveying: Introduction of Plane table surveying- Area by the method of radiation and intersection – Two point problem

Computation of Areas and Volumes

Areas- Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes- Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

Unit-III

Theodolite Surveying

Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.

Traversing

Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

Unit-IV

Tacheometric Surveying

Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves

Types of curves and their necessity, elements of simple curve, setting out of simple Curves, Introduction to compound curves.

Unit-V

Modern Surveying Methods

Total Station and Global Positioning System. : Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working, E.D.M. method and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

TEXT BOOKS:

1. Chandra A M, "Plane Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
2. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
3. Duggal S K, "Surveying (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. New Delhi, 2004.
4. Hoffman.B, H.Lichtenegga and J.Collins, Global Positioning System - Theory and Practice, Springer -Verlag Publishers, 2001.

REFERENCES:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill – 2000
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004

3. Surveying (Vol – 1, 2 & 3), by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
4. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
5. Surveying by BHAVIKATTI; Vikas publishing house ltd.

B.TECH III SEMESTER		PCC	L	T	P	C
			0	0	3	1.5
20CE3L06	STRENGTH OF MATERIALS LAB					

Experiments

1. Tension test on Mild steel bar
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood orconcrete
8. Impact test (Charpy and Izod impact test)
9. Shear test (on UTM)
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of Electrical resistance strain gauges
12. Continuous beam – deflection test.

List of Major Equipment:

1. Universal Testing Machine
2. Torsion testing machine
3. Brinnell's / Rock well's hardness testing machine
4. Setup for spring tests
5. Compression testing machine
6. Izod Impact machine
7. Shear testing machine
8. Beam setup for Maxwell's theorem verification.

Note: Any10 Experiments must be completed**.**

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

20CE3L07 **SURVEYING FIELD WORK**

List of Field Works:

1. Survey by chain survey of road profile with offsets in case of road widening.
2. Survey in an area by chain survey (Closed circuit)
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse)
5. Plane table survey; finding the area of a given boundary by the method of Radiation
6. Plane table survey; finding the area of a given boundary by the method of intersection.
7. Two Point Problem by the plane table survey.
8. Fly levelling: Height of the instrument method (differential levelling)
9. Fly levelling: rise and fall method.
10. Fly levelling: closed circuit/ open circuit.
11. Fly levelling; Longitudinal Section and Cross sections of a given road profile.
12. Fly levelling and Fly chaining (complete field work).

Note: Any 10 field work assignments must be completed.

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

20CE3L08 CONCRETE TECHNOLOGY LAB

Pre-Requisites: Concrete Technology Theory

Course Objectives

To develop the skill of testing the building materials like cement & aggregates.

To impart the knowledge on properties of fresh concrete.

To familiarize with the strength properties of hardened Concrete.

To introduce the concepts of non-destructive testing.

List of Experiments

I. Tests on Cement

Normal Consistency and Fineness of Cement. (IS: 4031-PART 4&1)

Initial and Final Setting Times of Cement. (IS: 4031-PART5)

Specific Gravity and Soundness of Cement. (IS: 4031-PART 11&3).

Compressive Strength of Cement. (IS: 4031-PART6)

II. Tests on Fine Aggregate

Specific Gravity and Bulking of Sand (IS: 2386-PART3)

Fineness Modulus and Grading of Fine aggregate (IS:383)

III. Tests on Coarse Aggregate

Specific Gravity of Coarse aggregate. (IS: 2386-PART3)

Fineness Modulus of Coarse aggregate. (IS: 2386-PART1)

Flakiness index of coarse aggregate. (IS: 2386-PART1)

Elongation index of coarse aggregate. (IS: 2386-PART1)

IV. Tests on Fresh and Hardened Concrete

Workability test on concrete by compaction factor, slump and Vee-bee. (IS:1199)

Compressive strength, split tensile strength and flexural strength of concrete (IS:516)

Non-Destructive testing on concrete by Rebound hammer. (IS: 13311-PART1)

B.TECH III SEMESTER		**SC**	**L**	**T**	**P**	**C**
			0	**0**	**4**	**2**
20CE3S09	**AUTOCAD 2D&3D (Skill Oriented Course-I)**					

Course Objectives: The objective of this lab is to teach the student usage of Auto cad and basic drawing fundamentals in various civil engineering applications, specially in building drawing.

Course Outcomes:

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

CO1: Use the Autocad commands for drawing 2D & 3D building drawings required for different civil Engg applications ,

CO2: Plan and draw Civil Engineering Buildings as per aspect and orientation.

CO3: Presenting drawings as per user requirements and preparation of technical report

LIST OF EXPERIMENTS

1. Introduction to computer aided drafting and different coordinate system
2. Drawing of Regular shapes using Editor Mode
3. Introduction GUI and drawing of regular shapes using GUI
4. Exercise on Draw tools
5. Exercise on Modify tools
6. Exercise on other tools (Layers, dimensions, texting etc.)
7. Drawing of building components like walls, lintels, Doors, and Windows. Using CAD software
8. Drawing a plan of Building and dimensioning
9. Drawing a plan of a residential building using layers
10. Developing a 3-D plan from a given 2-D plan

11. Developing sections and elevations for given a) Single storied buildings b) multi storied buildings

12. Auto CAD applications in surveying, mechanics etc.

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh –Laxmi Publications.

2. Engineering Graphics by P. J. Sha – S. Chand & Co.

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

20CE4T01: COMPLEX VARIABLES AND STATISTICAL METHODS

Pre-requisite: Basic knowledge about Calculus and Probability

Course Objective: Objective of the course is to impart

- basic understanding of complex variable theory
- description of sampling distribution of means, proportions & variances
- testing the hypothesis concerning means, proportions & variances

Course Outcomes:

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

CO 1: Determine analytic and non-analytic functions

CO 2: Analyze the analytic function into a power series which is useful in the study of communication systems.

CO 3: Understand random variables and probability distributions

CO 4: Apply different distributions to compute confidence intervals

CO 5: Test the hypothesis concerning means and proportions

SYLLABUS

UNIT-I: Analytic Functions:

Introduction, Complex function, Limit and continuity of a complex function, Derivative of f(z), Analytic functions, Harmonic functions & orthogonal system, finding analytic functions by Milne-Thomson method. Applications to flow problems.

UNIT-II: Complex Integration and Residues: (all theorems without proofs)

Complex integration, Cauchy's theorem and Cauchy's integral formula, Series of complex terms, Taylor's series and Laurent's series. Zeros and singularities of an analytic function, Residues and Cauchy-Residue theorem. Evaluation of real definite integrals using contour integration about unit circle.

UNIT-III: Random variables and distributions:

Introduction-Discrete & Continuous Random variable - Distribution functions.

Binomial, Poisson distributions. Continuous distribution: Normal distributions, Normal approximation to Binomial distribution.

UNIT-IV: Sampling Theory:

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

UNIT-V: Tests of Hypothesis:

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

Text Books:

1. **B. S. GREWAL,** Higher Engineering Mathematics, Khanna Publishers**,** 43rd Edition, 2014.
2. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition, PHI.

Reference Books:

3. **N. P. BALI & Dr. MANISH GOYAL,** A Text book of Engineering Mathematics, Lakshmi Publications, 9th Edition, 2014.
4. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8thedition, Cengage Publshers.

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

20CE4T02 ENGINEERING GEOLOGY

Course Objectives:

The objective of this course is:

- To introduce the Engineering Geology as a subject in Civil Engineering
- To enable the student to use subject in civil engineering applications.
- To know the Geological history of India.

Course Outcomes:

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

CO1: Identify and classify the geological minerals

CO2: Measure the rock strengths of various rocks

CO3: Classify and measure the earthquake prone areas to practice the hazard zonation

CO4: Classify, monitor and measure the Landslides and subsidence

CO5: Prepares, analyses and interpret the Engineering Geologic maps

CO6: Analyses the ground conditions through geophysical surveys.

CO7: Test the geological material and ground to check the suitability of civil engineering project construction.

CO8: Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc...

SYLLABUS

UNIT-I: Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies

Weathering: Weathering of rocks, Geological agents, weathering process of Rock, River process and their development.

UNIT-II

Mineralogy And Petrology: Definitions of mineral, Structures of silicates and rock, Different methods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks, Common rock forming minerals are Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and other ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite And Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate and their importance in Civil Engineering.

UNIT-III

Structural Geology: Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering–Indian stratigraphy. Aims of statigrtaphy, Principles, Geological time scour, Geological division in India, Major stratigraphic units in India.

UNIT-IV

Earthquakes And Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides Case studies.

UNIT-V

Geophysics: Importance of Geophysical methods, Classification, Principles ofGeophysicalstudybyGravitymethod,Magneticmethod,Electricalmethods,S eismicmethods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

Geology of Dams, Reservoirs And Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunneling, effects, Lining of Tunnels. Influence of Geology for successful Tunneling.

Text Books:

1. Engineering Geology, N. Chenn Kesavulu, Laxmi Publications, 2nd

Edition, 2014.

2. Engineering Geology, Subinoy Gangopadhay, Oxford University press

References:

1. Engineering Geology, D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
2. Engineering Geology, Vasudev Kanithi, University Press.
3. Engineering Geology for Civil Engineers P. C. Varghese, PHI learning pvt. Ltd.
4. G Fundamentals of Engineering Geology' P.G. Bell, B. S. P. Publications, 2012
5. Geology for Engineers and Environmental Society, Alan E Kehew, person publications, 3rd edition.
6. Engineer's Geology by S. K. Duggal, H.K. Pandey, N. Rawd, McGraw Hill education.
7. Engineering Geology, K. S. Valdiya, McGraw Hill.
8. Environmental Geology, K. S Valdiya, Mcgraw Hill Publications, 2nd Edition.

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

20CE4T03 HYDRAULICS AND HYDRAULIC MACHINERY

Course Objectives:

- To study about uniform and non-uniform flows in open channel and also to learn about the characteristics of hydraulic jump
- To introduce dimensional analysis for fluid flow problems
- Tounderstandtheworkingprinciplesofvarioustypesofhydraulicmachinesand Pumps.

Course Outcomes:

Upon successful completion of this course the students will be able to:

CO1: Solve uniform and non-uniform open channel flow problems.

CO2: Apply the principals of dimensional analysis and similitude in hydraulic model testing.

CO3: Understand the working principles of various hydraulic machineries and pumps.

SYLLABUS

UNIT– I UNIFORMFLOW IN OPEN CHANNELS:

Types of channels–Types of flows-Velocity distribution–Energy and momentum correction factors–Chezy's, and Manning's formulae for uniform flow–Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth

UNIT II NON-UNIFORM FLOW IN OPEN CHANNELS:

Steady Gradually Varied flow-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes – surface profiles – direct step method-Rapidly varied flow, hydraulic jump, energy dissipation.

UNIT – III HYDRAULIC SIMILITUDE:

Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimension less numbers– model and proto type relations.

UNIT–IV

BASICS OF TURBOMACHINERY:

Hydro dynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle

UNIT – V

HYDRAULIC TURBINES – I:

Layout of a typical Hydropower installation –Heads and efficiencies - classification of turbines, Pelton wheel - Francis turbine – Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-geometric similarity – cavitation.

UNIT– VI

CENTRAIFUGAL-PUMPS:

Pump installation details-classification-work done - Manometric head-minimum starting speed-losses and efficiencies-specific speed,multistagepumps-pumpsinparallelandseries-performanceofpumps-characteristiccurves- NPSH-Cavitation.

RECIPROCATINGPUMPS:

Introduction, classification, components, working, discharge, indicat or diagram, work done and slip.

Text Books:

1. Open Channel flow, K.Subramanya, Tata McGraw Hill Publishers
2. A text of Fluid mechanics and hydraulic machines, R.K.Bansal Laxmi Publications New Delhi
3. Fluid Mechanics, Modi and Seth, Standard book house.

References:

1. Fluid Flow in Pipes and Channels, G.L.Asawa, CBS
2. Fluid Mechanics and Machinery, C.S.P.OJHA, R.BERNDTSSON

and P.N.Chandramouli, Oxford Higher Education.

3. Fluid Mechanics and Machinery, Md.KaleemKhan, Oxford Higher Education.

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

20CE4T04 STRUCTURAL ANALYSIS-1

Pre Requisites: Strength of Materials –I

Objectives: To make the students to understand the principles of analysis of structures of static and moving loads by various methods.

Course Outcomes: after the completion of the course student should be able to

CO1: Able to analyse the determinate and in-determinate structures

CO2: Able to understand the behavior of Structural systems

CO3: Able to evaluate the response of structural systems subjected to static and moving loads

SYLLABUS

UNIT – I

ANALYSIS OF PERFECT FRAMES:

Determinate and indeterminate structures. Degree of freedom. Types of frames- Perfect, Imperfect and Redundant pin jointed frames. - Analysis of determinate pin jointed frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT-II

Columns and Struts:

Introduction–Types of columns–Short, medium and long columns– Axially loaded compression members–Crushing load–Euler's theorem-assumptions-derivation of Euler's critical load formulae for various end conditions–Equivalent length of a column–slenderness ratio–Euler's critical stress–Limitations of Euler's theory– Rankine–Gordon formula–Long columns subjected to eccentric loading–Secant formula–Empirical formulae–Straight line formula–Prof. Perry's formula.

UNIT – III

PROPPED CANTILEVER and FIXED BEAMS:

Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - Shear force and Bending moment diagrams for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams; effect of sinking of support, effect of rotation of a support.

UNIT – IV

CONTINUOUS BEAMS:

Introduction-Continuous beams. Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang. Effects of sinking of supports.

SLOPE DEFLECTION METHOD:

Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Determination of static and kinematic indeterminacies for frames. Analysis of Single Bay – Single storey Portal Frames by Slope Deflection Method Including Side Sway. Shear force and bending moment diagrams and Elastic curve.

UNIT – V

MOVING LOADS AND INFLUENCE LINES:

Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length. Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section - Point loads, UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses. Equivalent uniformly distributed load. Focal length.

Text Books:

1) Structural Analysis Vol–I & II by V. N. Vazirani and M. M. Ratwani, Khanna Publishers.
2) Structural Analysis Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.
3) Basic Structural Analysis by K.U.Muthu *et al.,* I.K.International Publishing House Pvt.Ltd.

References:

1) Structural Analysis by R.C.Hibbeler, Pearson Education
2) Mechanics of Structures Vol – I and II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
3) Structural Analysis by Devdas Menon, Narosa Publishing House.
4) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Education Pvt. Ltd.
5) Fundamentals of Structural Analysis by M.L.Gamhir, PHI Learning Pvt. Ltd
6) Structural Analysis -I by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

B.TECH IV SEMESTER

HSMC	L	T	P	C
	3	0	0	3

20CE4T05 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives:

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

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product

CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs

CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units

CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis

CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

SYLLABUS

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of

Demand, Types of Elasticity of Demand and Measurement Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III

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

UNIT IV

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

UNIT V

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

Text Books:

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

Reference Books:

1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.

2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition

3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.

4) MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd

5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd

6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.

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

20CE4L06 ENGINEERING GEOLOGY LAB

Course Objectives:

The objective of this lab is that to provide practical knowledge about physical properties of minerals, rocks, drawing of geological maps, showing faults, uniformities etc.

Course Outcomes:

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

CO1: Understand the method and ways of investigations required for Civil Engineering projects

CO2: Identify the various rocks, minerals depending on geological classifications

CO3: Learn to couple geologic expertise with the engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects and the quantification of processes such as rock slides and settlement.

CO4: Write a technical laboratory report

LIST OF EXPERIMENTS

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite;

   Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
4. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Pegmatite, and Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.

5. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
6. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
7. Study of topographical features from Geological maps. Identification of symbols in maps.
8. Simple structural Geology Problems (Strike & Dip and Bore hole data)

LAB EXAMINATION PATTERN:

1. Description and identification of minerals
2. Description and identification of rocks (igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problem.
5. Simple bore hole data problem.

Note: Any10 Experiments must be completed**.**

B.TECH IV SEMESTER		PCC	L	T	P	C
			0	0	3	1.5
20CE4L07	FLUID MECHANICS AND HYDRAULIC MACHINERY LAB					

LIST OF EXPERIMENTS

1. Calibration of Venturimeter & Orificemeter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouthpiece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jetonvanes
8. Study of Hydraulic jump.
9. Performance test on Peltonwheel turbine
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Efficiency test on reciprocating pump.

Note: Any10 Experiments must be completed**.**

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

20CE4L08 ADVANCED SURVEYING LAB

LIST OF EXPERIMENTS

1 The odolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.
2 The odolite Survey: Finding the distance between two in accessible points.
3 The odolite Survey: Finding the height off arobject.
4 Tachometric Survey: Heights and distance problems using tachometric principles.
5 One Exercise on Curve setting.
6 One Exercise on contours.
7 Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallax error.
8 Total Station: Determination of area using total station.
9 Total Station: Traversing
10 Total Station: Contouring
11 Total Station: Determination of Remote height.
12 Total Station: Distance between two in accessible points.

Note: Any10 field work assignments must be completed**.**

B.TECH IV SEMESTER		**SC**	**L**	**T**	**P**	**C**
			0	**0**	**4**	**2**
20CE4S09	**REVIT ARCHITECTURE (Skill Oriented Course-II)**					

1 Introduction to Revit Architecture Software, User Interface,

2 Introduction to BIM

3 Introduction to Basic Commands, Templates

4 Setting of units, explaining about Walls Doors, Windows, Edit Type

5 Placing of Components, Explaining about Modify Tools

6 Creating Floor, Ceiling, Editing Floor and Ceiling

7 Curtain Walls, Wall Opening

8 Roofs Types of Roofs

9 Staircase Types of Staircase

10 Ramp, Railing, Creating Section View

11 Text, Dimension, Annotations, Model Text, Model line, Room & Area

12 Paint, Colour Scheme, Creating new Materials, Sweep, Extrude Modeling

B.TECH IV SEMESTER

	L	T	P	C
MC	2	-	-	-

20CE4M10 **CONSTITUTION OF INDIA**

Course Objectives:

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

Course Outcomes:

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

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

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

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

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

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

SYLLABUS

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.

2) Subash Kashyap, Indian Constitution, National Book Trust

3) J.A. Siwach, Dynamics of Indian Government & Politics

4) D.C. Gupta, Indian Government and Politics

5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

6) J.C. Johari, Indian Government and Politics Hans

7) J. Raj Indian Government and Politics

8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in

Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-sources:

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

B.TECH V SEMESTER

PCC	L	T	P	C
	3	0	0	3

20CE5T01 GEOTECHNICAL ENGINEERING-1

Course Objectives: The objective of this course is to

- Understand the formation of soil and classification of the soils
- Determine the Index & Engineering Properties of Soils
- Determine the flow characteristics & stresses due to externally applied loads Estimate the consolidation properties of soils
- Estimate the shear strength and seepage loss

Course Outcomes: On successful completion of this course, the student will be able to

CO1: Characterize and classify the soils

CO2: Able to estimate seepage, stresses under various loading conditions and compaction characteristics

CO3: Able to analyze the compressibility of the soils

CO4: Able to understand the strength of soils under various drainage conditions

SYLLABUS

UNIT–I:

INTRODUCTION: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity-Field density by core cutter and sand replacement methods-Relative density.

INDEX PROPERTIES OF SOILS: Grain size analysis – consistency limits and indices –I. S. Classification of soils.

UNIT–II:

PERMEABILITY: Soil water – capillary rise – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems.

EFFECTIVE STRESS & SEEPAGE THROUGH SOILS: Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT–III:

STRESS DISTRIBUTION IN SOILS: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

COMPACTION: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

UNIT–IV:

CONSOLIDATION: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil - pre consolidation pressure and its determination - Terzaghi's 1-D consolidation theory-coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

UNIT–V:

SHEAR STRENGTH OF SOILS: Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt Ltd,
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.

Reference Books:

1. Foundation Engineering by P.C.Varghese, PHI
2. Soil Mechanics and Foundation Engg. By K. R. Arora, Standard Publishers and Distributors, Delhi.
3. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.
4. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
5. Geotechnical Engineering Principles and Practices by Cuduto, PHI Intrernational.
6. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.
7. Soil Mechanics and Foundation by byB.C.Punmia, Ashok Kumar Jain and Arun KumarJain, Laxmi, publications Pvt. Ltd., New Delhi.

B.TECH V SEMESTER **PCC**

L	T	P	C
3	0	0	3

20CE5T02 TRANSPORTATION ENGINEERING -1

Course Objectives: The objective of this course is to

- Highway development in India an understanding factors to be considered while aligning of highways.
- Understand the necessity of highway geometric design.
- Introduce traffic characteristic, road safety and parking issues.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Understand the longitudinal and cross sectional elements of a highway.

CO2: Design the horizontal and vertical alignment of roads.

CO3: Understanding the concept of intersections, interchanges.

CO4: Understanding the various parking parameters.

SYLLABUS

UNIT-I:

HIGHWAY DEVELOPMENT AND PLANNING: Highway Development in India – Necessity for Highway Planning- Different Road Development Plans; Classification of Roads - Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports – Highway Project.

UNIT–II:

HIGHWAY GEOMETIC DESIGN: Importance of Geometric Design - Design controls and Criteria - Highway Cross Section Elements - Sight Distance Elements- Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance - Design of Horizontal Alignment - Design of Super elevation and Extra widening- Design of Transition Curves - Design of Vertical alignment-Gradients- Vertical curves.

UNIT–III:

TRAFFIC ENGINEERING & REGULATIONS: Basic Parameters of Traffic-Volume, Speed and Density - Traffic Volume Studies - Data Collection and Presentation - Speed studies - Data Collection and Presentation - Origin & Destination studies, Parking Studies – On street & Off street Parking - Road Accidents - Causes and Preventive Measures – Accident data Recording – Condition Diagram and Collision Diagrams - Traffic Signs – Types and Specifications – Road Markings - Need for Road Markings-Types of Road Markings - Design of Traffic Signals – Webster Method

UNIT–IV:

Highway Materials and Construction : Subgrade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen– Bituminous paving mixes: Requirements – Marshall Method of Mix Design - Construction of Earthen , Gravel, Water Bound Macadam (WBM) Roads – Construction of Bituminous Pavements and Cement Concrete Pavements.

UNIT-V:

Design of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors.

Flexible Pavements: Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses –Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

Text books:

1. Highway Engineering – S.K. Khanna & C.E.G.Justo, A. Veera Ragavan Nemchand & Bros., 7th edition-2000.
2. Traffic Engineering & Transportation Planning – Dr.L.R. Kadyali, Khanna Publications – 6th Edition – 1997.

Reference Books:

1. Principles of Traffic and Highway Engineering – Garber & Hoel, Cengage Learning.
2. Principles and Practices of Highway Engineering – Dr. L. R. Kadiyali and Dr.N. B Lal - Khanna Publications.
3. Highway Engineering – S.P. Bindra, Dhanpat Rai & Sons. – 4th Edition (1981).

B.TECH V SEMESTER **PCC**

L	T	P	C
3	0	0	3

20CE5T03 DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES

Course Objectives: The objective of this course is to

- Identify the basic components of any structural system and the standard loading for the RC structure
- Identify and tell the various codal provisions given in IS. 456
- Describe the salient feature of limit state method, compare with other methods And the concepts of limit state of collapse and limit state of serviceability
- Evaluate the behaviour of RC member under flexure, shear and compression, torsion and bond.

Course Outcomes:

On successful completion of this course, the student will be able to

CO1: Compare and Design the singly reinforced, doubly reinforced and flanged sections.

CO2: Design the axially loaded, uniaxial and biaxial bending columns.

CO3: Classify the footings and Design the isolated square, rectangular and circular footings.

CO4: Distinguish and Design the one-way and two-way slabs.

SYLLABUS

UNIT-I:

Introduction- Structure - Components of structure - Different types of structures - Equilibrium and compatibility– Safety and Stability - Loads – Different types of Loads – Dead Load, Live Load, Earthquake Load and Wind Load– Forces – Different types of materials – RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method – Load combinations as per Limit state method - Materials - Characteristic Values – Partial safety factors – Behaviour and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 -2000. Limit state Analysis and design of sections in Flexure – Behaviour of RC section under flexure - Rectangular, T and L-sections, singly reinforced and doubly reinforced Beams – Detailing of reinforcement.

UNIT-II:

Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond –Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement.

UNIT-III:

Design of Two-way slabs with different end conditions, one-way slab, and continuous slab Using I S Coefficients - Design of dog-legged staircase – Limit state design for serviceability for deflection, cracking and codal provisions.

UNIT–IV:

Design of compression members - Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - I S Code provisions.

UNIT–V:

Design of foundation **-** Different types of footings – Design of wall footing – Design of flat isolated square, rectangular, circular footings and combined footings for two columns.

Text books:

1. Limit state designed of reinforced concrete – P.C. Varghese, PHI Learning Pvt. Ltd.
2. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill.
3. Reinforced concrete design by N.Krishna Raju and R.N. Pranesh, New age International Publishers.

IS Codes: IS Code 456-2000 (Permitted to use in examination hall) IS- 875 SP-16

Reference Books:

1. Reinforced concrete structures, Vol. 1, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd.
2. Fundamentals of Reinforced concrete design by M. L. Gambhir, Prentice Hall of India Pvt. Ltd.,
3. Design of Reinforced Concrete Structures by N. Subramanian, Oxford University Press
4. Design of concrete structures by J.N. Bandhyopadhyay PHI Learning Private Limited.
5. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand & Company.

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in two components as follows :

1. Descriptive examination - 25 Marks
2. Assignment - 5 Marks

NOTE:

Alternate weeks two periods of theory can be converted into drawing classes. The end examination paper should consist of Part – A and Part – B. Part – A should consist of two questions in design and drawing out of which one question to be answered. Part –B should consist of five questions in design out of which three to be answered. Weightage for Part – A is 40 % and Part – B is 60 %.

B.TECH V SEMESTER

PEC	L	T	P	C
	3	0	0	3

20CE5T06 STRUCTURAL ANALYSIS – II

(PROFESSIONAL ELECTIVE-I)

Course Objectives: **The objective of this course is to**

- Identify the various actions in arches.
- Understand classical methods of analysis for statically indeterminate structures.
- Differentiate the approximate and numerical methods of analysis for indeterminate structures.
- Find the degree of static and kinematic indeterminacies of the structures.
- Plot the variation of S.F and B.M when a moving load passes on indeterminate structure

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Understand the importance of various methods of slop and deflections for determinate structures.

CO2: Analyze the two hinged arches.

CO3: Solve statically indeterminate beams and portal frames using classical methods

CO4: Formulate the multistoried buildings by approximate methods

CO5: Formulate the stiffness matrix and analyze the beams by matrix methods

SYLLABUS

UNIT-I: ENERGY METHODS:

Introduction- expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem. Strain energy method for analysis of indeterminate structures, beams, pin jointed and rigid jointed structures, temperature effect, bending moment and shear force diagram.

UNIT–II: DISPLACMENT METHODS:

Moment Distribution Method - Analysis of continuous beams with and without settlement ofsupports using - Analysis of Single Bay Single Storey Portal Frames including side Sway -Analysis of inclined frames - Shear force and Bending moment diagrams, Elastic curve.

Kani's Method- Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two Storey Frames including Side Sway using Kani's Method - Shear force and bending moment diagrams - Elastic curve.

UNIT–III: APPROXIMATE METHODS:

Introduction – Analysis of multi-storey frames for lateral loads: Portal Method, Cantilever method. Introduction to Analysis of multi storey frames for gravity loads – Introduction to Substitute Frame method.

UNIT-IV: CABLES AND ARCHES

Cables and Suspension Bridges Introduction- Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges. Influence lines for three hinged stiffening girders.

Arches Introduction – Classification of Three and Two hinged Arches –Elastic theory of arches-Eddy's theorem- Analysis of three hinged, two hinged and fixed arches – Parabolic and circular arches Secondary stresses in three and two hinged arches due to elastic shortening of rib –Settlement and temperature effects

UNIT-V: MATRIX METHODS:

Introduction to Flexibility and Stiffness matrix methods of analyses using 'system approach' up to three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods

Computer Applications in Structural Analysis Introduction to software and its applications to 2D trusses and building frames. Advance structure analysis with Matlab.

Text Books:

1. Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S. Pandit S.P. Gupta Tata McGraw Hill Education Pvt. Ltd.
3. Indeterminate Structural Analysis by K.U. Muthu et al., I. K.International Publishing House Pvt.Ltd.

Reference Books:

1. Structural analysis T. S Thandavamoorthy, Oxford university Press
2. Mechanics of Structures Vol –II by H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd.
3. Basic Structural Analysis by C.S. Reddy., Tata McGraw Hill Publishers.
4. Examples in Structural Analysis by William M.C. McKenzie, Taylor & Francis.

B.TECH V SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE5T07 RURAL WATER SUPPLY AND ENVIRONMENTAL SANITATION

(PROFESSIONAL ELECTIVE-I)

Course Objectives: The objective of this course is to

- To Provide knowledge on Rural Water Supply and Rural Sanitation
- For Understanding the importance of Low Cost Water Treatment
- To get knowledge on Industrial Hygiene and Sanitation.
- To know about Solid Waste Management.

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Identify the problems pertaining to rural water supply and sanitation

CO2: Design water supply and sanitation system for rural community.

CO3: Design low cost waste management systems for rural areas.

CO4: Plan and design an effluent disposal mechanism.

SYLLABUS

UNIT-I:

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies

UNIT-II:

Low Cost Water Treatment: Introduction – Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

UNIT –III:

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines- Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas- stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems- Effluent disposal.

UNIT–IV:

Industrial Hygiene And Sanitation: Occupational Hazards- Schools- Public Buildings Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.

UNIT-V:

Solid Waste Management: Disposal of Solid Wastes- Composting- land filling -incineration-

Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

Text Books:

1. Park, J.E., and Park, K., Text Book of Preventive and Social Medicine, Banarsidas Bhanot, 1972
2. Rural Water Supply And Sanitation by Sanjay gupta , Vayu Education of India; First edition (1 January 2012); Vayu Education of India.

Reference Books:

1. Eulers, V.M., and Steel, E.W., Municipal and Rural Sanitation, 6th Ed., McGraw HillBook Company, 1965
2. Wright, F.B., Rural Water Supply and Sanitation, E. Robert Krieger Publishing Company, Huntington, New York, 1977.
3. Juuti, P., Tapio S. K., and Vuorinen H., Environmental History of Water: Global Views on Community Water Supply and Sanitation, IWA Publishing (Intl Water Assoc), 2007.

B.TECH V SEMESTER

PEC	L	T	P	C
	3	0	0	3

20CE5T08 GEO SYNTHETICS

(PROFESSIONAL ELECTIVE-I)

Course Objectives:

The objective of this course is to

- Understand history and various manufacturing methods of geosynthetics.
- Know Properties and Testing methods of Geosynthetics.
- Design geotextiles.
- Design geogrids.
- Uses of Geomembranes in various Constructions.
- To learn Advantages of Geo composites

Course Outcomes:

On successful completion of this course , the students will be able to

CO1: Testing methods of Geo synthetics.

CO2: Design geo textiles.

CO3: Design geo grids.

CO4: Using Geo membranes in various constructions.

CO5: Using Geo composites in various constructions.

SYLLABUS

UNIT–I: Introduction:

Introduction to Geo synthetics – Basic description – History – Manufacturing methods – Uses and Applications.

UNIT–II: Geotextiles:

Designing for Separation – Reinforcement – Stabilization – Filtration – Drainage and Moisture barriers. Properties and Testing methods of Geotextiles.

UNIT–III: Geo grids:

Designing for Reinforcement – Stabilization – Designing Gabions – Construction methods – Design of retaining walls. Properties and Testing methods of Geogrids.

UNIT-IV: Geo membranes:

Survivability Requirements – Pond Liners – Covers for Reservoirs – Canal Liners – Landfill Liners – Caps and closures – Dams and Embankments. Properties and Testing methods of Geo membranes.

UNIT-V: Geo composites:

Geo composites – An added advantage – Geo composites in Separation – Reinforcement– Filtration – Geo composites as Geo webs and Geo cells – Sheet drains – Strip drains and Moisture barriers. Properties and Testing methods of Geo composites.

Text Books:

1. "Engineering with Geosynthetics",by G.Venkatappa Rao and GVS Suryanarayana Raju – Tata McGraw Hill Publishing Company Limited – New Delhi.
2. Ground Improvement Techniques by P.Purushothama Raj ,Laxmi Publications; Second edition (1 January 2016).

Reference Books:

1. "Designing with Geosynthetics by Robert M. Koerner Prantice Hall, Eaglewood cliffs, NJ 07632.
2. "Construction and Geotechnical Engineering using Synthetic Fabries" by Robert M. Koerner and Josoph P. Welsh. John Willey and Sons, New York.
3. "Foundation Analysis and Design" by J.E. Bowles McGraw Hill Publications.

B.TECH V SEMESTER

PEC	L	T	P	C
	3	0	0	3

20CE5T09 INTERIOR DESIGNS AND DECORATIONS

(PROFESSIONAL ELECTIVE-I)

Course Objectives: The objective of this course is to

- Understand the elements and principles of interior designs and decorations.
- Learn the importance of art elements in the composition of building spaces.
- Learn the new design concepts for developing interiors of buildings.
- Learn the application of colors, lightings, furniture in creating beautiful interiors.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Understand the importance of interior designs and decorations.
CO2: Should realize the use of art elements in the composition of building spaces.
CO3: Should learn the new design concepts for developing interiors of buildings.
CO4: Learn be able to apply colors, lightings, furniture in creating beautiful interiors.

SYLLABUS

UNIT-I:

Development of interior design concepts- importance for interiors in modern buildings, changing trends and salient features, objectives of aesthetic planning - beauty, expressiveness, functionalism, economy- good taste - meaning and importance- developing skill in aesthetics.

UNIT-II:

Designs- concepts, meaning, purpose, types - structural and decorative characteristics, forms to function relationship, elements of designs - line and direction, form and shape, size, colour, light, pattern, texture and space - application of elements to form designs.

UNIT-III:

Application of colour harmonies in the interiors and exteriors –effects of light on colour, Illusion of colour, psychology of colour, effect of colour on each other-uses and application of colours- walls, wall finishes, ceilings, roofs, decorative exteriors.

UNIT-IV:

Importance of lighting – artificial lighting - light sources, types and uses of light, specific factors in lighting- measurements of lighting, psychological aspects of light, glare, types of glare and prevention– selection of lamps, lighting fixtures, lighting for various areas and activities.

UNIT–V:

Interior furnishings- floors, floor coverings, soft furnishings, furniture- selection and arrangement, placement of accessories, home accessories- interior decorations- flower arrangement, floor decorations, interior decoration trends in India.

Text Books:

1. 'Interior Design and Decoration' by Premavathy Seetharaman and Praveen Pannu, CBS Publishers and distributors, New Delhi, 2005.
2. 'Building Construction' by Rangawala, S.C, Charter publishing house, Anand, 1963.
3. 'Interior Design Principles and practice' by Pratap R.M., Standard publishers distribution, Delhi, 1988.

Reference Books:

1. 'How to see, how to paint it' by Judy M., Harpen Colling publishers, London, 1994.
2. 'Lighting for a beautiful Home' by Jan Orcharchd, Dunestyle publishing Ltd., U.S.A., 1993.
3. 'The Complete Home Decorator' by Stewart and Sally .W., Annes publishers Ltd., New York, 1997.

B.TECH V SEMESTER **PCC LAB**

L	T	P	C
0	0	3	1.5

20CE5L10 GEOTECHNICAL ENGINEERING LAB

Course Objectives: To obtain index and engineering properties of locally available soils, and to understand the behavior of these soil under various loads.

Course Outcomes: At the end of the course, the student will be able to Classify and evaluate the behavior of the soils subjected to various loads.

LIST OF EXPERIMENTS

1. Atterberg Limits (Liquid Limit, Plastic Limit, and Shrinkage Limit)
2. a) Field density by core cutter method and b) Field density by sand replacement method
3. Determination of Specific gravity of soil Grain size distribution by sieve analysis
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation (square root time fitting method)
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Triaxial compression test

Reference Books:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International publications.
2. Determination of Soil Properties by J. E. Bowles.
3. IS Code 2720-relevant parts.

B.TECH V SEMESTER **PCC LAB**

L	T	P	C
0	0	3	1.5

20CE5L11 TRANSPORTATION ENGINEERING LAB

Course Objectives:

- To test crushing value, impact resistance, specific gravity and water absorption,Percentage attrition, percentage abrasion, flakiness index and elongation index for the given road aggregates.
- To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
- To test the stability for the given bitumen mix
- To carry out surveys for traffic volume, speed and parking.

LIST OF EXPERIMENTS

Experiments to be conducted on following materials and should determine the corresponding values.

I. ROAD AGGREGATES:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

III. BITUMINOUS MIX:

1. Marshall Stability test.

IV. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.
2. Spot speed studies.

Text Books:

1. Highway material testing manual by S.K.Khanna, C.E.G. Justo and A. Veeraraghavan Neam Chand Publications ,New Delhi.

Reference Books:

1. IRC Codes of Practice
2. Asphalt institute of America manuals
3. Code of Practice of B.I.S.

B.TECH V SEMESTER

SC	L	T	P	C
	0	0	4	2

20CE5S12 STAAD PRO LAB
(Skill Oriented Course)

Course Objectives: The objective of this course is to

- Understand the details of STAAD. Pro software package.
- Prepare input data for RCC & Steel structures.
- Design different components of structures.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Understand the details of STAAD.Pro software package.

CO2: To prepare input data of STAAD.Pro.

CO3: Run STAAD.Pro for analysis and desing of structures.

CO4: Design different components of structures.

EXPERIMENTS

1. Design of simply supported RCC beam.
2. Design of cantilever RCC beam.
3. Design of continuous RCC beam.
4. Design of simply supported Steel beam.
5. Design of continuous Steel beam.
6. Design of RCC columns with different end conditions.
7. Design of Steel columns with different end conditions.
8. Design of steel trusses.
9. Design of RCC portal frames.
10. Design of steel portal frames.

Text Books:

1. Concept and Techniques of GIS by C.P.L.O Albert, K.W. Yong, Printice Hall Publishers.

B.TECH V SEMESTER

MC	L	T	P	C
	2	0	0	0

20CE5M13 ESSENCE OF INDIAN KNOWLEDGE TRADITION

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing.
- Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

Course Outcomes:

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

CO1: Understand the significance of Indian Traditional Knowledge

CO2: Classify the Indian Traditional Knowledge

CO3: Compare Modern Science with Indian Traditional Knowledge system.

CO4: Analyze the role of Government in protecting the Traditional Knowledge

CO5: Understand the impact of Philosophical tradition on Indian Knowledge System.

SYLLABUS

Unit I

Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in Global Economy.

Unit II

Basic structure of Indian Knowledge System: Astadash Vidya- 4 Ved - 4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi),6vedanga (Shisha, Kalppa, Nirukha,Vykaran, Jyothisha & Chand),4upanga (Dharmashastra, Meemamsa, purana & Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System: Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge -

Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain &Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, Nruthya Yevam Sahithya.

Text Books

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.

References

1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, BharatiyaVidya
2. Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan
3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
4. Pramod Chandra, India Arts, Howard Univ. Press, 1983.
5. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html
2. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf
3. https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_tex t.pdf

B.TECH V SEMESTER

	L	T	P	C
I	0	0	0	1.5

20CE5I14 SUMMER INTERNSHIP

A) There shall be an Industrial oriented Internship / Summer Internship in Collaboration withan Industry (or) Government organization of the relevant specialization to be registered immediately after IVth Semester Examinations and VIth Semester taken up during the summer vacation for about Minimum six weeks duration.

B) The industry-oriented Internship or Summer Internship shall be submitted in a report form, and a presentation of the same shall be made before a Committee, which evaluates it for 50 marks. The committee shall consist of Head of the Department, the supervisor of internship and a Senior Faculty Member of the Department. There shall be no internal marks for Industry oriented internship/ Summer Internship. The internship shall be evaluated in the V SEM and VII Semester

B.TECH VI SEMESTER

PCC	L	T	P	C
	3	0	0	3

20CE6T01 DESIGN AND DRAWING OF STEEL STRUCTURES

Course Objectives: The objective of this course is to

- Explain the mechanical properties of structural steel, plasticity, yield.
- Describe the salient features of Limit State Method of design of Steel structures.
- Identify and explain the codal provisions given in IS.800.
- Analyze the Behavior of steel structures under tension, compression and flexure.
- Design the tension, Compression, flexural members and plate girder
- Design the connection in steel structure, 'build -up member and (bolted and welded).

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Analyze the tension members, compression members

CO2: Design the tension members, compression members and column bases And joints and connections

CO3: Analyze and Design the beams including built-up sections and beam and connections.

CO4: Identify and Design the various components of welded plate girder Including stiffeners

SYLLABUS

UNIT-I:

Materials: Types of structural steel, Mechanical properties of steel, Concepts of plasticity, yield strength, Loads and Stresses, Local buckling behavior of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states, Design Strengths, deflection limits, serviceability, stability check.

Design of Connections: Different types of connections, Bolted connections, Design strength, efficiency of joint, prying action, Welded connections, Types of welded joints – Design requirements, Design of Beam, column connections, Eccentric connections, Type I and Type II connection – Framed connection.

UNIT–II:

Flexural Members: Plastic moment, Plastic section modulus for different sections, Design of Flexural Members, laterally supported and unsupported Beams – Design of laterally supported beams, Bending and shear strength/buckling, Built-up sections Beam splice.

UNIT–III:

Design of tension members –Simple and built up members - Design strength – Design procedure for splicing - lug angle.

Design of compression members – Buckling class – slenderness ratio –Design of simple compression members and struts.

UNIT–IV:

Design of Columns - Built up compression members-Design of Lacings and Battened Columns- Design principle of eccentrically loaded columns-Splicing of columns- Design of Column Foundation-Design of slab base and gusseted base.

UNIT–V:

Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener–intermediate stiffeners – Design of web splice and flange splice.

Design of Gantry Girder: Impact Factors-Longitudinal and Lateral Forces- Design of Gantry Girder.

Note:* *Design of structural members include detailed sketches.

Text Books:

1. Design of steel structures by S.K. Duggal, Tata Macgrawhill publishers, 2000, 2nd Edition
2. Design of steel structures by N.Subramanian , Oxford University press, 2008

Reference Books:

1. Design of steel structures by K.S.Sairam, Pearson Educational India, 2ndEdition,2013
2. Design of steel structures by Edwin H.Gayrold and Charles Gayrold, Tata Mac-graw hill publishers,1972
3. Design of steel structures by L. S. JayaGopal, D.Tensing, Vikas Publishing House

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in two components as follows:

1. Descriptive examination - 25 Marks
2. Assignment - 5 Marks

NOTE:

Alternate weeks two periods of theory can be converted into drawing classes. The end examination paper should consist of Part – A and Part – B. Part – A should consist of two questions in design and drawing out of which one question to be answered. Part –B should consist of five questions in design out of which three to be answered. Weightage for Part – A is 40 % and Part – B is 60 %.

B.TECH VI SEMESTER

PCC	L	T	P	C
	3	0	0	3

20CE6T02 WATER RESOURCES ENGINEERING-1

Course Objectives: The objective of this course is to

- Introduce hydrologic circle
- Derive various formulas used in estimation of different basic components of surface and Ground water cycle.
- Understand the concept of water requirement for irrigation and connectivity of hydrology to the field requirement.

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Understand the different concepts and terms used in engineering hydrology

CO2: To identify and explain various formulae used in estimation of surface and Groundwater hydrology components

CO3: Demonstrate their knowledge to connect hydrology to the field requirement

SYLLABUS

UNIT-I:

Introduction: Concepts of Hydrologic cycle, Global Water Budget, Applications in Civil engineering Sources of data.

Precipitation

Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Arithmetic,Theissen's and Isohyetal methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth-duration- frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

UNIT-II:

Abstractions from precipitation

Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney & Criddle Methods, potential evapotranspiration over India, actual evapotranspiration, , interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices. Runoff - Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.

UNIT-III:

Hydrographs

Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall– Base Flow- Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function- Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

UNIT-IV:

Groundwater Hydrology

Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law.

Well Hydraulics - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.

UNIT-V:

Canal Systems: Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Regime channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals-Types of lining- Advantages and disadvantages. Drainage of irrigated lands-necessity, methods.

Text Books:

1. Hydrology by K. Subramanya (Tata McGraw-Hill)
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers
3. G L Asawa, Irrigation Engineering, Wiley Eastern

Reference Books:

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications)
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K. N. Duggal and J.P. Soni (New Age International.

B.TECH VI SEMESTER **PCC**

L	T	P	C
3	0	0	3

20CE6T03 ENVIRONMENTAL ENGINEERING

Course Objectives: The objective of this course is to

- Provide the knowledge of water sources
- Provide the knowledge of water treatment
- Design of distribution system
- Impart knowledge on Waste water treatment
- know the safe disposal methods.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Assess characteristics of water and wastewater and their impacts

CO2: Estimate quantities of water and waste water and plan conveyance components

CO3: Design components of water and waste water treatment plants

CO4: Be conversant with issues of air pollution and control

SYLLABUS

UNIT–I:

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

UNIT–II:

Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

UNIT-III:

characteristics of sewage –waste water collection–Estimation of waste water and storm water decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming –self-purification of rivers.

UNIT–IV:

Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment-trickling filters – ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

UNIT–V:

Air pollution– classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior – Control of particulates – Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

Text Books:

1. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
3. Environmental Engineering, I and II by BC Punmia, Std. Publications.
4. Environmental Engineering, I and II by SK Garg, Khanna Publications.
5. Environmental Pollution and Control Engineering CS Rao, Wiley Publications

Reference Books:

1. Water and Waste Water Technology by Steel, Wiley
2. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.Wiley, 2007.
5. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication

B.TECH VI SEMESTER

	L	T	P	C
PEC	3	0	0	3

20CE6T04 GEOTECHNICAL ENGINEERING-2 (PROFESSIONAL ELECTIVE-II)

Course Objectives: The objective of this course is to

- Impart to the student knowledge of types of shallow foundations and Theories required for the determination of their bearing capacity.
- Enable the student to compute immediate and consolidation settlements of shallow foundations.
- Impart the principles of important field tests such as SPT and Plate bearing test.
- Enable the student to imbibe the concepts of pile foundations and determine Their load carrying capacity.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics.

CO2: The student must be able to compute the magnitude of foundation settlement to decide the size of the foundation.

CO3: The student must be able to use the field test data and arrive at the bearing capacity.

CO4: The student must be able to design Piles based on the principles of bearing capacity.

SYLLABUS

UNIT–I:

Shallow Foundations & Settlement analysis:

Bearing Capacity Criteria: Types of foundations and factors to be considered in their location - Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory - IS Methods.

Settlement Criteria: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures.

UNIT–II:

Pile Foundations: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load tests - Load carrying capacity of pile groups in sands and clays.

UNIT-III:

Well Foundations: Types – Different shapes of well – Components of well – functions – forces acting on well foundations

Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – planning of Programme and preparation of soil investigation report.

UNIT–IV:

Stability of Slopes: Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices – Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions.

UNIT-V:

Earth Retaining Structures: Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils.

Text Books:

1. Principles of Foundation Engineering, Das, B.M., (2011), 6th edition Cengage learning
2. Basic and Applied Soil Mechanics, Gopal Ranjan & A.S.R. Rao, New Age International Pvt. Ltd, (2004).

Reference Books:

1. Foundation Analysis and Design, Bowles, J.E., (1988), 4th Edition, McGraw-Hill Publishing Company, Newyork.
2. Analysis and Design of Substructures by Swami Saran, Sarita Prakashan, Meerut

B.TECH VI SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE6T05 AIR POLLUTION AND CONTROL (PROFESSIONAL ELECTIVE-II)

Course Objectives: The objective of this course is to

- know the analysis of air pollutants
- know the Threshold Limit Values (TLV) of various air pollutants
- acquire the design principles of particulate and gaseous control
- learn plume behaviour in different environmental conditions
- to learn carbon credits for various day to day activities

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Decide the ambient air quality based on the analysis of air pollutants

CO2: Design particulate and gaseous control measures for an industry

CO3: Judge the plume behaviour in a prevailing environmental condition

CO4: Estimate carbon credits for various day to day activities

SYLLABUS

UNIT–I:

Air Pollution: Sampling and analysis of air pollutants, conversion of ppm into $\mu g/m^3$. Definition of terms related to air pollution and control - secondary pollutants - Indoor air pollution – Ozone holes and Climate Change and its impact - Carbon Trade.

UNIT-II:

Thermodynamics and Kinetics of Air-pollution: Applications in the removal of gases like SOx, NOx, CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

UNIT–III:

Meteorology and Air Pollution: Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena on plume behaviour and Air Quality - Wind rose diagrams and Isopleths.

UNIT-IV:

Ambient Air Quality Management: Monitoring of SPM - RPM SO2; NOx and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring – Noise Monitoring - Weather Station. Emission Standards- Gaussian Model for Plume Dispersion

UNIT-V:

Air Pollution Control: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipment – Settling Chambers, Cyclone separators –Fabric filters–Scrubbers, Electrostatic precipitators

Text Books:

1. Air Pollution and Control, K.V.S.G. Murali Krishna, Laxmi Publications, NewDelhi, 2015
2. Air Pollution, M. N. Rao and H. V. N. Rao, Tata McGraw Hill Company.

Reference Books:

1. An Introduction to Air pollution, R. K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution by Wark and Warner - Harper & Row, New York.

B.TECH VI SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE6T06 URBAN TRANSPORTATION PLANNING (PROFESSIONAL ELECTIVE-II)

Course Objectives: The objective of this course is to

- To learn various procedures for travel demand estimation.
- To various data collection techniques for OD data.
- To know various models and techniques for trip generation, trip distribution, mode choiceand traffic assignment.
- To develop alternative urban transport network plans.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Estimate travel demand for an urban area.

CO2: Plan the transportation network for a city.

CO3: Identify the corridor and plan for providing good transportation facilities.

CO4: Evaluate various alternative transportation proposals.

SYLLABUS

UNIT-I:

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution ofPlanning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT-II:

Data Collection and Inventories: Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT–III:

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution.

UNIT -IV

Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation.

UNIT-V:

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements.

Text Books:

1. 'Introduction to Urban System Planning' by Hutchinson, B.G., McGraw Hill.
2. 'Transportation Engineering - An Introduction' by Khisty C.J., Prentice Hall.
3. 'Fundamentals of Transportation Planning' by Papacostas, Tata McGraw Hill.

Reference Books:

1. 'Urban Transportation Planning: A decision-oriented Approach' by Mayer M and Miller E, McGrawHill.
2. 'Introduction to Transportation Planning' by Bruton M.J., Hutchinson of London.
3. 'Metropolitan Transportation Planning' by Dicky, J.W., Tata McGraw Hill.
4. 'Traffic Engineering and Transportation Planning' by Kadiyali.L.R., Khanna Publishers, New Delhi.

B.TECH VI SEMESTER

PEC	L	T	P	C
	3	0	0	3

20CE6T07 GROUND WATER DEVELOPMENT AND MANAGEMENT (PROFESSIONAL ELECTIVE-II)

Course Objectives: The objective of this course is to

- learn about Ground water occurrence
- Know about Ground water movement
- Acquire knowledge of well design.

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Understand Ground Water occurrence,

CO2: Ground Water Movement

CO3: Well design

UNIT-I:

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT–II:

Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT–III:

Steady groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theim's equations, Assumptions, Formation constants, yield of an open well Well interface and well tests – Recuperation Test. Unsteady flow towards a well – Non equilibrium equations – Theis' solution – Jocob and Chow's simplifications, Leaky aquifers – Well Interference.

UNIT–IV:

Well Design: Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery. Well Construction and Development Water wells, drilling methods-rotary drilling, percussion drilling, well construction, well development, well completion, well disinfection, well maintenance.

UNIT–V:

Groundwater: Modelling and Management Basic principles of groundwater modelling-Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models, Concepts of groundwater management, basin management by conjunctive use-case studies.

Text Books:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H. M. Raghunath, Wiley Eastern Ltd.
3. Ground Water Hydrology by D.K. Todd and L.R Mays John Willey.

Reference Books:

1. Groundwater Hydrology by Bower, John Wiley & sons.
2. Groundwater System Planning & Management – R. Willes & W. W. G. Yeh, Prentice Hall.

B.TECH VI SEMESTER **PCC LAB**

L	T	P	C
0	0	3	1.5

20CE6L10 ENVIRONMENTAL ENGINEERING LAB

Course Objectives: The objective of this course is to

- Perform the experiments to determine water and waste water quality
- Understand the water & waste water sampling, their quality standards
- Estimate quality of water, waste water, Industrial water

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Understand about the equipment used to conduct the test procedures

CO2: Perform the experiments in the lab

CO3: Examine and Estimate water, waste water, air and soil Quality

CO4: Compare the water, air quality standards with prescribed standards set by the Local governments

CO5: Develop a report on the quality aspect of the environment

LIST OF EXPERIMENTS

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Acidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD/ DO
12. Determination of Residual Chlorine
13. Total count No.
14. Noise level measurement

Reference Books:

1. Chemical Analysis of Water and Soil by Dr.K.V.S.G. Murali Krishna, Reem Publications Pvt. Ltd.
2. Manual on Water Supply & Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi.

B.TECH VI SEMESTER **PCC LAB**

L	T	P	C
0	0	3	1.5

20CE6L11 DESIGN AND DRAWING OF IRRIGATION STRUCTURES

Course Objectives:

To understand design principle of various irrigation structures

Course Outcomes:

At the end of the course the student will be able to design various irrigation structures.

SYLLABUS:

Design and drawing of

1. Surplus weir
2. Tank sluice with a tower head
3. Canal drop-Notch type
4. Canal regulator
5. Under tunnel
6. Syphon aqueduct type III

Final Examination Pattern:

Any two question of the above six designs may be asked out of which the candidate has to answer one question. The duration of the examination is three hours.

Text Books:

1. Water Resources Engineering – Principles and Practice by C. Satyanarayana Murthy, New age International Publishers.

Reference Books:

1. Irrigation Engineering and Hydraulic Structures, S. K. Garg, Standard Book House.
2. Irrigation and Water Power Engineering, B. C Punmia & Lal, Lakshmi Publications Pvt. Ltd., New Delhi.

B.TECH VI SEMESTER	**PCC LAB**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

20CE6L12 GEOGRAPHICAL INFORMATION SYSTEMS LAB

Course Objectives:

Objective of this course is to introduce concepts of GIS through QGIS open source software

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Describe fundamental concepts related to GIS

CO2: Work with vector data

CO3: Work with raster data

CO4: Perform data digitalization and process

CO5: Work with attributes, external files

CO6: Prepare map

LIST OF EXPERIMENTS

1 Understanding coordinate systems, raster and vector data

2 Preparing QGIS environment

3 Working with vector data

4 Applying styles

5 Working with raster data

6 Data digitalization and processing

7 Working with attributes

8 External files and spatial interpolation

9 Maps and visualization

Software Used: QGIS

B.TECH VI SEMESTER **SC**

L	T	P	C
0	0	4	2

20CE6S13 SOFT SKILLS
(Skill Oriented Course)

Course Outcomes:

The student will acquaint himself with various nuances of Soft Skills and Personality Development besides aspects related to Campus Recruitment Process.

1 Life Skills

2 JAM

3 Presentation Skills

4 Resume Writing

5 Group Discussion

6 Interview Skills

Reference Books:

1. ***Interact*****,** Orient Blackswan
2. **Communication Skills,** Sanjay Kumar and Pushp Latha. OUP, 2011

B.TECH VI SEMESTER **MC**

L	T	P	C
2	0	0	0

20CE6M14 DISASTER MANAGEMENT

Course Learning Objectives: The objective of this course is to

1. Understand Types of disasters like Earthquake, Landslide, Flood, Drought, Fire
2. Know Panchayati Raj Institutions/ Urban Local Bodies (PRIs/ ULBs), States, Centre, and other stakeholders
3. Understand Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India
4. Understand Role of GIS and Information Technology Components in Preparedness, Risk Assessment
5. Know various case studies

Course Learning Outcomes: On successful completion of this course, the students will be able to

CO1: Differentiate the types of disasters, causes and their impact on environment and society

CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation.

CO3: Draw the hazard and vulnerability profile of India, Scenarios in the Indian context

CO4: Analyze the Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

CO5: Understand about Risk Assessment, Response and Recovery Phases of Disaster Disaster Damage Assessment

UNIT-I:

INTRODUCTION TO DISASTERS Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT-II:

APPROACHES TO DISASTER RISK REDUCTION (DRR) Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural-nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT-III:

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources

UNIT-IV:

DISASTER RISK MANAGEMENT IN INDIA Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT-V:

DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Text Books:

1. Singhal J.P.“Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T01 TRANSPORTATION ENGINEERING-2
(PROFESSIONAL ELECTIVE-III)

Reference Books:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009

Course Objectives: The objective of this course is to

- know various components and their functions in a railway track
- acquire design principles of geometrics in a railway track.
- know various techniques for the effective movement of trains.
- acquire design principles of airport geometrics and pavements.
- know the planning, construction and maintenance of Docks and Harbours.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Design geometrics in a railway track.
CO2: Design airport geometrics and airfield pavements.
CO3: Plan, construct and maintain Docks and Harbours.

SYLLABUS

A. RAILWAY ENGINEERING

UNIT–I:

Components of Railway Engineering: Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzingof Sleepers-Sleeper density – Rail joints.

UNIT–II:

Geometric Design of Railway Track: Alignment – Engineering Surveys - Gradients-Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT–III:

Turnouts & Controllers: Track layouts – Switches – Design of Tongue Rails – Crossings–Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations.

B. AIRPORT ENGINEERING

UNIT–IV:

Airport Planning & Design: Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

UNIT–V:

Runway Design: Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.

Text Books:

1. Railway Engineering, Satish Chandra and Agarwal M. M., Oxford University Press, New Delhi
2. Airport Engineering, Khanna & Arora - Nemchand Bros, New Delhi

Reference Books:

1. Railway Engineering, Saxena & Arora – Dhanpat Rai, New Delhi.
2. Transportation Engineering Planning Design, Wright P. H. & Ashfort N. J., John Wiley & Sons.
3. Transportation Engineering Volume II, C Venkatramaiah, 2016, Universities Press, Hyderabad.
4. Transportation Engineering, Railways, Airports, Docks & Harbours, Srinivasa Kumar R, University Press, Hyderabad
5. Airport Engineering Planning & Design, Subhash C. Saxena, 2016, CBS Publishers,

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T02 SOLID AND HAZARDOUS WASTE MANAGEMENT
(PROFESSIONAL ELECTIVE-III)

Course Objectives: The objective of this course is to

- Impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.
- acquire the principles of treatment of municipal solid waste
- know the impact of solid waste on the health of the living beings
- learn the criterion for selection of landfill and its design
- plan the methods of processing such as composting the municipal organic waste

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Design the collection systems of solid waste of a town
CO2: Design treatment of municipal solid waste and landfill
CO3: Know the criteria for selection of landfill
CO4: Characterise the solid waste and design a composting facility
CO5: Know the Method of treatment and disposal of Hazardous wastes.

SYLLABUS

UNIT-I:

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities, Terms related to ISWM like WTE, ULB, TLV etc..Measurement of NPK and Calorific value.

UNIT-II:

Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

Transfer, Transport and Transformation of Waste: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements. Unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization

UNIT-III:

Processing and Treatment: Processing of solid waste - Waste transformation through combustion and composting. Market yard wastes and warming composting and vermin composting, anaerobic methods for materials recovery and treatment – Energy recovery– biogas generation and cleaning– Incinerators.

UNIT-IV:

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation. Case studies

UNIT-V:

Hazardous Waste Management- sources, collection, transport, treatment and disposal methods; Biomedical waste Management; Electronic waste Management; Environmental law related to waste Management; Case studies.

Text Books:

1. Integrated Solid Waste Management, George Techobanoglous, McGraw Hill Publication, 1993

Reference Books:

1. Solid Waste Engineering, Vesilind, P. A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
2. Hazardous Waste Management, Charles A. Wentz, McGraw Hill Publication, 1995.
3. Solid and Hazardous Waste Management PM Cherry, CBS Publishers and Distributors. New Delhi, 2016.
4. Solid Waste Engineering, William A Worrell, P Aarue Vesilind, Cengage Learning, New Delhi 2016

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T03 BRIDGE ENGINEERING (PROFESSIONAL ELECTIVE-III)

Course Objectives: The objective of this course is to

- Impart knowledge on different types of Bridges and IRC standards
- Equip student with concepts and design of Slab Bridges, T Beam Bridges, Box Culverts
- Understand concepts of design of Plate Girder Bridges
- Know the different methods of inspection of bridges and maintenance

Course Outcomes: **On successful completion of this course , the students will be able to**

CO1: Explain different types of Bridges with diagrams and Loading standards

CO2: Carryout analysis and design of Slab bridges, T Beam bridges, Box culvers and suggest structural detailing

CO3: Carryout analysis and design of Plate girder bridges

CO4: Organize for attending inspections and maintenance of bridges and prepare reports.

SYLLABUS

UNIT-I:

Introduction- Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges,Pre stressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading

UNIT-II:

Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon's – Massonet Method –Hendry- Jaegar Methods- Courbon's theory- Pigeaud's method

UNIT-III:

T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondary beams- Reinforcement detailing.

UNIT-IV:

Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

UNIT-V:

Box Culverts: Loading – Analysis and Design- Reinforcement detailing.

Text Books:

1. Essentials of Bridge Engineering, Jhonson Victor D
2. Design of Bridge Structures, T. R. Jagadeesh, M.A. Jayaram, PHI
3. Design of Bridges, N. Krishna Raju, Tata McGraw Hill

Reference Books:

1. Design of Concrete Bridges, Aswini, Vazirani, Ratwani
2. Design of Steel Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications
3. Design of R C Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications

B.TECH VII SEMESTER **PEC**

L	T	P	C
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20CE7T04 GROUND IMPROVEMENT TECHNIQUES (PROFESSIONAL ELECTIVE-III)

Course Objectives: The objective of this course is to

- make the student appreciate the need for different ground improvement methods adopted for improving the properties of remoulded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
- Make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
- Enable the students to know how geotextiles and geo synthetics can be used to improve the engineering performance of soils.
- make the student learn the concepts, purpose and effects of grouting.

Course Outcomes: **On successful completion of this course, the students will be able to**

CO1: Possess the knowledge of various methods of ground improvement and their suitability to different field situations.

CO2: Design a reinforced earth embankment and check its stability.

CO3: Know the various functions of Geo synthetics and their applications in Civil Engineering practice.

CO4: Understand the concepts and applications of grouting.

SYLLABUS

UNIT-I:

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT–II:

Dewatering – sumps and interceptor ditches – single and multi stage well points –vacuum well points – horizontal wells – criteria for choice of filler material around drains– electro osmosis

UNIT-III:

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime– bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT-IV:

Geosynthetics – geotextiles – types – functions , properties and applications –geogrids , geomembranes and gabions - properties and applications.

UNIT-V:

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests

Text Books:

1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi.
3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

Reference Books:

1. Ground Improvement, M.P. Moseley, Blackie Academic and Professional, USA.
2. Designing with Geosynethetics, R. M Koerner, Prentice Hall

B.TECH VII SEMESTER **PEC**

L	T	P	C
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20CE7T05 WATER RESOURCES ENGINEERING – 2
(PROFESSIONAL ELECTIVE-IV)

Course Objectives: The objective of this course is to

- Introduce the types, concepts of planning and design of irrigation systems
- Discuss about irrigation projects of India
- Discuss the relationships between soil, water and plant and their significance in planning an irrigation system
- Understand design methods of erodible and non-erodible canals
- Know the principles of hydraulic structures on permeable foundations
- Know the concepts for analysis of storage and diversion head works

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Estimate irrigation water requirements

CO2: Design irrigation canals and canal network and can plan and canal irrigation system

CO3: Find the capacity of a reservoir

CO4: Analyze stability of gravity dams

CO5: Apply suitable spillways and energy dissipation works

SYLLABUS

UNIT-I:

Irrigation: Necessity and importance; Terminology of Irrigation and Irrigation structures; Major Irrigation projects in India– Polavaram, Nagarjuna sagar, Kaleswaram, Bakranangal ; Principal crops and crop seasons of India; Types of irrigation and methods of applying water to crops ; Recent irrigation technologies Crop Water Requirement: soil-water-plant relationship, soil moisture constants, consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, Time factor, Crop ratio, Overlap allowance, Irrigation efficiencies.

UNIT-II:

Assessment of Irrigation water: Water Logging; Land Reclamation; Standards of Irrigation water Canals: Classification, canal alignment, lining of irrigation canals, types of lining design of lined canals; Silting and scouring; Silt theories-Kennedy's silt theory and Lacey's regime theory, Application of Kennedy's and Lacey's theory to channel design, comparison.

UNIT-III:

Canal Structures: Definition and usage of Canal Falls, Regulators, Cross Drainage Works, Outlets; Cross Drainage Works-Types, selection; Basic design principles of canal structures Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. Causes and failures of weirs on permeable foundations, Bligh's creep theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-IV:

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir. Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Life of reservoir .Dams: Types of dams, selection of type of dam, selection of site for a dam.

UNIT-V:

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, limiting height of a dam, stability analysis, drainage galleries Spillways: Types, types of spillway crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

Text Books:

1. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications (P) Ltd.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.

Reference Books:

1. Irrigation and Water Resources Engineering, Asawa GL (2013), New Age International Publishers.
2. Irrigation Water Resources and Water Power Engineering, Modi P N (2011), Standard Book House, New Delhi

B.TECH VII SEMESTER **PEC**

L	T	P	C
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20CE7T06 FINITE ELEMENT METHODS (PROFESSIONAL ELECTIVE-IV)

Course Objectives: The objective of this course is to

- Equip the students with the fundamentals of Finite Element Analysis
- Enable the students to formulate the design problems into FEA.
- Enable the students to solve Boundary value problems using FEM

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Solve simple boundary value problems using Numerical technique of Finite element method.

CO2: Develop finite element for mulation of one- and two-dimensional problems and solve them.

CO3: Assemble Stiffness matrices, apply boundary conditions and solve for the displacements

CO4: Compute Stresses and Strains and interpret the result.

SYLLABUS

UNIT-I:

Introduction: Review of stiffness method- Principle of Stationary potential energy- Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation. Principles of Elasticity- Equilibrium Equations- Strain Displacement relationships- Constitutive relationship for plane stress, plane stain and axi symmetric bodies of revolution with axi symmetric loading.

UNIT-II:

Finite element formulation of Beam elements: Beam stiffness- assemblage of beam stiffness matrix- Examples on Analysis of beams Subjected to Concentrated and Distributed loading.

UNIT-III:

Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix –Selection of approximate displacement functions- solution of a plane truss transformation matrix- Galerkin's method for 1-D truss – Computation of stress in a truss element.

UNIT-IV:

Finite element formulation for plane stress and plane strain problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces

UNIT-V:

Iso-parametric Formulation: An isoparametric bar element- plane bilinear isoparametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature for performing numerical integrations.

Text Books:

1. A first course in the Finite Element Method, Daryl L. Logan, Thomson Publications.
2. Introduction to Finite Elements in Engineering, Tirupati R. Chandrupatla, Ashok D. Belgundu, PHI publications.
3. Introduction to Finite Element Method, Desai & Abel CBS Publications

Reference Books:

1. Concepts and applications of Finite Element Analysis, Robert D. Cook, Michael E Plesha, John Wiley & sons Publication.

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T07 PAVEMENT DESIGN (PROFESSIONAL ELECTIVE-IV)

Course Objectives: The objective of this course is to

- Know the concept of pavement design
- Acquire Knowledge on material characteristics
- Design of flexible, rigid pavements
- Design low volume roads.

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Design Concepts of Pavements

CO2: Know the Pavement material characteristics

CO3: Design of flexible pavements

CO4: Design of rigid pavements

CO5: Design of pavement for low volume roads

SYLLABUS

UNIT–I:

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT–II:

Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements.

Stresses In Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts.

Stresses In Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

UNIT–III:

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent

Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics.

UNIT-IV:

Design Of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods

Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

UNIT-V:

Design of Pavement for Low Volume Roads: Pavement design for low volume roads, Rural road designs – code of practice. Design of Overlays: Types of Overlays, Suitability, Design of overlays.

Text Books:

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc

Reference Books:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Principles of Pavement Design, Yoder.J. & Witzorac Mathew, W. John Wiley & Sons Inc
3. Pavement and Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes 37, 58, 62, 81 for Flexible and Rigid Pavements design, low volume roads and overlays.

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T08 PORT AND HARBOUR STRUCTURES (PROFESSIONAL ELECTIVE-IV)

Course Objectives: The objective of this course is to

- have a knowledge about growth and regulation of ports
- acquire knowledge on harbor planning site investigation
- Know the concept of ocean waves, berthing structures
- Design principles of dock structures

Course Outcomes: On successful completion of this course, the students will be able to

CO1: have a knowledge about growth and regulation of ports

CO2: harbor planning site investigation

CO3: Concept of ocean wave

CO4: Concept of berthing structures

CO5: Design principles of dock structures

SYLLABUS

UNIT-I:

Growth and regulation of Ports: History of Port. Classification of Harbours - Factors affecting the growth of Port. - Requirement of a Harbour - General Planning. Port capacity. traffic analysis - Berth occupancy. financial evaluation - EIA -Description of selected Indian ports.

UNIT-II:

Harbour Planning (Technical) Site investigation. harbour entrance - Navigational Channel. Depth of harbour. Turning basin. Anchor basin. berthing area. Storage area - Shipping terminal facilities. Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals.

UNIT-III:

Introduction to ocean waves. Wave transformation. Wave and wind climate inside Harbour – Break waters: Types. Factors determining their selection. Forces on break waters. Design of rubble mound and vertical break waters. Physical Model Studies.

UNIT-IV:

Berthing structures. Types. Loads. Selection of berthing structures. Design principles of diaphragm walls, dolphins and piles. Selection and Design principles of Dock fenders and Mooring accessories.

UNIT-V:

Design principles of dock structures - Graving dry dock. Slip way. floating dry dock - Monitoring and repair of harbour structures - Dredging - Navigational aids. Light house.

Text Books:

1. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 1993.
2. Oza and Oza, "A course in Docks & Harbour Engineering".

Reference Books:

1. Harbour and Coastal Engineering (Indian Scenario) Vol - I & Vol . II; S. Narasimhan & S. kathiroli, NIOT- Chennai
2. Design and construction of Port and marine Structures. Alonzo Def. Quinn.McGraw. Hill book Company
3. IS: 7314 1974 - Glossary of terms relating to Port and harbour Engineering.
4. IS: 4651 – Code of practice for Planning and Design of Port and harbour (Part. I) Site Investigation.
5. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part. II) Earth Pressure.
6. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part. III) Loading.
7. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part. IV) General Design Consideration.
8. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part. V) Layout and functional Requirement.

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T09 ESTIMATION, SPECIFICATION AND CONTRACTS (PROFESSIONAL ELECTIVE-V)

Course Objectives: The objective of this course is to

- Understand the quantity calculations of different components of the buildings.
- Understand the rate analysis of different quantities of the buildings components.
- Learn various specifications and components of the buildings.

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: The student should be able to determine the quantities of different components of buildings.

CO2: The student should be in a position to find the cost of various building components.

CO3: The student should be capable of finalizing the value of structures.

SYLLABUS

UNIT–I:

General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estimating.

UNIT–II:

Rate Analysis – Working out data for various items of work over head and contigent charges.

UNIT-III:

Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

UNIT–IV:

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation ofbuildings Standard specifications for different items of building construction.

UNIT-V:

Detailed Estimation of Buildings using individual wall method- Detailed Estimation of Buildings using center line method.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of SIX questions from Unit 1 to Unit 4, out of which THREE are to be answered (60% weight-age) & ONE mandatory question (40% weight-age) from Units 5 & 6 is to be answered.

Text Books:

1. Estimating and Costing, B.N. Dutta, UBS publishers, 2000.
2. Civil Engineering Contracts and Estimates, B. S. Patil, Universities Press

(India) Pvt. Ltd., Hyd.

3. Construction Planning and Technology, Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. Estimating and Costing, G.S. Birdie.

Reference Books:

1. Standard Schedule of rates and standard data book, Public works department.
2. IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil Engg Works – B.I.S.
3. Estimation, Costing and Specifications, M. Chakraborthi; Laxmi publications.
4. National Building Code

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T10 PRESTRESSED CONCRETE (PROFESSIONAL ELECTIVE-V)

Course Objectives: The objective of this course is to

- Familiarize Students with concepts of prestressing
- Equip student with different systems and devices used in prestressing
- Understand the different losses of prestress including short and long term losses
- Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion

Course Outcomes: **On successful completion of this course , the students will be able to**

CO1: Understand the different methods of prestressing

CO2: Estimate effective prestress including the short and long term losses

CO3: Analyze and design prestressed concrete beams under flexure and shear

CO4: Understand the relevant IS Codal provisions for prestressed concrete

SYLLABUS

UNIT-I:

Basic concepts of Prestressing- Advantages and Applications of Prestressed Concretes, High Strength Concrete- Permissible Stresses, Shrinkage, Creep, Deformation Characteristics, High strength Steel- Types, Strength- Permissible Stresses- Relaxation of Stress, Cover Requirements. Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems.

UNIT-II:

Basic Assumptions in Analysis of prestress and design, Analysis of prestress, Resultant Stresses at a section- pressure line- Concepts of load balancing- Stresses in Tendons, Cracking moment.

UNIT-III:

Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned membersdue to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation stress in steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design.

UNIT-IV:

Design for Flexural resistance- Types of flexural failure – Code procedures- Design of sections for flexure- Control of deflections- Factors influencing Deflection- Prediction ofshort term and long term deflections.

UNIT-V:

Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

Text Books:

1. Prestressed Concrete, N. Krishna Raju, Tata McGraw hill
2. Prestressed Concrete, S. Ramamrutham

Reference Books:

1. Prestressed Concrete, P. Dayaratnam
2. Prestressed Concrete, T. Y. Lin & Burns, Wiley Publications

B.TECH VII SEMESTER **PEC**

L	T	P	C
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20CE7T11 GEOENVIRONMENTAL ENGINEERING (PROFESSIONAL ELECTIVE-V)

Course Objectives: The objective of this course is to

1. study the sources of contamination and characterization of contaminated ground.
2. study and model the contaminable Transport.
3. identify appropriate remediation technique for the contaminated.

Course Outcomes: On successful completion of this course , the students will be able to

CO1: Able to identify appropriate remediation techniques for containimation & provide models.

SYLLABUS

UNIT-I:

Sources and Site Characterization: Scope of Geoenvironmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterisation methods.

UNIT- II:

Solid and Hazardous Waste Management: Classification of waste, Characterisation solid wastes, Environmental Concerns with waste, waste management strategies.

UNIT-III:

Contaminant Transport: Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation.

Unit –IV:

Remediation Techniques: Objectives of site remediation, various active and passive methods, remediation NAPL sites, Emerging Remediation Technologies.

UNIT-V:

Landfills: Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

Text Books:

1. Bedient, Refai & Newell - Ground Water Contamination
2. Sharma, H. D. and Reddy, K. R. - Geoenvironmental Engineering

Reference Books:

1. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Handbook
2. Reddi, L. N. and Inyang, H. I. - Geoenvironmental Engineering
3. LaGrega, M. D., Buckingham, P. L. and Evans, J. C. - Hazardous Waste Management

B.TECH VII SEMESTER **PEC**

L	T	P	C
3	0	0	3

20CE7T12 WATER HARVESTING AND CONSERVATION (PROFESSIONAL ELECTIVE-V)

Course Objectives:

- The main aim of this course is to discuss various aspects of water resources development and management on watershed basis
- The various sections in the course will focus on the technical aspects of Watershed management
- Perspectives on water management
- Skills of analyzing the complex issues in water management and on specific knowledge on issues of watershed management.

Course Outcomes:

CO1: Water harvesting methods and principles

CO2: Water recovery and reuse

CO3: Sustainable watershed management practices

CO4: Watershed modeling techniques

CO5: Methods of soil and water conservation

SYLLABUS

UNIT-I:

Water Harvesting: Principles of water harvesting-methods of rainwater harvesting-design of rainwater harvesting structures-Purification Techniques for direct use- Harvesting of surface runoff-onsite detention basin - ponds - types - Recycling of harvested water

UNIT–II:

Water Recovery and Reuse: Perspective on recycle and reuse- factors affecting the development of water reclamation and reuse criteria- elements/components of water reclamation and reuse criteria / guidelines- sewage irrigation- Waste water reclamation- wastewater recharge for reuse – Treatment Requirements for Water Reuse-methods

UNIT–III:

Sustainable Watershed Approach & Watershed Management Practices: Concept of watershed- Introduction to watershed management- Integrated water resources management- natural resources management-agricultural practices-integrated farming Conjunctive use of water Regions-Case studies-Short term and long term strategic planning.

UNIT–IV:

Watershed Modeling: Standard modeling approaches and classifications, system concept for watershed modeling, overall description of different hydrologic processes, modeling of rainfall-runoff process, subsurface flows and groundwater flow.

UNIT–V:

Soil and Water Conservation: Scope of soil and water conservation-Mechanics and types of erosion-their causes-Soil erosion control measures - bank protection-vegetative barriers contour bund- contour trenches-contour stone walls-contour ditches-terraces-outlets and grassed waterways-Gully control structures - temporary and permanent - design of permanent soil conservation structures-Design of farm ponds and percolation ponds.

Text Books:

1. Pierce, F.J. and Frye, W. W. (1998): Advances in Soil and Water Conservation,Ann Arbor Press, Michigan.
2. Schwab, G. O., Fangmeier, D. D., Elliot, W. J. and Frevert, R. K. (1993): Soil and Water Conservation Engineering, 4th Ed. John Wiley and Sons Inc., USA
3. Murty, J.V.S. "Watershed Management", New Age Intl., New Delhi 1998.
4. Murthy, J.V.S., Watershed Management in India, Wiley Eastern, New Delhi, 1994 .

Referrence Books:

1. Dilip Kumar Majumdar, Irrigation water management - Principles and Practice, PHI Pvt. Ltd. NewDelhi-1.
2. Madan Mohan Das & Mimi Das Saikia, Irrigation and water power Engineering, PHI learning pvt. Ltd., NewDelhi-1
3. Chatterjee, S. N., Water Resources Conservation and Management, Atlantic Publishers, 2008

B.TECH VII SEMESTER

HSMC	L	T	P	C
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20CE7T17 UNIVERSAL HUMAN VALUES 2
Understanding Harmony

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcome

On completion of this course, the students will be able to

CO1: Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society

CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.

CO3: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society

CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.

CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

SYLLABUS

UNIT- I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I

2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential

Validation- as the process for self-exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT- II

Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT- III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships

in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

22. Definitiveness of Ethical Human Conduct

23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

24. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

25. Case studies of typical holistic technologies, management models and production systems

26. Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations

27. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Readings

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

B.TECH VII SEMESTER **SC**

L	T	P	C
0	0	4	2

20CE7S18 ETABS

(Skill Oriented Course)

Course Objective: Objective of this course to introduce concepts of ETABS

Exercises:

1). Load Combinations

2). Wind load analysis

3). Seismic Analysis

4). Composite column building design

5). Reinforcement details of beams

6). Slab Design

7). RCC building design – Single column building design

8). Multistory building.

Software Used : ETABS

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

20CE7I19 INTERNSHIP

A) There shall be an Industrial oriented Internship / Summer Internship in Collaboration withan Industry (or) Government organization of the relevant specialization to be registered immediately after IVth Semester Examinations and VIth Semester taken up during the summer vacation for about Minimum six weeks duration.

B) The industry-oriented Internship or Summer Internship shall be submitted in a report form, and a presentation of the same shall be made before a Committee, which evaluates it for 50 marks. The committee shall consist of Head of the Department, the supervisor of internship and a Senior Faculty Member of the Department. There shall be no internal marksfor Industry oriented internship/ Summer Internship. The internship shall be evaluated in the V SEM and VII Semester.

B.TECH VIII SEMESTER

		L	T	P	C
	PROJ	0	0	0	12

20CE8P01 PROJECT

Course Content:

Project work is intended to provide training in the solution of field engineering problems involving Surveying, Planning, drawing plans, Designing, Estimating and Marking out of a Building/Highway/Irrigation/Public health project.

Project work will also include the preparation of the feasibility report for any one type of enterprise under self – employment schemes. Students shall be divided into groups of four (or) five each and shall be assigned a problem that calls for application of the knowledge he/she acquired in the course and also which involves some extra study of reference materials.

Sample Project Titles

a) Planning and designing of a Residential Colony.
b) Multi storied Building project.
c) Industrial complex
d) Irrigation project.
e) Rural Water Supply Scheme.
f) Sanitary Engineering Scheme
g) Bridge project.
h) Low Cost Housing Scheme.
i) Set up of a small enterprise under self-employment scheme etc.

Every student should prepare a project report and submit the same for assessment. Every student puts his share to the work in all the operations of the project. The end examination in Project work shall consist of Power point presentation and Viva-voce test to be assessed by a panel of examiners comprising of an External examiner, the Head of Section, and member of staff who guided the project as internal examiner.

Suggested Learning Outcomes: After completion of the subject, the student shall be able to

Identify different works to be carried out in the Project.

Collect data relevant to the project.

Carry out Site Surveys.

Select the most efficient method from the available choices based on preliminary investigation.

Design the required elements of the project as per standard Practice.

Prepare working drawings for the project.

Estimate the cost of project, men, materials and equipment required.

Prepare schedule of time and sequence of operations.

Prepare project report.

Prepare C.P.M. Chart.

Collect the requirements to start a Small Enterprise/ Industry under Self Employment Scheme.

The aim of the Project work is to develop capabilities among the students, for a comprehensive analysis of implementation of Good Hygienic Practices in conducting investigation and report writing in a systematic way and to expand students understanding on the subject.

*****

B.TECH V SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20CE5T04 ARCHITECTURE AND TOWN PLANNING

(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

- Initiating the students to different architectures of the world.
- Salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization.
- Architectural Design concepts, Principles of Planning and Composition.
- To understand town planning from ancient times to modern times.
- To impart the concepts of town planning standards.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Student should be able to distinguish architectural styles of eastern and Western world.

CO2: Student should understand the importance of Orders of Architecture.

CO3: Should be able to compose spaces of buildings using design concepts, planning principles.

CO4: Student should understand the town planning standards, landscaping features.

SYLLABUS

UNIT-I:

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization–Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace – Fort - Tomb.

UNIT-II:

Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT-III:

Principles of Planning: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements,

Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wright, Walter Groping.

UNIT-IV:

Histroical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT-V:

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- neighbor hood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation planning regulations and limitations.

Text books:

1. ‘The great ages of World Architecture’ by G.K. Hiraskar.
2. ‘Planning and Design of Buildings by Section of Architecture’ by Y. S.Sane.
3. ‘Professional Practice’ by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, NewDelhi.
4. ‘Indian Architecture – Vol. I & II’ by Percy Brown, Taraporevala Publications, Bombay.
5. ‘Fundamentals of Town Planning’by G.K. Haraskar.

Reference Books:

1. ‘Drafting and Design for Architecture’ by Hepler, Cengage
2. Learning ‘Architect’s Portable Handbook’ by John Patten Guthrie – Mc Graw Hill International Publications.
3. ‘Mordern Ideal Homes for India’ by R. S. Deshpande.
4. ‘Town and County Planning’ by A.J. Brown and H.M. Sherrard.
5. ‘Town Design’ by Federik Glbbard, Architectural press, London.

B.TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

20CE5T05 ELEMENTS OF CIVIL ENGINEERING

(OPEN ELECTIVE-I)

Course Objectives: The objective of this course is to

To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources, Water Supply, Sanitary, Electrical Works in Building and Highway engineering.

Course Outcomes: On successful completion of this course, the students will be able to

CO1: The student should be able to know the basics of civil engineering and concepts of surveying.

CO2: The student should be able to know various properties of building materials and various types of building.

CO3: The student should be able to know the fundamentals of Water Resources, Water Supply, Sanitary and Electrical Works in Building.

CO4: The student should be able to know the fundamental concepts highway engineering.

SYLLABUS

UNIT-I:

Introduction. Introduction of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on economy of country.

UNIT-II:

Surveying Introduction: Definition of Surveying, Fundamental principles of surveying, Classification of surveying.

Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining and Ranging.

Angular Measurement: Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing local attraction.

Levelling: Objectives and applications-terminology-Instruments, component parts of dumpy level, Types of levelling, levelling staff

UNIT-III:

Building Materials and Construction Materials: Introduction to construction materials - Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen. Construction: Classification of buildings, Building components and their functions.

UNIT-IV:

Water Resources Hydrologic cycle, water use and its conservation, Introduction to dams, barrages and check dams. Water Supply, Sanitary and Electrical Works in Building Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

UNIT–V:

Transportation Engineering, classification of roads, Introduction of flexible and rigid pavements, Introduction to road traffic and traffic control mechanism.

Text Books:

1. Elements of Civil Engineering, Mimi Das Saikia, Bhargab Mohan Dasand Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, Publisher: McGraw Hill Education, India Pvt. Ltd.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, Arun kumar Jain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books:

1. Surveying Theory and Practice, James M Anderson and Edward, 7th Edition, M Mikhail Publisher: McGraw Hill Education, India Pvt. Ltd.
2. Surveying and Leveling, R. Subramanian Publisher, Oxford University.
3. Building drawing, M.G. Shah, C.M.Kale and S.Y. Patki Publisher: TataMcGraw Hill.

		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**

20EC5T06 SOLID STATE DEVICES (OPEN ELECTIVE –I)

Course Objectives: Students undergoing this course, are expected to

1. Familiarize with the fundamentals of Semiconductor physics
2. Familiarize with various diodes and characteristics.
3. Familiarize with the transistors and their configurations.
4. Disseminate Amplifications with transistors
5. Understand the operation and working of Oscillators

Course Outcomes:

After undergoing the course, students will be able to

CO1: Understand importance of semiconductors.

CO2: Analyze Diode characteristics.

CO3: Differentiate various Transistor BJT configurations.

CO4: Design amplifiers at different applications using transistor.

CO5: Analyze different Feedback amplifiers & oscillators design

SYLLABUS.

Unit I: Basics Concepts of Semiconductor Physics, Charged Particles, Field Intensity, Potential, Energy, the eV unit of energy, Energy Band theory of Crystals, Insulators, Semiconductors and metals, Mobility and Conductivity, Electrons and Holes, Donor and Acceptor impurities, Charge Densities in a Semiconductor, Electrical properties of Ge and Si, Hall Effect, Diffusion and Drift Currents, Mass action Law, Fermi-Dirac distribution.

Unit II: Diodes: PN junction diode- Energy band diagram of PN junction Diode-V-I Characteristics –Current components in PN junction Diode- Diode equation-Diode resistance and capacitance, Characteristics of Zener Diode, Varactor Diode- SCR and UJT.

Unit III: Transistors Bipolar Junction Transistor: Transistor current components- Transistor equation- Transistor configurations- Characteristics of a transistor in CB, CC&CE configurations- Transistor as a Switch,Transistor as an amplifier. Field Effect Transistors (FET): Junction Field Effect Transistor construction & operation, characteristics of CS, CD & CG

Unit IV: Small Signal Transistor Amplifier models: Low Frequency Transistor Amplifier Models: Two port network, Transistor hybrid model, determination of h- parameters, generalized analysis of transistor amplifier model using h-parameters

Unit V: Feedback Amplifiers and Oscillators: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and their analysis. Generalized analysis of LC Oscillators, Hartley and Colpitt‘s oscillators with BJT and their analysis.

Text Books:

1) Millman, Halkias, ―Integrated Electronics- Analog and Digital Circuits and Systems, TMH.

2).Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGrawHill,Second Edition.

Reference Books:

1) Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.

2) . Basic Electronic Circuits -V.K.Mehta, S-chand Publications,2008

B. TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

INTRODUCTION TO ARTIFICIAL INTELLIGENCE
20CS5T07 (OPEN ELECTIVE –I)

Course Objectives:

- To gain a historical perspective of Artificial Intelligence and its foundations.
- To familiarize the basic principles of Artificial Intelligence towards problem solving Inference, Perception, Knowledge representation and Learning.
- To understand advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems.

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

CO1: To Understand the history of Artificial Intelligence and its foundations.

CO2: Apply various Artificial Intelligence Techniques for problem solving.

CO3: Formalization of knowledge using the framework of predicate logic.

CO4: Ability to apply knowledge representation and reasoning to real world problems.

CO5: Derive conclusions from uncertain knowledge and quantify the uncertainty in the Conclusions obtained.

SYLLABUS

UNIT-1:

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

UNIT-2: Problem Solving:

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

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

UNIT-3: Logic Concepts:

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

UNIT-4: Knowledge representation:

Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT-5: Expert system and applications:

Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-Shaffer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning (Units 1,2,3,4,5)

REFERENCES:

1. Artificial Intelligence- Deepak Khemani, TMH, 2013
2. Introduction to Artificial Intelligence, Patterson, PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
4. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

B. TECH V SEMESTER

		L	T	P	C
	OEC	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
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PRINCIPLES OF MANAGEMENT
20MB5T01 (OPEN ELECTIVE –I)

COURSE OBJECTIVE

This course ensures that the students understand

1. Management Concepts
2. Applications of Concepts in Practical aspects of business and Development of Managerial Skills.
3. Managers manage business organizations in the dynamic global environment and maintain competitive advantage.
4. Business decisions are made using various tools and techniques to remain competitive
5. Managers use problem-solving strategies, critical thinking skills in real-life situations and implement successful planning.

COURSE OUTCOME

After learning the contents of this course, the student would be able to know

CO1: What are the circumstances that lead to management evolution and how it will affect future managers.

CO2: Analyze and evaluate the influence of historical forces on the current practice of management

CO3: Develop the process of management's functions: Planning and Organizing.

CO4: Evaluate leadership styles to anticipate the consequences of each leadership style and directing.

CO5: Identify the areas to control and selecting the appropriate controlling methods/techniques.

SYLLABUS

UNIT I

Introduction to Management: Definition, Functions, Process, Scope and Significance of Management.

Nature of Management, Functions of Management, Managerial Roles, Levels Managerial Skills and Activities, Difference between Management and Administration, Significance of Values and Ethics in Management.

Challenges of Management

UNIT II

Evolution of Management Thought: Approaches to Management - Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT III

Planning and Organizing: Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing.

UNIT IV

Directing: Effective Directing, Supervision, Motivation, Different Theories of Motivation-Maslow, Herzberg, McClelland, Vroom, Porter and Lawler, Job Satisfaction. Concept of Leadership- Theories and Styles. Communication Process, Channels and Barriers, Effective Communication.

UNIT V

Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.

TEXT BOOKS

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Management-Tasks, Responsibilities & Practices, Drucker, F. Peter
4. Principles of Management, Terry and Franklin

REFERENCES

1. Essentials of Management, Koontz Weihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

NPTEL WEB COURSE:

nptel.ac.in/courses/122108038/

NPTEL VIDEO COURSE:

nptel.ac.in/courses/122108038/#

B. TECH V SEMESTER	OEC	L	T	P	C
		3	0	0	3

TECHNOLOGY MANAGEMENT
20MB5T02 (OPEN ELECTIVE –I)

Course Objective

- The course aims at providing an overview of various issues connected with Management of Technology in organizations.

Course Outcomes

CO1: To understand the importance of technology and innovation management

CO2: To understand the technology absorption, incremental innovation, research and development, technovation and technology fusion that dominate the contemporary world industry.

CO3: To understand the nature, significance, dimensions requirements, concepts, issues, themes, policies and structure of the management of technology and technovation.

SYLLABUS

UNIT-I

Evolution of Technology-Effects of New Technology- Technology Innovation.-Invention-Innovation- Diffusion- Revolutionary and Evolutionary Innovation- Product and Process Innovation- Strategic Implications of Technology- Technology – Strategy Alliance -Convergent and Divergent Cycle- The Balanced Approach.

UNIT-II

Technology Assessment- Technology Choice- Technological Leadership and Followership- Technology Acquisition- Technological Forecasting- Exploratory, Intuitive, Extrapolation, Growth Curves, Technology Monitoring- Normative: Relevance Tree, Morphological Analysis, Mission Flow Diagram.

UNIT-III

Diffusion of Technology- Rate of Diffusion; Innovation Time and Innovation CostSpeed of Diffusion- Technology Indicators- Various Indicators- Organizational Implications of Technology- Relationship between Technical Structure and Organizational Infrastructure- Flexible Manufacturing Management System (FMMS).

UNIT-IV

Financial Aspects in Technology Management- Improving Traditional Cost - Management System- Barriers to the Evaluation of New Technology- Social Issues in Technology Management- Technological Change and Industrial Relations- Technology Assessment and Environmental Impact Analysis.

UNIT-V

Human Aspects in Technology Management- Integration of People and Technology Organizational and Psychological Factors- Organizational Outcome- Technology Transfer-Technology Management Scenario in India.

Text Books

1. Sharif Nawaz: Management of Technology Transfer & Development, APCFT, Bangalore, 1983.

2. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill,New Delhi.

References

1. Betz Fredrick: Managing Technology, Prentice Hall, New Jersey.
2. Gaynor: Handbook of Technology Management, McGraw Hill.
3. Tarek Khalil: Management of Technology, McGraw Hill International, 2000.
4. “Managing Technology and Innovation”, Robert & Roland, 1st Edition, Routledge.

B. TECH V SEMESTER

	L	T	P	C
OEC	**3**	**0**	**0**	**3**

FOUNDATIONS OF DATA SCIENCE
20AD5T07 (OPEN ELECTIVE –I)

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

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

CO1: Describes benefits of data science, facets of data

CO2: Illustrates data science process and describes the need of machine learning

CO3: Describes the problems of handling large data

CO4: Introduces distributed data storage and processing frame works

CO5: Describes about graph databases and text analytics

SYLLABUS

UNIT-1: Data science in a big data world: Benefits and uses of data science and big data, Facets of data, The data science process, The big data eco system and data science, An introductory working example of Hadoop.

UNIT-2:

The data science process: Overview of the data science process, Step 1: Defining research goals and creating a project charter, Step 2: Retrieving data, Step 3: Cleansing, integrating, and transforming data, Step 4: Exploratory data analysis, Step 5: Build the models, Step 6: Presenting findings and building applications on top of them. Machine learning: What is machine learning and why should you care about it?, The modeling process, Types of machine learning, Semi-supervised learning.

UNIT-3:

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

UNIT-4: First steps in big data: Distributing data storage and processing with frameworks, Case study: Assessing risk when loaning money, Join the NoSQL movement: Introduction to NoSQL, ACID: the core principle of relational databases, CAP Theorem: the problem with DBs on many nodes, The BASE principles of NoSQL databases, NoSQL database types, Case study: What disease is that?

UNIT-5: The rise of graph databases: Introducing connected data and graph databases , Introducing Neo4j: a graph database, Connected data example: a recipe recommendation engine, Text mining and text analytics: Text mining in the real world, Text mining techniques, Case study: Classifying Reddit posts.

Text Book:

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

B. TECH V SEMESTER

OEC	L	T	P	C
	3	0	0	3

20AM5T07 INTRODUCTION TO MACHINE LEARNING (OPEN ELECTIVE –I)

Pre-requisite: Probability and Statistics, Linear Algebra

Course Objective: *This* ***course*** explains basic concepts of Machine Learning and teaches you to use recent machine learning software for solving problems and understanding supervised and unsupervised learning methods

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

CO1: Identify the characteristics of machine learning.

CO2: Summarize the Model building and evaluation approaches.

CO3: Apply Bayesian learning and regression algorithms for real-world Problems.

CO4: Apply supervised learning algorithms to solve the real-world Problems.

CO5: Apply unsupervised learning algorithms for the real world data.

SYLLABUS

Unit-1: Introduction to Machine Learning and Preparing to Model:

Introduction to Machine Learning- Introduction, What is Human Learning? Types of Human Learning, What is Machine Learning? Types of Machine Learning, Problems Not To Be Solved Using Machine Learning, Applications of Machine Learning.

Preparing to Model- Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

Modeling & Evaluation, Basics of Feature Engineering:

Modeling & Evaluation - Introduction, Selecting a Model, Training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model.

Basics of Feature Engineering - Introduction, Feature Transformation, Feature Subset Selection.

Unit-2: Bayesian Concept Learning and Regression:

Bayesian Concept Learning - Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network.

Regression: Introduction, Regression Algorithms - Simple linear regression, Multiple linear regression, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

Unit-3: Supervised Learning: Classification, Ensemble Learning: Classification-Introduction, Example of Supervised Learning, Classification Model, Classification

Learning Steps, Common Classification Algorithms - k-Nearest Neighbour (KNN), Decision tree, Random forest model, Support vector machines.

Ensemble Learning- Boosting, Bagging

Unit-4: Basics of Neural Network

Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network, Learning Process in ANN, Backpropagation, Deep Learning

Unit-5: Unsupervised Learning:

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning.

Principle Component Analysis: Introduction, Probabilistic PCA- Maximum Likelihood PCA, EM Algorithm for PCA, Bayesian PCA, Factor Analysis; Kernel PCA

Clustering: Clustering as a Machine Learning task, Different types of clustering techniques, Partitioning methods, Hierarchical clustering, Density-based methods: DBSCAN.

Finding Pattern using Association Rule - Definition of common terms, Association rule, Apriori algorithm.

Text Books:

1. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, "Machine Learning", Pearson Education India ,1st edition.
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning". New York :Springer, 2006.

Reference Books:

1. Tom M. Mitchell, "Machine Learning', MGH, 1997.
2. Shai Shalev-Shwartz, ShaiBen David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge.
3. Peter Harington, "Machine Learning in Action" , Cengage, 1st edition, 2012.

B.TECH VI SEMESTER	OEC	L	T	P	C
		3	0	0	3

20CE6T08 REMOTE SENSING AND GIS (OPEN ELECTIVE-II)

Course Objectives: The objective of this course is to

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Learn various types of sensors and platforms
- learn concepts of visual and digital image analyses
- Understand the principles of spatial analysis
- Appreciate application of RS and GIS to Civil engineering

Course Outcomes:

On successful completion of this course, the students will be able to

CO1: Be familiar with ground, air and satellite based sensor platforms.

CO2: Interpret the aerial photographs and satellite imageries

CO3: Create and input spatial data for GIS application

CO4: Apply RS and GIS concepts in water resources engineering

SYLLABUS

UNIT–I:

Introduction to remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems. Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

UNIT–II:

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT–III:

Geographic Information System: Introduction, key components, application areas of GIS, map projections. Data entry and preparation: spatial data input, raster data models, vector data Models.

UNIT – IV:

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT–V:

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications. Application to Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management.

Text Books:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

Reference Books:

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A KW Yeung, Prentice Hall (India), 2006
3. 'Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. 'Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

		L	T	P	C
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
3	0	0	3

20EE6T08 RENEWABLE ENERGY SOURCES (OPEN ELECTIVE-II)

Course Objective:

- To give sufficient knowledge about the promising new and renewable sources of energy
- Explain the concept of various forms of renewable energy
- Learn the present energy scenario
- Analyse the environmental aspects of renewable energy resources.

Course Outcomes:

CO1: Know the need of various renewable energy systems

CO2: understand the concepts of bio-energy,

CO3: Acquire the knowledge of OTEC, tidal,

CO4: Acquire the knowledge of geothermal and Alternative energy sources

SYLLABUS

UNIT-I

Introduction: Introduction to energy sources, reserves and estimates, global energy scenario, renewable energy -environment implications, global warming and climate change, limitations of conventional energy sources, classification of non-conventional energy sources - solar energy, wind energy, bio-energy, Ocean Thermal Energy Conversion (OTEC), tidal, geothermal and hydro.

UNIT-II

Bio-energy: Biomass and its sources, energy plantation, production of fuel wood, bio-conversion processes, bio-gas, bio-diesel and ethanol production and utilization, thermo-chemical processes, biomass gasification, process, types of reactors, utilization of producer gas for thermal and electricity generation.

UNIT-III

Ocean thermal energy conversion, tidal, geothermal: Tidal energy, wave energy, data, technology options; open and closed *Ocean thermal energy conversion* cycles, geothermal energy sources, power plant and environmental issues.

UNIT-IV

Fuel Cells: Hydrogen generation-storage, transport and utilization, applications, power generation. Fuel cells-Technologies, types, economics and power generation.

UNIT-V

Solar Energy Storage and Applications:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

Text Books:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2006
2. Renewable Energy Resources – Twidell&Wier, CRC Press(Taylor & Francis), 2012
3. *Y. W. B. Charles, B.H. Essel, ―Biomass Conversion and Technology‖*, John Wiley, Latest Edition

Reference Books:

1. Renewable energy resources by G. N. Tiwari, M. K. Ghosal, Alpha Science International, 2005.
2. Renewable Energy Technologies by R. Ramesh, K. Uday Kumar, M. Anandakrishnan, Narosa Publishing House, 1997
3. Non-Conventional Energy Systems by K Mittal, A. H. Wheeler Publishing Company Limited, 01-Jan-1999.
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, P.H.I.
5. Godfrey Boyle, ―Renewable Energy- Power for a Sustainable Future‖, Oxford University Press, U.K.,
6. Twidell, J.W. & Weir, A., ―Renewable Energy Sources‖, E.F.N Spon Ltd., UK.

B.TECH VI SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE6T09 ENERGY AUDIT, CONSERVATION AND MANAGEMENT (OPEN ELECTIVE-II)

Course Objective:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

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

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

SYLLABUS

UNIT-I

Basic Principles of Energy Audit and management: Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Piecharts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions –Language – Questionnaire – Check list for top management.

UNIT-II

Lighting: Modification of existing systems – Replacement of existing systems – Priorities**:** Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level –Illumination of inclined surface to beam – Luminance or brightness – Types of lamps –Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT-III

Power Factor and energy instruments: Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters– Tong testers – Power analyzer.

UNIT-IV

Space Heating and Ventilation: Ventilation – Air–Conditioning (HVAC) and Water Heating**:** Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning –Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

UNIT-V

Economic Aspects and Financial Analysis: Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems.

Computation of Economic Aspects

Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment –Numerical examples.

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill

2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd– 2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevierpublications. 2012

2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.

3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.

4. Energy management hand book by W.C.Turner, John wiley and sons.

5. Energy management and conservation –k v

B.TECH VI SEMESTER		**OEC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
	20ME6T07	**INDUSTRIAL ROBOTICS (OPEN ELECTIVE-II)**				

Pre-requisite: Kinematics and Mathematics

Course Objective:

1. The student will be exposed to the concepts of automation and fundamentals of robotics
2. The students will be exposed to the concepts of transformations and robot kinematics,
3. The students will understand the functioning of sensors and actuators
4. The students will be exposed to robot programming languages and Programming.
5. The student will be exposed to the applications of robotics in manufacturing.

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

CO1	Understand various applications of robotics and classification of coordinate system and control systems.
CO2	Build the concepts of components of industrial robotics.
CO3	Apply kinematic analysis with D-H notation, forward and inverse kinematics and Solve dynamic analysis with Lagrange – Euler and Newton – Euler formulations.
CO4	Model trajectory planning for a manipulator by avoiding obstacles.
CO5	Understand different types of actuators and applications of robots in manufacturing.

SYLLABUS

UNIT-I:

Introduction: Automation and Robotics – An over view of Robotics – present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT-II: MOTION ANALYSIS AND CONTROL:

Motion Analysis: Basic Rotation Matrices, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems. Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems.

UNIT-III:

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion straight line motion.

UNIT-IV:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools.

UNIT-V:

Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.

Text Book(s)

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson, 3rd edition.

References

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
4. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley

5. Introduction to Robotics by SK Saha, The McGrah Hill Company, 6th, 2012
6. Robotics and Control / Mittal R K &Nagrath I J / TMH

B.TECH VI SEMESTER		OEC	L	T	P	C
			3	0	0	3
20ME6T08	3D PRINTING (OPEN ELECTIVE-II)					

Pre-requisite: Manufacturing Process

Course Objective:

The course aims at the importance of Additive Manufacturing, Classifications, models, specifications of various Additive Manufacturing Techniques. To learn the different tools, soft-wares required and the applications of Additive Manufacturing

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

CO1:	Understand the working principle and process parameters of AM processes
CO2:	Explore the applications of AM processes in various fields
CO3:	Apply the suitable process and material for fabricating a given product
CO4:	Use the suitable post process based on product application
CO5:	Design and develop a product for AM Process

SYLLABUS

UNIT-I:

Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT-II:

Machines for Rapid Prototyping: Overview of Polymerization: Stereolithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT-III:

Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive Manufactured Tools, Indirect Rapid

UNIT-IV:

Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture of Metal Components

UNIT-V:

Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Text Books:

1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2015, 2nd Edition.
2. 3D Printing and Additive Manufacturing: Principles & Applications, Chua Chee Kai, Leong Kah Fai, World Scientific, 2015, 4th Edition.

References:

1. Rapid Prototyping: Laser-based and Other Technologies, Patri K. Venuvinod and Weiyin Ma, Springer, 2004.
2. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.
3. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006.

B.TECH VI SEMESTER	OEC	L	T	P	C
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20EC6T07 ELECTRONIC CIRCUITS AND NETWORKS (OPEN ELECTIVE-II)

Course Objectives:

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

1. To understand the Differentiator and Integrator circuits
2. To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
3. To Introduce to Time-base Generators and Principles of Synchronization and Frequency division.
4. To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.
5. To understand and Design gates using various logic families.

Course Outcomes:

At the end of this course the student will able to:

CO1: Understand the basic concepts of Optoelectronic Devices

CO2: Design linear wave shaping circuits.

CO3: Design Non- linear wave shaping circuits.

CO4: Design Different Time Base Generators

CO5: understand the concepts of one port networks

SYLLABUS

UNIT-I: Optoelectronic Devices

Introduction, Photo sensors, Photoconductors, Photodiodes, Phototransistors, Light-Emitting Diodes, Liquid Crystal Displays, Cathode Ray Tube Displays, Emerging Display Technologies, Opto couplers.

UNIT-II: LINEAR WAVE SHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT-III: NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT-IV: VOLTAGE TIME BASE GENERATORS

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator.

UNIT-V: Synthesis of one port networks

Synthesis of one port networks
Synthesis of reactive one-ports by Foster's and Cauer methods (forms I and II) - Synthesis of LC, RC and RL driving-point functions.

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.

2. K. S. Suresh Kumar, ―Electric Circuit Analysis‖, Pearson Publications, 2013.

Reference Books:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002

B.TECH VI SEMESTER	OEC	L	T	P	C
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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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OEC	3	0	0	3

20EC6T09 MICROCONTROLLERS & ITS APPLICATIONS (OPEN ELECTIVE-II)

Course Objectives:

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

1. To understand the basics of 8051 Microcontroller and its functionalities
2. To understand the 8051 family instruction set
3. To develop machine language programming in microprocessors.
4. Todesign and develop microcontroller based interfacing for real time applications using low level language like ALP.
5. To understand the basics of ARM architectures and its functionalities.

Course Outcomes:

At the end of this course the student will able to:

CO1: To be able to understand the overview of 8051 Micro controller in general.

CO2: To be able to understand the instruction set of 8051 microcontroller

CO3: To be able to understand the Assembly Language Programming in microcontrollers.

CO4: To be able to understand the microcontroller is interfacing with I/O devices, memory, and serial communication using ALP.

CO5: To be able to understand the overview of ARM Architecture in general.

SYLLABUS

UNIT-I: Introduction to 8051 Microcontrollers

Overview of 8051 microcontrollers, Architecture, I/O ports, Memory organization, Addressing modes, SFRs, Counters and timers, Synchronous serial-cum, Asynchronous serial communication, Interrupts and priorities.

UNIT-II: 8051 FAMILY MICROCONTROLLERS INSTRUCTION SET

Basic assembly language programming, Data transfer instructions, Data and bit- manipulation instructions, Arithmetic instructions, Instructions for logical operations on the test among the registers, Program flow control instructions, Interrupt control flow.

UNIT-III: 8051 REAL TIME CONTROL

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the serial communication Interrupts, programming Timers and Counters, serial port and its programming,

UNIT-IV: I/O and Memory Interface and Serial Communication and Bus Interface

I/O and Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer, USART, External Communication Interfaces-RS232,USB

UNIT-V: ARM Architecture:

ARM processor fundamentals, ARM Architecture –Register, exceptions and interrupts, interrupt vector table, ARM instruction set- Data processing, Branch, load and store instructions; Software instructions, Program status register instructions loading constants

TEXTBOOKS:

1. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System
Design, 2/e, Pearson Education, 2005.
2. Kenneth. J. Ayala, The 8051 Microcontroller, 3/e, Cengage Learning, 2004.

REFERENCE:

1. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems, 2/e, Pearson Education, 2007
2. ARM system Developers guide, Andrew N Sloss, Dominic Symes, Chris Wright, Elsevier,2012

B. TECH VI SEMESTER

OEC	L	T	P	C
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INTRODUCTION TO MACHINE LEARNING
20CS6T07 (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

OEC	L	T	P	C
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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 **OEC**

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AGILE TECHNOLOGIES
20CS6T09 (OPEN ELECTIVE –II)

COURSE OBJECTIVES:

1. To have an understanding of the Agile Manifesto and Principles
2. To Apply Agile based techniques in each of the development phases.

COURSE OUTCOMES:

CO1: Understand the Agile Manifesto and Principles.

CO2: Apply agile software development practices to create high-quality software.

CO3: Acquire Knowledge on software design, set of software technologies and APIs.

CO4: Examine and demonstrate knowledge of Agile development

CO5: Demonstrate the Agile Approach to estimate project variables, control and Risk Management

SYLLABUS

UNIT-I

Agile Software Development: Genesis of Agile, Introduction and Background, Traditional Model Vs Agile Model, Values of Agile, Agile Manifesto and Principles, Stakeholders, Challenges.

UNIT-II

Lean Approach: Waste Management, Kaizen and Kanban, Add process and products add Value, Roles related to life cycle, Differences between Agile and Traditional Plans, Differences at different life cycle phases, Key techniques, Principles, Understand as a means of assessing the initial status of the project, How agile helps to build quality.

UNIT-III

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, **Agile Requirements:** User story definition, Characteristics and contents of user stories, Acceptance tests and verifying stories, Product Velocity, Burn down chart, Sprint planning and retrospective, Daily Scrum, Scrum roles- Product Owner, Scrum Master, Scrum Team, Scrum Case Study, Tools for Agile Project Management.

UNIT-IV

Agile Software Design and Development: Agile Design practices, Role of design principles including Single Responsibility principle, Open Closed Principle, Liskov Substitution principle, Interface Segregation principles, Dependency Inversion principle in Agile Design, Refactoring- Need and significance, Refactoring techniques, Continuous Integration, Automated Build tools, Version Control.

UNIT-V

Agile Testing and Review: Agile Testing Techniques, Test Driven Development, User Acceptance Test, Agile Metrics and Measurements, The Agile Approach to estimate project variables, Agile control- The 7 control parameters, Agile Approach to Risk, Agile approach to Configuration Management, Atern Principles and Philosophy, Best practices to manage Scrum.

TEXT BOOKS:

1. Robort C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013(Units 1, 3, 5)

2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson(Units 3,4)

3. Mike Cohn, Succeeding with Agile: Software Development Using Scrum, Addison Wesley Series.(Units 3, 4)

REFERENCES:

1. David J. Anderson and Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer,.

3. Craig Larman, ―Agile and Iterative Development: A Managers Guide, Addison-Wesley.

4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and management, Butterworth-Heinemann.

B. TECH VI SEMESTER

OEC	L	T	P	C
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20IT6T07 FUNDAMENTALS OF MACHINE LEARNING (OPEN ELECTIVE –II)

Course Objective:

This course will enable students to,

- To introduce the basic concepts and techniques of Machine Learning.
- To develop the skills in using recent machine learning software for solving practical problems.
- To be familiar with a set of well-known supervised, semi-supervised and unsupervised learning algorithms

Course Outcomes:

After studying this course, the students will be able to

CO1: Choose the learning techniques and investigate concept learning

CO2: Identify the characteristics of decision tree and solve problems associated with

CO3: Apply effectively neural networks for appropriate applications

CO4: Apply Bayesian techniques and derive effectively learning rules

CO5: Evaluate hypothesis and investigate instant based learning and reinforced learning

SYLLABUS:

UNIT-I:

Introduction: Well-posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT-II:

Decision Tree Learning: Decision tree representation, Appropriate problems for decision treelearning, Basic decision tree learning algorithm, hypothesis space search in decision treelearning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT-III:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Back propagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes classifier, Bayesian belief networks.

UNIT-IV:

Learning Sets of Rules: Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

UNIT-V:

Instance Based Learning: Introduction, k-nearest neighbour learning, locally weighted regression, radial basis function, cased-based reasoning,

Reinforcement Learning: Introduction, Learning Task, Q Learning

TEXT BOOKS:

2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

REFERENCES:

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning,2nd edition, springer series in statistics.
4. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

B. TECH VI SEMESTER

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	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**

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OPERATIONS RESEARCH
20HS6T01 (OPEN ELECTIVE –II)

Course Objectives:

1) Identify and develop operational research models from the verbal description of the real system.
2) Understand the mathematical tools that are needed to solve optimization problems.
3) Use mathematical software to solve the proposed models.
4) Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

Course Outcomes:

CO1: Understand the methodology of Operations Research& concepts of linear programming

CO2: Formulate the solutions to transportation problems

CO3: Explain the solutions for various sequencing problems

CO4: Illustrate the solutions to different replacement policies

CO5: Apply game theory to solve real world problems

SYLLABUS

UNIT-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

UNIT-II

Transportation Problem. Formulation, Solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.

UNIT-III

Assignment model. Formulation. Hungarian Method for optimal solution. Solving Unbalanced problem. Sequencing Models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines Processing n Jobs through m Machines.

UNIT-IV

Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

UNIT-V

Game Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

Inventory models. Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

TEXT BOOKS:

1) P. SankaraIyer,"Operations Research", Tata McGraw-Hill, 2008.
2) A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

REFERENCES:

1) J K Sharma. "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2) P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.

B. TECH VI SEMESTER

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20MB6T01 ORGANIZATIONAL BEHAVIOUR (OPEN ELECTIVE –II)

Course Objectives

1. To understand the fundamentals of Organizational Behaviour.
2. For the understanding and balancing of Values and Emotions at work place.
3. To improve the student's Personality and Attitude.
4. To understand and improve the skill of perception and Group Behaviour.
5. Understanding and managing organizational culture, leadership and conflict.

Course Outcomes

Learning Organizational Behavior enables engineers:

CO1: To understand the psychology of workers and other members in the organization.

CO2: To be equipped with the right knowledge and skills regarding organizational processes, group behavior, organizational structure and culture.

CO3: To build up strategies for development at their work place.

CO4: To motivate and control employees.

CO5: To resolve organizational conflict effectively.

SYLLABUS

UNIT I

Fundamentals of OB: Definition, Scope and Importance of OB, Relationship between OB and the individual, Evolution of OB, Models of OB (Autocratic, Custodial, Supportive, Collegial & SOBC), Limitations of OB.

Unit II

Values, Attitudes and Emotions: Introduction, Values, Attitudes, Definition and Concept of Emotions, Emotional Intelligence - Fundamentals of Emotional Intelligence, The Emotional Competence Framework, Benefits of Emotional Intelligence, difference between EQ and IQ. Stress at workplace: Work Stressors – Prevention and Management of stress – Balancing work and Life, Workplace spirituality.

Unit III

Personality & Attitude: Definition Personality, importance of personality in Performance, The Myers-Briggs Type Indicator and The Big Five personality model, Johari Window, Transaction Analysis. Attitude – Definition, Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude.

Unit IV

Perception: Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). Motivation:

Definition & Concept of Motive & Motivation. Group and Team Dynamics: Meaning Group Dynamics, Types of Groups, Group Development, Team Effectiveness & Team Building.

Unit V

Organizational Culture: Types of Culture, Creating and Maintaining Organization Culture, Managing Cultural Diversity. Organizational Change: Types of Organizational change, Forces that acts as stimulants to change, overcome the Resistance to Change, Developing a Learning Organization. Leadership: Introduction, Managers V/s Leaders. Overview of Leadership- Traits and Types. Conflict Management: Sources of Conflict, Types of Conflict, Conflict Management Approaches.

Text Books

1. Pareek Udai: "Understanding Organizational Behavior", Oxford University Press, New Delhi, 2007.

1. K.Aswathappa: "Organizational Behavior-Text, Cases and Games", Himalaya Publishing House, New Delhi,2008.

2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "Organizational Behavior", Tata McGraw Hill Education, New Delhi, 2008.

References

1. Jerald Greenberg and Robert A Baron: "Behavior in Organizations", PHI Learning Pvt Ltd, New Delhi, 2009.

2. Robbins, Stephen P. Organizational behavior, 14/E. Pearson Education India, 2001.

B. TECH VI SEMESTER

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20MB6T02 PROJECT MANAGEMENT (OPEN ELECTIVE –II)

Course Objectives

The objective of this course is to enable the students to gain basic knowledge about the concept of project, project management, project life-cycle, project appraisal; to acquaint the students about various issues of project management.

SYLLABUS

Unit -I

Basics of Project Management –Concept– Project environment – Types of Projects – Project life cycle – Project proposals – Monitoring project progress – Project appraisal and Project selection – Causes of delay in Project commissioning– Remedies to avoid overruns. Identification of Investment opportunities – Sources of new project ideas, preliminary screening of projects – Components for project feasibility studies.

Unit- II

Market feasibility -Market survey – Categories of Market survey – steps involved in conducting market survey– Demand forecasting techniques, sales projections.

Unit- III

Technical and Legal feasibility: Production technology, materials and inputs, plant capacity, site selection, plant layout, Managerial Feasibility Project organization and responsibilities. Legalities – Basic legal provisions. Development of Programme Evaluation & Review Technique (PERT) –Construction of PERT (Project duration and valuation, slack and critical activities, critical path interpretation) – Critical Path Method (CPM)

Unit- IV

Financial feasibility – Capital Expenditure – Criteria and Investment strategies – Capital Investment Appraisal Techniques (Non DCF and DCF) – Risk analysis – Cost and financial feasibility – Cost of project and means of financing — Estimation of cash flows – Estimation of Capital costs and operating costs; Revenue estimation – Income – Determinants – Forecasting income –Operational feasibility - Breakeven point – Economics of working.

Unit -V

Project Implementation and Review: Forms of project organization – project planning – project control – human aspects of project management – prerequisites for successful project implementation – project review – performance evaluation – abandonment analysis.

Text Books

1. Prasanna Chandra, ―Projects, Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill Company Pvt. Ltd., New Delhi 1998.

2. Gido: Effective Project Management, 2e, Thomson, 2007.

References

1. Singh M.K, ―Project Evaluation and Management‖.

2. Vasanth Desai, Project Management, 4th edition, Himalaya Publications 2018.

3. Clifford F. Gray, Erik W. Larson, ―Project Management, the Managerial Emphasis, McGraw Hill, 2000.

B. TECH VI SEMESTER

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20AM6T07 BIG DATA ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: Data Base Management System

Course objectives:

In this course student will learn about

1. To understand the need of Big Data, challenges and different analytical architectures
2. Installation and understanding of Hadoop Architecture and its ecosystems
3. Processing of Big Data with Advanced architectures like Spark.
4. Describe graphs and streaming data in Spark.

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

CO1: Discuss the challenges and their solutions in Big Data

CO2: Understand and work on Hadoop Framework and eco systems.

CO3: Explain and Analyze the Big Data using Map-reduce programming in Both Hadoop and Spark framework.

CO4: Demonstrate spark programming with different programming languages.

CO5: Demonstrate the graph algorithms and live streaming data in Spark.

SYLLABUS

Unit-I:

Introduction to big data: Data, Types of digital data, Evolution and Definition of big data, Challenges of big data, Characteristics and Need of big data.

Introduction to Hadoop: Introducing Hadoop, need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Hadoop Distributors.

HDFS (Hadoop Distributed File System): HDFS Daemons, Anatomy of file read, Anatomy of file write, working with HDFS commands.

Unit-II:

Introduction to MAPREDUCE Programming: Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Mapper, Reducer, Combiner, Partitioner, Searching, Sorting , Compression, Hadoop EcoSystem.

Unit-III:

Introduction to Pig: Key Features of pig, The Anatomy of Pig, Pig on Hadoop , Pig Philosophy, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, Relational Operators.

Introduction to HIVE: HIVE features, HIVE architecture, HIVE datatypes, HIVE File Formats, HIVE Query Language.

Unit-IV:

NoSQL: Introduction to NOSQL, Types of NoSQL Databases, and Advantages of NoSQL databases, CAP Theorem, BASE, SQL versus NoSql.

NoSQL databases: Introduction to MongoDB, Data types in MongoDB, MongoDB query language.

Unit-V:

Spark: Introduction to data analytics with Spark, Spark Stack, Programming with RDDS, Working with key/value pairs, Spark SQL, Schema RDDs,

Sparking Streaming: High level architecture of Spark Streaming, DStreams, Transformations on DStreams, Different Types of Transformations on DStreams.

Text Books:

[1].SeemaAcharya, SubhashiniChellappan, Big Data and Analytics, Wiley Publishers

[2].Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia, "Learning Spark: Lightning-Fast Big Data Analysis", O'Reilly Media, Inc.

Reference Books:

[1]. TomWhite, Hadoop,“TheDefinitiveGuide”,3rdEdition,O’ReillyPublications, 2012.

[2].David Loshin, "BigDataAnalytics: From Strategic Planning to Enterprise IntegrationwithTools,Techniques,NoSQL,andGraph”,MorganKaufmannPublishers, 2013

[3].Hadoopin PracticebyAlexHolmes, MANNING

[4].Hadoop in Action byChuckLam, MANNING

[5] Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch , “Understanding Big Data Analytics for Enterprise ClassHadoopandStreamingData”, 1st Edition, TMH,2012.

[6] HienLuu, Beginning Apache Spark 2

E-resources and Other digital materials:

[1].Big Data Use cases for Beginners | Real Life Case Studies | Success Stories https://www.youtube.com/watch?v=HHR0-iJp2sM

[2]. Alexey Grishchenko, Hadoopvs MPP, https://0x0fff.com/hadoop-vs-mpp/

[3]. Random notes on bigdata- SlideShare: Available www.slideshare.net/yiranpang/random-notes-on-big-data-26439474

B. TECH VI SEMESTER

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20AD6T07 VISUAL ANALYTICS (OPEN ELECTIVE –II)

Pre-requisite: There is no prerequisite to learn this course.

Course Objective: *This* ***course*** explains apply the fundamentals of Tableau tool, Use all the basic functionality to visualize their data, Connect to various data sources, Build a variety of basic charts, Combine insights into a useable dashboard, Share and publish visualizations.

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

CO1: Examine, navigate, and learn to use the various features of Tableau

CO2: Create and design visualizations and dashboards for your intended audience

CO3: apply predicative analytics to improve business decision making

CO4: Assess the quality of the data and perform exploratory analysis

CO5: Combine the data to and follow the best practices to present your story

SYLLABUS

UNIT-1:

Introduction: Tableau Application Suite, Installing and Activating Tableau Desktop, Data Preparation, Finding the Dataset, Understanding the Data, The Tableau Workspace, Saving, Opening, and Sharing Your Workbooks, Setting Up a Data Connector, Adding a Table to a Data Model, Data Extracts and Live Connections, Data Protection and Data Governance, Data Types, Data Collection with IFTTT and Google Sheets, Website Analysis with Google Analytics, Performance Optimization.

UNIT-2:

Data Visualizations and Aggregate Functions: Chart Types, Scatter Plots, Bar Charts, Legends, Filters, and Hierarchies, Line Charts, Straight Lines, Step Charts, Continuous Date Fields, Highlight Tables, Heat maps, Bullet Charts, Aggregate Functions, Calculated Fields, Aggregations in Calculated Fields, Text Operators, Splits, Date Fields, and Formats, Working with NULL Values, Parameters

UNIT-3:

Table Calculations and Maps: Different Types of Calculations, Quick Table Calculations, Customized Table Calculations, Bump Charts, Dual Axis Charts, Keywords and Syntax, Cohort Analysis, Regional Averages, Different Types of Maps, Map Layers, Maps with Pie Charts: Creating a Pie Chart Map, Dual Axis Map Embedding the Chart in Tooltips, Mapbox Maps, Mapbox in Tableau, Using the Background Map, Spatial Data.

UNIT-4:

Advanced Analytics and Interactive Dashboards: Overview of the Tableau Analytics Pane, Constant, Average, and Reference Lines, Trend Lines, Forecasts, Model Description, Cluster Analysis, Clustering in Tableau, Python, R, and MATLAB Integration, Connecting Tableau with TabPy, Security, The Dashboard Pane, Placing Charts on the Dashboard, Dashboard Actions, Filter Actions, Adding Web Content via URL Actions, Design Tips for Creating a Dashboard

UNIT-5:

Data Preparation with Tableau: Connecting to Data, Wildcard Unions, Inspecting the Data, Removing Unneeded Fields, Data Cleaning and Formatting, Cleaning Steps and Built-in Cleaning Features, Unions, Joins, Splits Grouping, Running the Flow and Outputting the Data, Saving Flows.

Text Book:

Alexander Loth, "**Visual Analytics with Tableau**", ISBN: 978-1-119-56020-3, Wiley 2019

Reference Books:

1. "**Visual Thinking for Design"** by Colin Ware
2. "**Storytelling With Data: A Data Visualization Guide for Business Professionals"** by Cole Nussbaumer Knaflic
3. "**Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics"** by Nathan Yau

B.TECH VII SEMESTER **OEC**

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20CE7T13 CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE-III)

Course Objectives:

- To introduce to the student the concept of project management including network drawing and monitoring
- To introduce various equipments like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
- to introduce the importance of safety in construction projects

Course Outcomes:

CO1: appreciate the importance of construction planning

CO2: understand the functioning of various earth moving equipment

CO3: the methods of production of aggregate products and concreting and usage of machinery required for the works.

CO4: apply the gained knowledge to project management and construction techniques

SYLLABUS

UNIT-I:

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts– critical Path Method – Applications

UNIT-II:

Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT-III:

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types

UNIT–IV:

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers –graders – scrapers– draglines - clamshell buckets

UNIT –V:

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers– selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder, Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

Reference Books:

1. Construction Project Management - An Integrated Approach, Peter Fewings, Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

B.TECH VII SEMESTER **OEC**

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20CE7T14 GREEN BUILDINGS (OPEN ELECTIVE-III)

Course Objectives:

- To introduce the different concepts of green building techniques and how they may be synthesized to best fit a construction.
- To Know the importance of Green buildings
- To know and implement energy conservation and renewable resources
- To understand the knowledge of ECBC, LEED, GRIHA etc.

Course Outcomes:

CO1: Able to describe the importance and necessity of green building.

CO2: Able to suggest materials and technologies to improve energy efficiency of building.

CO3: Able to assess a building on the norms available for green building.

SYLLABUS

UNIT-I:

Introduction of Green Buildings, Salient features of green buildings, Advantages of Green Buildings- Sustainable site selection and planning of buildings to improve comfort, day lighting, ventilation, planning for drainage.

UNIT-II:

ENERGY EFFICIENT BUILDINGS Passive cooling and day lighting – Active solar and photovoltaic, building energy analysis methods, Lighting system design, Lighting economics and aesthetics, Impacts of lighting efficiency, Technological options for energy management.

UNIT-III:

ENERGY CONSERVATION Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings, waste to energy management in residential complexes or gated communities.

UNIT-IV:

RENEWABLE ENERGY RESOURCES Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar, windand hydro power appliances, success case studies of fully solar, wind and hydro power energies.

UNIT-V:

ENERGY REQUIREMENT AND GREEN BUILDING RATING SYSTEMS Energy

Conservation Building Code (ECBC) requirement for green buildings, Requirement for green rating systems - Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment (GRIHA), Building automation and building management systems.

Text Books:

1. 'Handbook on Green Practices published by Indian Society of Heating Refrigerating and Airconditioning Engineers', 2009
2. 'Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddyand K.S. Nanjunda Rao.
3. 'Green Building Handbook' by Tomwoolley and Samkimings, 2009

Reference Books:

1. 'Complete Guide to Green Buildings' by Trish riley.
2. 'Non-Conventional Energy Resources' by G. D. Rai, Khanna Publishers.
3. 'Standard for the design for High Performance Green Buildings' by Kent Peterson, 2009
4. Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.

B.TECH VII SEMESTER **OEC**

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20EE7T13 CONCEPT OF POWER SYSTEM ENGINEERING (OPEN ELECTIVE-III)

Course Objective: To develop problem solving skills and understanding of Power System concepts through the application of techniques and principles of electrical Power Generation methods.

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

CO1: Various electrical Power System Components, Supply systems

CO2: Thermal Power Station working procedure, each module path directions

CO3: Hydro Power Station working procedure, classifications

CO4: Nuclear Power Station working procedure, Chain Reaction

CO5: Solar power generation & Wind Power Generation, Applications

SYLLABUS

UNIT-I: **Power System Components**

Single line Diagram of Power system, Different kinds of supply system, conventional and Non-conventional energy sources, Applications.

UNIT-II: Thermal Power Stations

Choice of site Selection, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super, heaters, Economizers, electrostatic precipitators

UNIT-III: Hydro & Nuclear Power Stations

Choice of site, arrangement of hydroelectric installations, Hydrology. Mass curve, flow duration curve, classification of Hydro Power Plants, Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components

UNIT-IV: Solar power generation & Wind Power Generation

Solar radiation spectrum. Radiation measurement. Applications of solar thermal systems Solar Photovoltaic (SPV) systems, Introduction to wind energy, basic principles of wind energy conversion.

UNIT-V: Transmission & Distribution

Transmission structure, classifications, types of conductors, primary & secondary distribution, Substation Equipments , layout.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, S.Bhatnagarand, A Chakrabarti, DhanpatRai& Co. Pvt. Ltd.

2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers
3. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006

B.TECH VII SEMESTER | **OEC** | **L T P C** | **3 0 0 3**

20EE7T14 INSTRUMENTATION (OPEN ELECTIVE-III)

Course Objectives:

1 To study the basics of measuring system.

2 To study various Electrical transducers and to measure the various types of Non–electrical quantities

3 To study various types of digital voltmeters

4 To study the working principles of various types of oscilloscopes and their applications.

5 To study various types of signal analyzers

Course Outcomes:

CO1: Able to study the basics of measuring system.

CO2: Acquire proper knowledge to use various types of Transducers and able to monitor and measure various parameters such as strain, Fow, temperature and pressure

CO3: Acquire proper knowledge and working principle of various types of digital voltmeters.

CO4: Able to measure various parameters like phase and frequency of a signal with the help of CRO.

CO5: Acquire proper knowledge and able to handle various types of signal analyzers.

SYLLABUS

UNIT-I

Basics of Measuring System: Measuring Systems, Performance Characteristics – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors and Random Errors, Statistical analysis of random errors.

UNIT-II

Transducer Basics and Applications: Definition of transducers – Classification of transducers – Advantages of Electrical transducers –Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers. Measurement of Temperature, Pressure, Strain and Flow.

UNIT-III

Digital Voltmeters: Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type DVM, digital frequency meter – Digital phase angle meter.

UNIT-IV

Oscilloscope: Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns – Sampling oscilloscope, data logger, Transient recorder.

UNIT-V

Signal Analyzers: Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co

Reference Books:

1. Measurement and Instrumentation theory and application, Alan S.Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doeblin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson/Prentice Hall ofIndia
4. Modern Electronic Instrumentation and Measurement techniques – by A.D HelfrickandW.D.Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

B.TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20ME7T10 GREEN ENGINEERING SYSTEMS (OPEN ELECTIVE -III)

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: The course aims to highlight the significance of alternative sources of energy, green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

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

CO1: Evaluate the impact of technology on environment

CO2: Compare biological ecology to industrial ecology

CO3: Design eco-friendly product

CO4: Create sustainable products, facilities, processes and infrastructure

CO5: Asses the life cycle of a product to evaluate its impact on energy and materials use. Determine the effects of air and water quality

SYLLABUS

UNIT-I:

INTRODUCTION: SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT-III:

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV: ENERGY EFFICIENT SYSTEMS:

(A) ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V: ENERGY EFFICIENT PROCESSES:

Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/ TMH
2. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3. Green Manufacturing Processes and Systems, Edited / J. Paulo Davim/Springer 2013

References:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international

2. Principles of Solar Engineering / D.YogiGoswami, Frank Krieth& John F Kreider / Taylor & Francis
3. Non-Conventional Energy / Ashok V Desai /New Age International (P) Ltd
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Non conventional Energy Source/ G.D Roy/Standard Publishers
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd
7. Fuel Cell Technology –Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

B.TECH VII SEMESTER	**OEC**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

20ME7T11 HYBRID ELECTRIC VEHICLES (OPEN ELECTIVE -III)

Pre-requisite: Internal-Combustion engines.

Course Objective:

The main objective of this course is to provide the knowledge on architecture of Hybrid Electric Vehicles, Fuel cells and their sub-systems. The focus is as well on explaining the requirements of hybrid electric vehicles and Fuel-cells for automobile applications. At the same time, various design considerations in fuel cell vehicles and electric vehicles will be explained.

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

CO1:	Compare and contrast the working of Conventional and Electric Vehicles.
CO2:	Comprehend the use of Series and Hybrid Electric vehicle drive trains
CO3:	Apply the fundamentals of to develop the propulsion and storage systems for Hybrid Electric Vehicles.
CO4:	Perform a case study on Hybrid Electric vehicle drive trains for different parameters
CO5:	Describe the working principle of various types of fuel-cells.

SYLLABUS

UNIT-I:

ELECTRIC VEHICLES: Introduction, Electric Vehicle Principle- Components of Electric Vehicle Constituents of a conventional vehicle-Drive cycles and Drive Terrain, Operating principle of Fuel Cell, Differences between conventional battery and Electric battery, Transmission differences between conventional and Electric Vehicles, Differences between conventional lighting system and Electric vehicle lighting system.

UNIT-II:

HYBRID ELECTRIC VEHICLES: Introduction, A Brief history of Hybrid Electric vehicles (HEVs),Basics of Hybrid Electric Vehicles (HEVs), Architecture of HEVs-Series HEVs, Parallel HEVs, Series-Parallel HEVs.

HYBRID ELECTRIC VEHICLE DRIVE TRAINS: Parallel Hybrid Drive trains with Torque coupling, Parallel Hybrid Drive trains with both Speed coupling, Parallel Hybrid Drive trains with both speed Torque coupling.

UNIT-III:

ELECTRIC PROPULSION SYSTEMS: DC Motors- Operating principle and control of DC motors, Induction Motor Drives: Operating principle and Control Mechanisms, Brushless Motor Drives-Principle and Construction, Switched Reluctance Motor (SRM) Drives- Basic structure, Drive Convertor, Modes of Operation.

ENERGY STORAGE SYSTEMS: Electrochemical Batteries, Lead-Acid Batteries, Nickel Based Batteries, Lithium Based Batteries, Ultra Capacitors- Basic Principles and Performance, Ultrahigh-speed flywheels- Basic Principle and Power Capacity, Fly Wheel technologies.

UNIT-IV:

DESIGN OF SERIES HYBRID ELECTRIC VEHICLE DRIVES: Design of Series Hybrid Electric Vehicle Drive- Control Strategies, Sizing of Major Components and Case Study for designing for various parameters.

DESIGN OF PARALLEL HYBRID ELECTRIC VEHICLE DRIVES: Design of Parallel Hybrid Electric Vehicle Drive- Control Strategies of Drive Train and Design of Drive Train Parameters.

UNIT-V:

FUEL CELL ELECTRIC VEHICLES: Operating principles of fuel cells, Fuel and oxidant consumption, Fuel cell system characteristics, Fuel cell technologies- Proton Exchange membrane fuel cells, Alkaline Fuel cells, Phosphoric acid fuel cells, Molten carbonate fuel cells, Solid oxide fuel cells, Fuel supply- Hydrogen storage-Hydrogen production, Ammonia as hydrogen carrier, Non-Hydrogen fuel cells, Fuel Cell Hybrid Vehicle Drive Train.

Text Books:

1) MehrdadEhsani, YiminGao, Ali Emadi, 2nd edition, Modern Electric, Hybrid Electric and Fuel cell vehicles, CRC Press, Taylor and Francis Group, 2010.
2) Chris Mi, M.AbulMasrur and David WenzhongGao, 1st Edition, Hybrid Electric Vehicles, John Wiley & Sons, Ltd, 2011.

B. TECH VII SEMESTER	OEC	L	T	P	C
		3	0	0	3

20EC7T10 DATA COMMUNICATIONS (OPEN ELECTIVE-III)

COURSE OBJECTIVES:
The main objectives of this course are given below:

	At the end of the course, student will be able to
1	To focus on information sharing and networks.
2	To Introduce flow of data, categories of network, different topologies.
3	To focus on different coding schemes.
4	To brief the students regarding protocols and standards.
5	To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices, etc.

COURSE OUTCOMES:
At the end of this course the student will able to:

CO1:	Know basic knowledge of data Communication
CO2:	Know basic knowledge of Analog & Digital Signals
CO3:	Understand the basic knowledge of Analog Transmission
CO4:	know Different types of transmission media
CO5:	Focus on DTE-DCE Interface

SYLLABUS

UNIT-I:

Introduction to data communication and networking: Reason to study data communication, Data Communication, Networks, Protocols and Standards, Standards Organizations. Line Configuration, Topology, Transmission Modes, Categories of Networks Internet works. Study of OSI and TCP/IP protocol suit: The Model, Functions of the layers, TCP/IP Protocol Suites

UNIT-II:

Study of Signals: Analog and Digital, Periodic and Aperiodic Signals, Analog Signals, Time and Frequency Domains, Composite Signals, Digital Signals. Study of Digital transmission: Digital to Digital Conversion, Analog to Digital Conversion.

UNIT-III:

Study of Analog transmission: Digital to Analog Conversion, Analog to Analog Conversion. Study of Multiplexing: Many to one/one to Many, Frequency division Multiplexing, Wage division Multiplexing, Time division Multiplexing, Multiplexing applications.

UNIT-IV:

Types of transmission media: Guided Media, Unguided Media, Transmission Impairments, Performance Wavelength, Shannon Capacity, Media Comparison, PSTN, Switching. Error Detection and Correction: Types of Errors, Detection, Parity Check, Vertical Redundancy Check, Longitudinal Redundancy Check, Cyclic Redundancy Check, Checksum, Error Correction.

UNIT-V:

Study of DTE-DCE in brief: Digital data transmission, DTE-DCE Interface, Modems, 56K Modems, Cable Modems. Introduction to networks and devices: Network classes, Repeaters, Hub, Bridges, Switches, Routers, Gateways Routers, Routing Algorithms, Distance Vector Routing, Link State Routing.

Text Books:

1. Data communication & Networking by Bahrouz Forouzan.

2. Computer Networks by Andrew S. Tanenbaum

Reference Books:

1. Data and Computer Communications by William Stallings

2. Kleinrock, Leonard. Queueing Systems, Vol 1: Theory. New York, NY: Wiley J., 1975. ISBN: 0471491101.

B. Tech VII Semester **OEC**

L	T	P	C
3	0	0	3

20EC7T11 MECHATRONICS (OPEN ELECTIVE III)

Course Objective: The main objective of this course is

- To introduce the integrative nature of Mechatronics.
- To describe the basic programming, different components and devices of mechatronics systems.

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

CO1: Basic concepts of mechatronics

CO2: To design mechatronics system with the help of Microprocessor

CO3: To design PLC and other electrical and Electronics Circuits

CO4: To understand the concept of solid state Devices

CO5: To know Dynamic models & controllers

SYLLABUS

UNIT-I:

Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance sensors – Strain gauges – Eddy current sensor – Hall effect sensor – Temperature sensors – Light sensors.

UNIT-II:

Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes –Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontrollers – Block diagram

UNIT-III:

Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC, Basic programming in PLC.

UNIT-IV:

Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning, operational amplifiers, noise reduction, filtering.

UNIT-V:

Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trend

TEXT BOOKS:

1. Bolton, ―Mechatronics‖, Printice Hall, 2000

2. Ramesh S Gaonkar, ―Microprocessor Architecture, Programming, and Applications with the 8085‖, 5th Edition, Prentice Hall, 2008.

REFERENCE BOOKS:

1. Mechatronics System Design / Devdas shetty/Richard/Thomson.

2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

B. TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

BIOMEDICAL INSTRUMENTATION.

20EC7T12 (OPEN ELECTIVE III)

Course Objectives:

1. To introduce student to basic biomedical engineering technology
2. To understand the anatomy & physiology of major systems of the body in designing equipment for medical treatments.
3. To impart knowledge about the principle and working of different types of bio-medical electronic equipment/devices.

Course- Outcomes:
After going through this course the student will able

CO1.To understand Physiological System of the Body and Bioelectric Potentials.

CO2.To understand Electrodes, Transducer and Sensors used in Biomedical field.

CO3 To understand the problem and identify the necessity of equipment for diagnosis and therapy.

CO4 To understand the importance of electronics engineering in medical field.

CO5 To understand the importance of telemetry in patient care

SYLLABUS

UNIT-1: INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT-II: ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output**.**

UNIT-III: CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV: PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids, Laparoscope, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention,

UNIT-V: DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring**.**

Text Books:

1. Bio-Medical Instrumentation‖, Cromwell , Wiebell, Pfeiffer
2. Hand Book of Bio-Medical Instrumentation‖, Instrumentation‖, Kandahar. McGraw-Hill

References

1. Introduction to Bio-Medical Equipment Technology‖, 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey, Rakesh Kumar, Katson Books.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

20CS7T10 **ARTIFICIAL NEURAL NETWORKS.**
(OPEN ELECTIVE III)

Course Objectives:

- To deal with the historical developments of artificial intelligence leading to artificial neural networks (ANN).
- To introduce the basic concepts and models of ANN for solving real world problems.

Course Outcomes:

At the end of this course the student will be able to:

CO1- Understand biological neuron & artificial neuron and basic building blocks of ANN.

CO2-Understand different single layer/multiple layer Perceptron learning algorithms.

CO3- Understand and analyze Adaline and Madeline Networks and their applications

CO4- Learning algorithms based on basic gradient descent, backpropagation and their modifications.

CO5- Understand self-organization learning, ART, Radial basis Functions.

SYLLABUS

UNIT - I: Introduction to Artificial Neural Networks:

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT - II: Fundamental Models of Artificial Neural Networks:

Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS)Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.

Perceptron Networks: Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks

UNIT – III: Adaline and Madaline Networks:

Introduction, Adaline, Madaline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

UNIT - IV: Feedback Networks:

Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets.

Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT - V: Self Organizing Feature Map:

Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

Adaptive Resonance Theory: Introduction, ART Fundamentals, ART 1, ART2.

TEXT BOOKS:

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL : 2005.

REFERENCES:

1. “Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

CYBER SECURITY
20CS7T11 (OPEN ELECTIVE III)

Course Objective:

- Understand the importance of Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

Course Outcomes:

CO1: Understand and classify various forms of Cybercrimes

CO2: Interpret the reasons for Cyber offence

CO3: Detect and analyze vulnerabilities in Mobile and Wireless devices

CO4: Analyze tools used to perform cyber crimes

CO5: Understand cyber security Laws

SYLLABUS:

UNIT-I: Introduction, Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes

UNIT-II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT-III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

UNIT-IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-V: Cybercrimes and Cyber security:

The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

B. TECH VII SEMESTER

	L	T	P	C
OEC	3	0	0	3

SOFTWARE TESTING METHODOLOGIES
20CS7T12 (OPEN ELECTIVE III)

Course Objectives:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To Understand different levels of Testing
- Apply Black Box and White Box Testing Techniques
- To learn how to plan a test project, design test cases and data, conduct testing operations, and generate a test report.
- To understand software test automation problems and solutions.

Course Outcomes:

CO1: Have an ability to apply software testing knowledge and engineering methods.

CO2: Ability to identify the needs of software test automation, and define a test tool to support test automation.

CO3: Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

CO4: Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.

CO5: Apply techniques and skills to use modern software testing tools to support software testing projects.

SYLLABUS

UNIT-I: Software Testing:

Introduction, Evolution, Dichotomies, Goals & Typical Objectives of Testing, Model for testing, Software Testing Principles, **Software Testing Terminology and Methodology:** Software Testing Terminology, Errors, Defects, Failures, Root Causes and Effects, Software Testing Life Cycle, Software Testing Methodology.

UNIT-II: Verification and Validation:

Verification & Validation Activities, Categories of Test Techniques: Dynamic Testing,

Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing,

White-Box Testing: Need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT-III: Static Testing:

Inspections, Structured Walkthroughs, Technical reviews, Benefits of Static Testing, Static Vs Dynamic Testing.

Levels of Testing: Unit testing, Integration Testing,. Function testing, System testing and Acceptance testing.

Regression testing: Progressive Vs Regressive testing, Objectives of regression testing, Regression testing techniques

UNIT-IV: Test Management:

Test Organization, Test Planning, Test Design and Test case specifications, Structure of a Testing Group, Reasons for the growth of a Test suite, Test suite Minimization, Test suite prioritization, Types of test case prioritization, prioritization techniques, Measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQA models

Debugging: Debugging process, Debugging Techniques, Correcting Bugs, Debuggers

UNIT-V: Automation and Testing Tools:

Need for automation, Testing Tool Considerations, Test Tool Classification, Benefits and Risks of Test automation, Special Considerations for Test execution and Test Management Tools, Principles for tool selection, Testing tools- success factors, Guidelines for automated testing, overview of some commercial testing tools.

Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web **engineering**, testing of web based systems, Testing mobile systems.

TEXT BOOKS:

1. Software testing techniques - Baris Beizer, International Thomson computer press, second edition. (Unit 1)
2. Software Testing, Principles and Practices, Naresh Chauhan, Oxford Publishers(Unit 2,3,4,5)

REFERENCES:

Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

1. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
2. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

INTERNET OF THINGS
20IT7T10 (OPEN ELECTIVE III)

Course Objectives:

- Understand the architecture of Internet of Things and connected world.
- Explore on use of various hardware, communication and sensing technologies to build IoT applications
- Develop the real time IoT applications to make smart world.
- Understand challenges and future trends in IoT.

Course Outcomes:

CO1: Design and Deployment of IoT.

CO2: Design and comparing M2M with IoT.

CO3: Understand Platform design and modeling of IoT

CO4: Apply IoT in different devices using Python

CO5: Implement IoT and cloud platforms.

SYLLABUS

UNIT-I: Introduction to Internet of Things (IoT):

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT Enabling Technologies, IoT levels and deployment, domains Specific IoTs.

UNIT-II: IoT and M2M :

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

UNIT-III: IoT Platforms Design Methodology:

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data Structures, control flow, functions, modules, packages, file handling. Raspberry PI with Python, other IoT devices.

UNIT-IV: IoT Protocols:

Messaging Protocols- MQ Telemetry Transport (MQTT), Constrained Application Protocol (CoAP) Transport Protocols-Light Fidelity (Li-Fi), Bluetooth Low Energy (BLE) IoT Protocols: Addressing and Identification: Internet Protocol Version 4 (IPV4), Internet Protocol Version 6(IPV6), Uniform Resource Identifier (URI)

UNIT-V: IoT Physical Servers And Cloud Offerings: Introduction to cloud storage models and communication APIs, WAMP –Auto Bahn for IoT, Xively cloud for IoT, case studies illustrating IoT design –home automation, smart cities, smart environment.

TEXT BOOKS:

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-on-Approach", VPT, 1st Edition, 2014. (Units1,2,3,5)
2. Matt Richardson, Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 3rd Edition, 2014. (Unit 3)
3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram " Internet of Things" Wiley (Unit 4).

REFERENCE BOOKS:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons2014.

B. TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

COMPUTER VISION
20IT7T11 (OPEN ELECTIVE III)

Course Objectives:

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand motion analysis.
- To study some applications of computer vision algorithms

Course Outcomes:

CO1: Implement fundamental image processing techniques required for computer vision.

CO2: Perform shape analysis.

CO3: Apply Hough Transform for line, circle, and ellipse detections.

CO4: Apply 3D vision techniques.

CO5: Develop applications using computer vision techniques

SYLLABUS

UNIT - I:

IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology –texture.

UNIT - II: SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT – III: HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT - IV: 3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

.**UNIT - V: APPLICATIONS**

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

TEXT BOOKS:

1.D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.

2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.
2. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
3. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
4. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

FUZZY SETS
20HS7T01 (OPEN ELECTIVE III)

COURSE OBJECTIVES:

1) Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
2) Explain different types operations performed on fuzzy sets.
3) Provide the knowledge of Arithmetic operations on fuzzy numbers.
4) Emphasis on different kinds of crisp and fuzzy relations
5) Enable students to know the validity of arguments by fuzzy logic.

COURSE OUTCOMES:

CO1: Understand basic knowledge of fuzzy sets and fuzzy logic.
CO2: Apply various kinds of operations on fuzzy sets.
CO3: Understand the concepts of fuzzy arithmetic to solve fuzzy equations.
CO4: Illustrate the properties of fuzzy sets to design modeling software system.
CO5: Apply fuzzy logic to solve the problems in neural networks.

SYLLABUS

UNIT-I

Fuzzy Sets(all theorems without proofs): Introduction, Crisp sets, Fuzzy sets: Basic types and basic concepts, additional properties of α-cuts, representations of Fuzzy sets, extension principle for Fuzzy sets.

UNIT-II

Operations on Fuzzy Sets(all theorems without proofs): Types of operations, Fuzzy complements, Fuzzy intersections: t-norms, Fuzzy unions: t-conorms, Combinations of operations, Aggregation operations.

UNIT-III

Fuzzy Arithmetic(all theorems without proofs): Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations.

UNIT-IV

Fuzzy Relations(all theorems without proofs): Crisp versus Fuzzy relations, Projection and cylindrical extensions, Binary Fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations, Fuzzy compatibility relations, Fuzzy ordering relations, Fuzzy morphisms.

UNIT-V

Fuzzy Logic(all theorems without proofs): Classical logic: an over view, multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic hedges, Inference from conditional Fuzzy propositions, Inference from conditional and qualified propositions, Inference from quantified propositions.

TEXT BOOKS:

1. George J. Klir& Bo Yuan, Fuzzy Sets & Fuzzy Logic, Pearson Education, PHI, 1995.
2. H. J. Zimmermann, Fuzzy Set Theory and its Applications, 4th edition, Springer.

REFERENCES:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd edition, Wiley, 2010.
2. John Yen & Reza Langari, Fuzzy Logic, Pearson.

B. TECH VII SEMESTER

OEC	L	T	P	C
	3	0	0	3

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 **OEC**

L	T	P	C
3	0	0	3

20EE7T15 POWER QUALITY
(OPEN ELECTIVE-IV)

Course Objective:

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

Course Outcome:

At the end of this course the student should be able to

CO1: Differentiate between different types of power quality problems.

CO2: Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.

CO3: Analyze power quality terms and power quality standards.

CO4: Explain the principle of voltage regulation and power factor improvement methods.

CO5: Explain the power quality monitoring concepts and the usage of measuring instruments.

SYLLABUS

Unit-I

Introduction to Power Quality: Terms and definitions of transients, Long Duration Voltage Variations: Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching DC offset; waveform distortion; voltage fluctuation; power frequency variations.

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction-capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics, measurement of harmonics, THD; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices" Kluwer Academic Publishers
3. Sankaran, " Power Quality" CRC Press.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis) Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20EE7T16 ELECTRIC VEHICLES

(OPEN ELECTIVE-IV)

Course Objective:

- To study the different drive train configurations of electric vehicles
- To propose the various propulsion and energy storage systems for EHVs
- To know the sizing of propulsion motors and other systems involved in EH vehicles
- To carry out different design case studies of EHv and BEVs

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

CO1: Assess the performance, societal and environmental impact of EHVs having known their past history

CO2: Implement various drive train topologies and control strategies in Electric and Hybrid vehicles

CO3: Recommend, Design/Size and Control different electric propulsion units and other components of EHVs and BEVs

CO4: Appropriately select the energy storage system and strategize its management in EHVs

CO5: Define Ancillary Service Management and explain different ancillary services.

SYLLABUS

UNIT-I INTRODUCTION TO ELECTRIC VEHICLES:

History of electric vehicles (EV) and hybrid electric vehicle (EHV), need and importance of EV and HEV, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies, Power/energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics.

UNIT-II HYBRID ELECTRIC DRIVE-TRAINS: Basic architecture and concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

UNIT-III ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, and Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV BATTERY ENERGY STORAGE SYSTEMS:

Battery Basics - Lead-Acid Battery -Cell Discharge Operation - Cell Charge Operation-Construction-Battery Parameters - Battery Capacity-Discharge Rate - State of Charge- State of Discharge- Depth of Discharge-Technical Characteristics - Practical Capacity -Battery Energy -Constant Current Discharge -Specific Energy - Battery Power -Specific Power -Batteries for EV applications.

UNIT-V MODELLING OF EV/HEV:

Modelling and analysis of EV/HEV drive train sizing of motor, and design of traction power electronics, various vehicle subsystems.

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2010.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,2009.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

REFERENCES:

1. Jefferson, C.M., Barnard and R.H., Hybrid Vehicle Propulsion, WIT Press, Boston, 2002
2. Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012
3. SerefSoylu “Electric Vehicles - The Benefits and Barriers”, InTech Publishers, Croatia, 2011
4. Jack Erjavec and Jeff Arias, “Alternative Fuel Technology – Electric, Hybrid and Fuel Cell Vehicles”, Cengage Learning Pvt. Ltd., New Delhi, 2007
5. Seth Leitman, “Build Your Own Electric Vehicle” McGraw hill, New York, USA, 2013

B.TECH VII SEMESTER | **OEC** | **L 3** | **T 0** | **P 0** | **C 3**

20ME7T12 **MICRO-ELECTRO- MECHANICAL SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Calculus and Differential Eq., Fundamentals of Physics (Mechanics, Optics, Electricity and magnetism), Fundamentals of Inorganic Chemistry.

Course Objective: The main objective of this course is to introduce the integrative nature of Micro Electro Mechanical systems. To describe the different components and devices of Micro Electro Mechanical systems.

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

CO1:	Explain MEMS and Principles of sensing and actuation
CO2:	Explain Thermal Sensors and Actuators & Magnetic Sensors and Actuators
CO3:	Explain Micro-Opto-Electro Mechanical Systems
CO4:	Explain Radio Frequency (RF) MEMS & Micro Fluidic Systems
CO5:	Explain Chemical And Bio Medical Micro Systems

SYLLABUS

UNIT-I:

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT-II:

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, magnetic MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT-III: MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS:

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT-IV:

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

UNIT-V: CHEMICAL AND BIO MEDICAL MICRO SYSTEMS:

Sensing mechanism & principle, membrane transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (Enose), mass sensitive chemosensors, fluroscence detection,
calorimetric spectroscopy.

Text Books:

1. MEMS, NitaigourPremchandMahalik, TMH Publishing co.

References:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. Bio-MEMS (Micro systems), Gerald Urban, Springer.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.

B.TECH VII SEMESTER **OEC**

L	T	P	C
3	0	0	3

20ME7T13 **SOLAR ENERGY SYSTEMS (OPEN ELECTIVE -IV)**

Pre-requisite: Thermodynamics, Environmental Sciences

Course Objective: To impart knowledge on non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

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

CO1: Significance of renewable energy and describe the principles of solar radiation. Analyze various solar collectors.

CO2: Know the various storage methods and application of solar energy.

CO3: Understand the concept of converting wind energy into electrical energy using both horizontal and vertical axis wind machines.

CO4: Know biomass disasters, functional operation of geothermal systems. Generalize the operation of ocean, tidal and wave energy systems.

CO5: understand the operating principle of direct energy conversion systems .and to recognize the need and ability to engage in lifelong learning for further developments in this field.

SYLLABUS

UNIT-I: FUNDAMENTALS OF SOLAR RADIATION:

Energy conservation principle, Energy scenario (world and India), Solar angles, Solar time, Solar radiation: Outside earth's atmosphere, Earth surface, measurements of solar radiation: Pyrometer, Sunshine recorder, Pyro heliometer.

UNIT-II: ENERGY STORAGE SYSTEMS:

Energy –Environment-Economy Necessity of energy storage, Specifications of energy storage devices, energy storage Methods-Mechanical Energy Storage-Thermal Energy Storage-Sensible Heat Storage-Solid media storage.

UNIT-III: SOLAR COLLECTORS:

Classifications, comparison of concentrating and non-concentrating types – Liquid flat plate collectors, Evacuated tube collectors. Modified flat plate collectors: Compound parabolic concentrator(CPC), Cylindrical parabolic Concentrator, Fixed mirror solar concentrator, Paraboloid Dish Collector.

UNIT-IV: SOLAR THERMAL DEVICES:

Solar water heater, Solar space heating and cooling systems, Solar industrial heating systems, Solar refrigeration and air conditioning systems, Solar Desalination – Solar cooker: domestic, community – Solar pond – Solar drying.

UNIT-V: SOLAR PHOTOVOLTAIC SYSTEMS:

Solar cell fundamentals, Energy band model of semiconductors, Working Principle of photovoltaic cell, solar cell classification, solar cell technologies, solar PV systems-classification. Solar cell –module-array Construction.

Text Books:

1. Goswami D.Y., Kreider, J. F. and Francis., “Principles of Solar Engineering’, Taylor and Francis, 2000.
2. Chetan Singh Solanki, “Solar Photovoltatics – Fundamentals, Technologies and Applications”, PHI Learning Private limited, 2011.
3. Sukhatme S.P., Nayak.J.P, ‘Solar Energy – Principle of Thermal Storage and collection”, Tata McGraw Hill, 2008.
4. Solar Energy International, “Photovoltaic – Design and Installation Manual” – New Society Publishers, 2006.
5. Roger Messenger and Jerry Vnetre, “Photovoltaic Systems Engineering”, CRC Press, 2010.

Reference Books:

1. B.H.Khan “Non – conventional Energy Resources” Tata McGraw Hill education Pvt. Ltd.
2. G.D. Rai, “Non-Conventional Energy Sources”, Dhanpat Rai and Sons .

B. TECH VII SEMESTER

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INTRODUCTION TO EMBEDDED SYSTEMS
20EC7T13 **(OPEN ELECTIVE –IV)**

Course Objectives:

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

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained
3. Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed
4. Embedded system implementation and testing tools are introduced and discussed.
   Technology capabilities and limitations of the hardware, software components
5. Design Methodologies

Course Outcomes:

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

CO1: Understand the basic concepts of an embedded system and able to know an embedded system design Approach to perform a specific function.

CO2: The various embedded firmware design approaches on embedded environment.

CO3: Identify the unique characteristics of real-time systems

CO4: Design, implement and test an embedded system.

CO5: Define the unique design problems and challenges of real-time systems

SYLLABUS

UNIT-I: Introduction to Embedded systems

What is an embedded system Vs. General Computing system, history, classification, major application areas, and purpose of embedded systems, Core of embedded system, Characteristics and Quality Attributes of Embedded systems

UNIT-II: Embedded Hardware Design

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real-time clock, Application specific and Domain specific embedded systems-Examples

UNIT-III:

Embedded Firmware design approaches, Embedded Firmware Development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA,Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV:

Factors to be considered in selecting a controller, 8051 Architecture, RTOS and Scheduling Operating basics, types, RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Types of multitasking, Non preemptive Scheduling, Preemptive Scheduling.

UNIT-V: Design and Development

Embedded system development Environment – IDE, Simulators, Emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry

Text books:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.

2. Embedded Systems, Rajkamal, TMH, 2009.

References:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE

2. Embedded Systems: A Contemporary Design Tool Paperback by James K. Peckol

B. Tech VII Semester

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20EC7T14 INTERNET OF THINGS (OPEN ELECTIVE –IV)

COURSE OBJECTIVES:
The main objectives of this course are given below:

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

1. To introduce the terminology, technology and its applications
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language which is used in many IoT devices
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To introduce the implementation of web-based services on IoT devices

COURSE OUTCOMES:

At the end of this course the student will able to:

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

CO1: Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.

CO2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on Bwireless, energy, power, and sensing modules

CO3: Market forecast for IoT devices with a focus on sensors

CO4: Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

SYLLABUS

UNIT-I: Introduction to Internet of Things

Definition and Characteristics of IoT, Sensors, Actuators,
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II: IoT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT-III: IoT Physical Devices and Endpoints

Introduction to Arduino and Raspberry Pi- Installation,
Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT-IV: Controlling Hardware-

Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors

Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

UNIT-V: IoT Physical Servers and Cloud Offerings–

Introduction to Cloud Storage models and
communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

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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.

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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.

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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

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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.

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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.

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20IT7T14 BUSINESS INTELLIGENCE (OPEN ELECTIVE –IV)

Course Objectives:

- Introduce the concepts and components of Business Intelligence (BI)
- Evaluate the technologies that make up BI (data warehousing, OLAP)
- Identify the technological architecture that makes up BI systems

Course Outcomes:

CO1: Understand concepts and components of Business Intelligence.

CO2: Explain the complete life cycle of BI development.

CO3: Illustrate technology and processes associated with Business Intelligence framework.

CO4: Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

CO5: Ability to design expert system using AI tools.

SYLLABUS

UNIT-I:

Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence

Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

UNIT-II:

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics. **Getting started with business intelligence:** Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards, Need for BI at virtually all levels, BI for past, present and future, The BI value chain, Introduction to business analytics.

UNIT-III:

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete BI professional, Popular BI tools.

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart,OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

UNIT-IV:

Business Intelligence Applications:

Marketing models: Relational marketing, Sales force management,

Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.

Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices

UNIT-V:

Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management

Artificial Intelligence and Expert Systems:

Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems

TEXT BOOKS:

1. Fundamental of Business Intelligence" Grossmann W, Rinderle-Ma Springer, 2015
2. "Fundamentals of Business Analytics" – By R N Prasad and SeemaAcharya, Publishers: Wiley India.

REFERENCE BOOKS:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : TheCompleteProject Lifecycle for Decision Support Applications, Addison WesleyInformation Technology
2. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann.

B. Tech VII Semester **OEC**

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20HS7T02 POLYMER CHEMISTRY (OPEN ELECTIVE –IV)

PREREQUISITES: Chemistry I and Chemistry II of AICTE syllabus

Course Outcomes

CO1: After studying this course, the learners are expected to: Relate polymer properties to their structure and conformation

CO2: Analyse different mechanisms of polymer formation and use this information in the synthesis of different polymers.

CO3: Distinguish between enthalpic and entropic contributions to polymerisation/crystallization.

CO4: Distinguish between absolute and relative methods for molecular weight determination.

CO5: Determine the flow properties of polymer melts and solutions.

CO6: Interpret experimental data and determine parameters such as polymerization ratesand copolymer composition.

CO7: Estimate the solubility of a given polymer in various solvents and blends.

CO8: Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.

CO9: Assess the effect of synthetic polymers on the environment.

SYLLABUS

Unit 1. Definitions, origin, nomenclature, classification and types of macromolecules; molecular weight (MW) and its distribution; Determination of molecular weight – methods for measuring number average, weight average, viscosity average MW; gel permeation chromatography; spectroscopic techniques to determine chemical composition and molecular microstructure, thermal transitions; melting temperature and glass transition temperature. Colligative properties, osmotic pressure, light scattering, refractive index, viscosity, small angle X-ray scattering (6)

Unit 2tep-Growth Polymerization: Reactivity of functional groups; kinetics; molecular weight in open and closed system cyclization vs. linear polymerization, cross-linking and gel point; process condition; step-copolymerization, examples of step polymers (3)

Unit 3. Free radical Polymerization: Nature of chain polymerization and its comparison with step polymerization; radical vs. ionic polymerizations; structural arrangements of monomer units; kinetics of chain polymerization; molecular weight and its distribution; chaintransfer, inhibition, retardation, auto-acceleration; energetic characteristics; techniques of radical polymerization – bulk, solution, emulsion, suspension polymerization; examples of polymers made by radical chain polymerization (4)**.** Ionic Polymerization: Propagation and termination of cationic polymerization, anionic and ring opening polymerization, active polycarbanions (2)

Unit 4. Copolymerization: types of copolymers, copolymer compositions, reactivity ratio; radical and ionic co-polymerizations; Block and Graft copolymer synthesis, examples (2). Thermodynamics of polymer solutions; Flory-Huggins theory, theta conditions; solubility parameters; fractionation of macromolecules, osmotic pressure, lower criticalsolution temperature (3)

Unit 5. Naturally occurring polymers, biodegradability, biosynthesis, polymers frombio/renewable resources (2)

Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography, Electron beam, X-ray and ion sensitive resists, Conducting polymers, types, properties and applications, electroluminescence, molecular basis of electrical conductivity, Photonic applications and non-linear optics, optical information storage (3)

Text Books:

1. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur
2. Polymer chemistry and Physics of Modern Materials, 2nd edn, J. M. G. Cowie, Stanley Thornes, UK, 1998
3. Contemporary Polymer Chemistry, 3rd edn. H. R. Allcock, F. W. Lampe and J. E.Mark, Pearson
4. Polymers: Chemistry and Physics of Modern Materials, J.M.G. Cowie, CRC Press
5. Introduction to Physical Polymer Science, L. H. Sperling, Wiley
6. Introduction to Soft matter, I. W. Hamley, John Wiley and Sons, 2007
7. Polymer Chemistry, 2nd edn, P. C. Hiemenz and T. P. Lodge, CRC Press (2007)

B. TECH VII SEMESTER **OEC**

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20MB7T03 TOTAL ENGINEERING QUALITY MANAGEMENT (OPEN ELECTIVE –IV)

Course Objective

To understand the Engineering and Management aspects of Planning, Designing, Controlling and Improving Quality in Manufactured products.

Course Outcome

1. To understand the fundamentals of quality
2. To understand the role of TQM tools and techniques in elimination of wastages and reduction of defects
3. To develop quality as a passion and habit
4. To Facilitate the understanding of Quality Management principles and process.
5. The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

SYLLABUS

UNIT I

Quality Gurus And TQM Kitemarks: Definition, Need & Evolution of TQM – Contributions of Quality Guru's – Edward Deming – Joseph Juran – Philip Crosby – Genichi Taguchi – Walter Shewart – Criteria for Deming's Prize.

UNIT II

Product Design & Analysis : Dimensions of product and service quality, Basic Design Concepts and TQM – Design Assurance – Design Validation –Failure Mode Effect Analysis – Fault Tree Analysis – Design for Robustness – Value Analysis.

UNIT III

Process Improvement & Modern Production Management Tools

Control Charts – Process Capability, -Bench Marking, Six Sigma Approach – Total Productive Maintenance – Just-In-Time – Lean Manufacturing Paradigms.

UNIT IV

Quality Improvement Tools & Continuous Improvement

Traditional Q-7Tools, New Q-7 Tools, Quality Function Deployment (QFD), Kaizen 5S, Poka-Yoke, Failure Mode and Effects Analysis(FMEA) – Stages, Types, Taguchi Quality Loss Function(QFD) – Total Productive Maintenance (TPM).

UNIT V

Quality Management Systems ISO 9000, ISO 9001: 2008, QS 9000, ISO 14000, TS16949:2002 and EMS14001 certifications of quality systems- Elements, Documentation, Quality Auditing — Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.

TEXT BOOKS

1. Total Engineering Quality Management, Sunil Sharma, 1st Edition, MacMillan India Limited.
2. Total Quality Management, Poornima M. Charantimath, 2nd Edition, Pearson Education.
3. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint 2006.

REFERENCES

1. "Quality and Performance Excellence", James R Evans, Edition, 7th Edition, Cengage Learning.
2. "Quality Management", Howard S Gitlow, Alan J Oppenheim, Rosa Oppenheim, David M Levine,3rd Edition , Tata McGraw Hill Limited.
3. "Fundamentals of Quality Control & Improvement", Amitava Mitra, 3rd Edition, Wiley Publications, 2012.
4. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.

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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

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20AM7T11 DEEP LEARNING (OPEN ELECTIVE –IV)

Pre-requisite: Linear Algebra, Calculus, Python Programming

Course Objective: *This **course*** explains understanding basics of deep neural networks, CNN architectures of deep neural networks, concepts of Artificial Neural Networks, basics of Data science in Deep learning, applications of deep learning in AI and Data Science

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

CO1: Explain the basics in deep neural networks

CO2: Apply Convolution Neural Network for image processing

CO3: Explain the basics of Artificial Intelligence using deep learning

CO4: Apply deep learning algorithms for data science

CO5: Apply deep learning algorithms for variety applications

SYLLABUS

Unit-1:

DEEP NETWORKS BASICS

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization – Machine Learning Basics: Capacity – Over fitting and under fitting – Hyper parameters and validation sets -- Estimators -- Bias and variance -- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization -- Optimization .

Unit-2:

CONVOLUTIONAL NEURAL NETWORKS

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.

Unit-3:

DEEP LEARNING ALGORITHMS FOR AI

Artificial Neural Networks – Linear Associative Networks – Perceptrons -The Back propagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Auto encoders - Deep Backprop Networks- Auto encoders

Unit-4:

DATA SCIENCE AND DEEP LEARNING

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

Unit-5:

APPLICATIONS OF DEEP LEARNING

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion -NLP tasks - dimensionality estimation - time series forecasting - building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016

2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019

3. Vance, William, Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science (Hardcover - 2020), Joiningthedotstv Limited

4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022

5. Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018.

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20CEMN01 BUILDING MATERIALS AND CONSTRUCTION
(Minor Engineering Course)

Course Objectives:

- To learn about the nature, properties, classification and manufacturing process of building materials and familiarize with various methods of masonry construction.
- To understand the knowledge of building components, finishings.

Course Outcomes: Upon the successful completion of the course, the student should be able to

CO1: identify different building materials and their importance in building construction.

CO2: differentiate brick masonry, stone masonry

CO3: construction and use of lime and cement in various constructions.

CO4: learnt the importance of building components and finishings.

CO5: know the classification of aggregates, sieve analysis and moisture content.

SYLLABUS

UNIT-I: Stones, Bricks and Masonry Stones and Bricks

Properties of building stones, Relation to their structural requirements; Classification of stones, Stone quarrying, Precautions in blasting; Dressing of stone; Composition of good brick earth, various methods of manufacture of bricks; Comparison between clamp burning and kiln burning; Qualities of a good brick.

Masonry: Types of Masonry, Rubble and Ashlar masonry; English Bond, Flemish Bond and Rat Trap Bond; Cavity walls and Partition walls.

UNIT-II: Wood, Lime and Cement

Wood: Classification of various types of wood used in buildings, Structure of wood, Properties - Seasoning and Defects in timber.

Lime and Cement: Various ingredients of lime, Constituents of lime, Classification of lime.

Cement: composition, cement manufacturing process, various types of cements, their properties and uses; Various field and laboratory tests for Cement.

UNIT-III: Aggregates

Classification of aggregate, Coarse and Fine aggregates; Particle shape and Texture, Bond and Strength of Aggregate; Specific gravity; Bulk density

Porosity and Absorption, Moisture content of Aggregate– Bulking of sand.

UNIT-IV: Building Components

Lintels, Arches, Vaults, Types of Stair cases; Different types of floors - Concrete, Mosaic and Terrazzo floors. Pitched, Flat and curved Roofs, Lean-to-Roof; Coupled roofs, Trussed roofs- King and Queen Post Trusses, RCC flat and Shell roofs.

UNIT-V: Finishings

Damp proofing and Water proofing- materials used; Plastering, Pointing, Whitewashing and Distempering; Painting – Constituents of paints – Types of paints; Painting of new/ old Wood Surface – Varnish – Form work and scaffolding.

Text Books:

1. Building Materials, S K Duggal, third Edition – New Age International Publishers.
2. Building Construction, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, third Edition – Laxmi Publications (P) ltd., New Delhi.

Reference Books:

1. Construction Technology, R. Chudly – Volumes I and II 2nd Edition, Longman,UK, 1987.
2. Engineering Materials, S. C. Rangwala, Fourth Edition, Charotar Publications.
3. Building Construction, P. C. Varghese, Second Edition, Prentice – Hall of India private Ltd,New Delhi.
4. The Text Book of Building Construction, S. P. Arora and S.P.Bindra, Dhanapati Rai, second Edition Publishers.
5. SP-7:2016 National Building Code of India 2016 (NBC 2016).

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20CEMN02 CONCRETE TECHNOLOGY

(Minor Engineering Course)

Course Objectives: Lot of advantages are taking place in the concrete technology as par with development taking place in the engineering. The present day industry needs the knowledge of concrete technology thoroughly. The subject is designed to give the basic knowledge as well as latest developments in concrete technology.

Course Outcomes: After the completion of the course student should be able to

CO1: Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.

CO2: Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties

CO3: Use advanced laboratory techniques to characterize cement-based materials.

CO4: Perform mix design

CO5: know engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete.

SYLLABUS

UNIT-I:

CEMENT: Portland cement – chemical composition – Types of Cements– Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

UNIT-II:

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity- Bulk density, porosity, adsorption & moisture content of aggregate.

Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT–III:

FRESH CONCRETE: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT-IV:

HARDENED CONCRETE: Water / Cement ratio – Abram's Law – Gelspaoe ratio -Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests – Tension tests- Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT

ELASTICITY, CREEP &SHRINKAGE: Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep –Effects of creep – Shrinkage – types of shrinkage.

UNIT–V:

MIX DESIGN: Factors in the choice of mix proportions – Durability of concrete- Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

SPECIAL CONCRETES: Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

Text Books:

1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition
2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004

Reference Books:

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.
2. Concrete Technology by A. R. Santha Kumar, Oxford university Press, New Delhi
3. Concrete: Micro structure, Properties and Materials – P. K. Mehta and J.M. Monteiro, Mc-Graw Hill Publishers

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20CEMN03 SURVEYING
(Minor Engineering Course)

Course Objectives: The first step in engineering practice is surveying and the soundness of the any civil engineering work is dependent on the reliability and accuracy of the surveying.

There ore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

Course Outcomes: after the completion of the course student should be able to

CO1: Gain a broad understanding of Land Survey

CO2: Get accustoms with the angular and linear measurements.

CO3: Trained with recording the field information and necessary plot

CO4: Contemporary issues and developments.

SYLLABUS

UNIT-I: Introduction and Basic Concepts

Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip.

UNIT-II: Leveling and Contouring

Leveling- Basics definitions, types of levels and leveling staves, temporary adjustments, methods of leveling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Plane Table Surveying: Introduction of Plane table surveying- Area by the method of radiation and intersection – Two point problem

UNIT-III: Theodolite Surveying

Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.

Traversing

Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT-IV: Tacheometric Surveying

Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves

Types of curves and their necessity, elements of simple curve, setting out of simple Curves, Introduction to compound curves.

UNIT-V: Modern Surveying Methods

Total Station and Global Positioning System. : Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working, E.D.M. method and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

Text Books:

1. Chandra A M, "Plane Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
2. Duggal S K, "Surveying (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co.Ltd. New Delhi, 2004.

Reference Books:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying,
   McGraw Hill – 2000
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004

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20CEMN04 TRAFFIC ENGINEERING

(Minor Engineering Course)

Course Objectives:

To provide engineering techniques to achiev the safe and efficient movement of people and goods on roadways.

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

CO1: Know the Traffic Volume, Speed and Density.

CO2: Gain Knowledge on Parking Studies

CO3: Know the concept of Traffic Capacity

CO4: Design Traffic Signals

CO5: Get knowledge on Transportation Management.

SYLLABUS

UNIT-I:

Traffic Studies (Part- I) : Basic principles of Traffic, Volume, Speed and Density; Definitions and their interrelationships; Traffic Volume studies - Objectives, Methods of Volume counts, Presentation of Volume Data; Speed studies- Types of Speeds, Objectives, Methods of speed studies, Statistical Methods for speed data Analysis, Presentation of speed data. Delay Studies; Head ways and Gap Studies - Headway and Gap acceptance, Origin and Destination Studies.

UNIT-II:

Traffic Studies (Part-II) : Parking Studies: parameters of parking, definitions, Parking inventory study, Parking survey by Patrolling method; Analysis of Parking Survey data; Accident studies- Causative factors of Road accidents, Accident data collection: Accident analysis and modeling;, Road Safety Auditing, Measures to increase Road safety.

UNIT-III:

Capacity and LOS Analysis: Introduction to Traffic capacity, Analysis concepts, Level of Service, Basic definitions, Factors affecting Capacity and LOS, Capacity of Urban/Rural Highway, With or without access control, Basic freeway segments - Service flow rate of LOS, Lane width or Lateral clearance adjustment; Heavy vehicle adjustment; Driver population adjustment.

UNIT-IV:

Signal Designing – Fixed Time signals, Determination of Optimum Cycle length and Signal setting for Fixed Time signals, Warrants for Signals, Time Plan Design for Pre-Timed Control- Lane group analysis, Saturation flow rate, and Adjustment factors, Uniform and Incremental Delay, Vehicle Actuated Signals, Signal Coordination.

UNIT-V:

Transportation System Management - Measures for Improving vehicular flow – one way Streets, Signal Improvement, Transit Stop Relocation, Parking Management, Reversible lanes- Reducing Peak Period Traffic - Strategies for working hours, Congestion Pricing, Differential Toll Policies.

Text Books:

1. Traffic Engineering: Theory and Practice, Pignataro LJ., Prentice hall, Inc
2. Traffic and Transport planning, Kadiyali L.R., Khanna Publishers

Reference Books:

1. Traffic Engineering Hand Book, Institute of Transportation Engineers, 4 Ed.,Prentice Hall
2. Traffic Engineering, Mc Shane, WR and RP Roess, Prentice Hall
3. Highway Traffic analysis and design, Salter RJ and NB Hounsell, 3rd ed., Macmillan
4. Traffic Planning and Engineering, Hobbs FD., Pergamon press
5. Traffic flow fundamentals, May, A.D., Prentice Hall.