PRIST
DEEMED TO BE
UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

PROGRAM HANDBOOK

B.TECH (CIVIL ENGINEERING)**FULL TIME**

[REGULATION 2020]

[for candidates admitted to B.Tech (Civil Engineering) program from June 2020 onwards]

COURSE

STRUCTURE

I - VIII SEMESTERS CURRICULUM AND SYLLABI

B.TECH (FT) CIVIL   **[REGULATION 2020]**   **SEMESTER I**

Sl.No	Course Code	Course Title	L	T	P	Credit
		THEORY	L	T	P	
1	20147S11	Communicative English	4	0	0	4
2	20148S12	Engineering Mathematics – I	3	2	0	4
3	20149S13	Engineering Physics	3	0	0	3
4	20149S14	Engineering Chemistry	3	0	0	3
5	20154S15	Engineering Graphics	2	0	4	4
6	20150S16	Problem Solving and Python Programming	3	0	0	3
		PRACTICALS				
7	20150L17	Problem Solving and Python Programming Laboratory	0	0	3	2
8	20149L18	Physics and Chemistry Laboratory	0	0	3	2
9	201AGIT	Induction Training Programme				2
		TOTAL				25

SEMESTER II

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1.	20147S21	Technical English(All Branches)	4	0	0	4
2.	20148S22A	Engineering Mathematics II(All Branches)	4	0	0	4
3.	20149S23D	Physics for Civil Engineering	3	0	0	3
4.	20149S24A	Environmental Science And Engineering	3	0	0	3
5.	20153S25E	Basic Electrical And Electronics Engineering	3	0	0	3
6.	20154S26D	Engineering Mechanics	3	2	0	4
PRACTICALS						
7.	20154L27	Engineering Practices Laboratory	0	0	3	2
8.	20155L28E	Computer Aided Building Drawing Lab	0	0	3	2
9.	201AGIC	Indian Constitution				2
10.	201ASBE	Basic Behavioral Etiquette				2
		TOTAL	21	0	8	25

SEMESTER III

S. No	Sub. Code	Name of the Subject	L	T	P	C
		THEORY				
1	20148S31C	Transforms and Partial Differential Equations	4	0	0	4
2	20155C32	Engineering Geology	3	0	0	3
3	20155C33	Construction Materials	3	0	0	3
4	20155C34	Strength of Materials –I	3	0	0	3
5	20155C35	Fluid Mechanics	3	2	0	4
6	20155C36	Surveying	4	0	0	3
PRACTICALS						
7	20155L37	Surveying Laboratory	0	0	3	2
8	20155L38	Construction Materials Laboratory	0	0	3	2
9	20147L39	Interpersonal Skills / Listening and Speaking	0	0	2	1
10	201AGGS	Introduction to Gender Studies				2
	TOTAL					25

SEMESTER IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20148S41C	Numerical Methods	4	0	0	4
2	20155C42	Construction Techniques and Practices	3	0	0	3
3	20155C43	Strength of Materials II	4	0	0	4
4	20155C44	Applied Hydraulic Engineering	3	0	0	3
5	20155C45	Concrete Technology	3	0	0	3
6	20155C46	Soil Mechanics	3	0	0	3
PRACTICALS						
7	20155L47	Strength of Materials Lab	0	0	3	2
8	20155L48	Hydraulic Engineering Lab	0	0	3	2
9	20147L49	Advanced Reading & Writing	0	0	2	1
10	20155CRS	Research Led Seminar	0	0	2	1
11	201AGCE	Community Engagement				2
12	201ASGS	Technical, General Aptitude and Skill Set Development				2
	TOTAL					26

SEMESTER – V

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20155C51	Design of Reinforced Cement Concrete Elements	4	0	0	4
2	20155C52	Structural Analysis I	3	2	0	4
3	20155C53	Water Supply Engineering	3	0	0	3
4	20155FE54	Open Elective I	3	0	0	3
5	20155E55	Elective I	3	0	0	3
6	20155C56	Foundation Engineering	3	0	0	3
PRACTICALS						
7	20155L57	Soil Mechanics Lab	0	0	3	2
8	20155L58	Water and Waste Water Analysis Lab	0	0	3	2
9	20155L59	Survey Camp	0	0	2	2
10	20155CRM	Research Methodology	0	0	2	3
11	201AGIE	Innovation and Entrepreneurship				2
	TOTAL					29

SEMESTER – VI

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20155C61	Design of Steel Structural Elements	3	0	0	3
2	20155C62	Structural Analysis II	3	2	0	4
3	20155C63	Irrigation Engineering	3	0	0	3
4	20155C64	Highway Engineering	3	0	0	3
5	20155C65	Waste Water Engineering	3	0	0	3
6	20155E66	Elective II	3	0	0	3
PRACTICALS						
7	20155L67	Highway Engineering Laboratory	0	0	3	2
8	20155L68	Irrigation and Environmental Engineering Drawing	0	0	3	2
9	20147L69	Professional Communication	0	0	2	1
10	20155CBR	Participation in Bounded Research	0	0	2	1
11	201ASTT	Technical Training				2
	TOTAL					25

SEMESTER – VII

S.No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20155C71	Estimation , Costing & Valuation Engineering	4	0	0	4
2	20155C72	Railways, Airports, Docks And Harbour Engineering	3	2	0	4
3	20155C73	Structural Design and drawing	3	2	0	4
4	20155FE74	Open Elective II	4	0	0	3
5	20155E75	Elective III	4	0	0	3
PRACTICALS						
6	20155L76	Creative and Innovation project (activity based –subject related)	0	0	4	2
7	20155L77	Industrial Training (4 Weeks during VI th Sem Summer)	0	0	0	2
8	20155L78	Technical Seminar	0	0	2	1
9	20155CSR	Design / Socio Technical Project	0	0	4	3
	TOTAL					26

SEMESTER – VIII

S.No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E81	Elective IV	3	0	0	3
2	20155E82	Elective V	3	0	0	3
3	20155PW83	Project Work	0	0	30	10
4	20155PEE	Program Exit Exam				2
5	201AGPE	Professional Ethics and Human Values				2
6	201ASIM	Interview Skills Training and Mock Test				2
	TOTAL					18

CREDITS DISTRIBUTION

CGPA CREDITS

Semester	Core	Elective Courses	Open Electives	Practical	Seminar	Exit Exam	Project	RSD Course	Total
I	21	-	-	04	-	-	-	-	25
II	21	-	-	04	-	-	-	-	25
III	20	-	-	05	-	-	-	-	25
IV	21	-	-	05	-	-	-	01	26
V	14	03	03	06	-	-	-	03	29
VI	16	03	-	05	-	-	-	01	25
VII	12	03	03	04	01	-	-	03	26
VIII	-	06	-	-	-	02	10	-	18
Total Credits									**199**

NON CGPA CREDITS

Semester	Audit courses	Total
I	01	01
II	02	02
III	01	01
IV	02	02
V	01	01
VI	01	01
VII	-	-
VIII	02	02
TOTAL NON CGPA CREDITS		**10**

TOTAL CREDITS	
CGPA CREDITS	**199**
NON CGPA CREDITS	**10**
TOTAL	**209**

LIST OF ELECTIVES

SEMESTER – V

ELECTIVE I

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E55A	Construction Equipment and Automation	3	0	0	3
2	20155E55B	Principles of Architecture	3	0	0	3
3	20155E55C	Geographic Information System	3	0	0	3
4	20155E55D	Forensic Engineering & Rehabilitation	3	0	0	3
5	20155E55E	Energy Efficient Buildings	3	0	0	3

SEMESTER – VI

ELECTIVE II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E66A	Energy and Environment	3	0	0	3
2	20155E66B	Environmental Policies and Legislation	3	0	0	3
3	20155E66C	Sustainable Urban Development Concepts and Strategies	3	0	0	3
4	20155E66D	Instrumental Methods and Analysis of Environmental Pollutants	3	0	0	3
5	20155E66E	Air pollution and control Engineering	3	0	0	3

SEMESTER – VII

ELECTIVE III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E75A	Building Automation & Management System	3	0	0	3
2	20155E75B	Design of Prestressed concrete structures	3	0	0	3
3	20155E75C	Pavement Design	3	0	0	3
4	20155E75D	Town Planning	3	0	0	3
5	20155E75E	Smart materials and smart structures	3	0	0	3

SEMESTER – VIII

ELECTIVE IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E81A	Environmental Economics	3	0	0	3
2	20155E81B	Simulation and Modeling in Environmental Systems	3	0	0	3
3	20155E81C	Membrane Separation for Water and Waste water	3	0	0	3
4	20155E81D	Theory and Practice of Industrial Wastewater Treatment	3	0	0	3
5	20155E81E	Geo-environmental Engineering	3	0	0	3

ELECTIVE V

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E82A	Airport & Waterways Engineering	3	0	0	3
2	20155E82B	Surface Hydrology	3	0	0	3
3	20155E82C	Prefabricated structures	3	0	0	3
4	20155E82D	Contracts Management	3	0	0	3
5	20155E82E	Sustainable Construction methods	3	0	0	3

OPEN ELECTIVE-I

1	20150FE54A	Database Management Systems (CSE)	3	0	0	3
2	20150FE54B	Cloud Computing (CSE)	3	0	0	3
3	20152FE54A	Basic Of Bio Medical Instrumentation (ECE)	3	0	0	3
4	20152FE54B	Sensor and Transducers (ECE)	3	0	0	3
5	20153FE54A	Industrial Nano Technology (EEE)	3	0	0	3
6	20153FE54A	Energy Conservation and Management (EEE)	3	0	0	3
7	20154FE54A	Renewable Energy Sources (MECH)	3	0	0	3
8	20154FE54B	Automotive Systems (MECH)	3	0	0	3

OPEN ELECTIVE-II

1	20150FE74A	Introduction to C Programming (CSE)	3	0	0	3
2	20150FE74B	Data Structures & Algorithms (CSE)	3	0	0	3
3	20152FE74A	Robotics (ECE)	3	0	0	3
4	20152FE74B	Electronic Devices (ECE)	3	0	0	3
5	20153FE74A	Basic Circuit Theory (EEE)	3	0	0	3
6	20153FE74B	Introduction to Renewable Energy Systems (EEE)	3	0	0	3
7	20154FE74A	Industrial Safety (MECH)	3	0	0	3
8	20154FE74B	Testing of Materials (MECH)	3	0	0	3

20147S11	**COMMUNICATIVE ENGLISH**	**L T P C**
		4 0 0 4

COURSE OBJECTIVES:

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills.

UNIT I   SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting-Writing- completing sentences- - developing hints. Listening- short texts- short formal and informal conversations. Speaking- introducing oneself - exchanging personal information-Language development- What Questions- asking and answering-yes or no questions- parts of speech. Vocabulary development-- prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II   GENERAL READING AND FREE WRITING   12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- Writing – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –Listening-telephonic conversations. Speaking– sharing information of a personal kind—greeting – taking leave- Language development – prepositions, conjunctions Vocabulary development-guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT   12

Reading- short texts and longer passages (close reading) Writing- understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences Listening –listening to longer texts and filling up the table- product description- narratives from different sources. Speaking- asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- direct vs indirect questions- Vocabulary development – single word substitutes- adverbs.

UNIT IV   READING AND LANGUAGE DEVELOPMENT   12

Reading- comprehension-reading longer texts- reading different types of texts- magazines Writing- letter writing, informal or personal letters-e-mails-conventions of personal email- Listening- listening to dialogues or conversations and completing exercises based on them. Speaking- speaking about oneself-speaking about one's friend- Language development-Tenses- simple present-simple past- present continuous and past continuous- Vocabulary development- synonyms-antonyms- phrasal verbs

UNIT V   EXTENDED WRITING   12

 Reading- longer texts- close reading–Writing- brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing-Listening – listening to talks- conversations- Speaking– participating in conversations- short group conversations- Language development-modal verbs- present/ past perfect tense – Vocabulary development- collocations- fixed and semi-fixed expression

 OUTCOMES:

At the end of the course, learners will be able to:
- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends andexpress opinions in English.
- Comprehend conversations and short talks delivered in English.
- Write short essays of a general kind and personal letters and emails in English.

TEXT BOOKS:
1. Board of Editors. Using English A Course book for Under Graduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad: 2015
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES
1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
3. Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013
4. Means,L. Thomas and Elaine Langlois. English & Communication For Colleges. CengageLearning ,USA: 2007
5. Redston, Chris &Gillies Cunningham Face2Face (Pre-intermediate Student's Book& Workbook)Cambridge University Press, New Delhi: 2005.

CO's-PO's&PSO's MAPPING :

CO	PO									PSO					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
2	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
3	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
4	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
5	2	3	3	3	-	3	3	3	2	3	-	3	-	-	-
Avg	1.6	2.2	1.8	2.2	1.5	3	3	3	1.6	3	3	3	-	-	-

- 1-low,2-medium,3-high,'-"-no correlation

20148S12   **ENGINEERING MATHEMATICS–I**   **L T P C**
                                                    3 2 0 4

COURSE OBJECTIVES:

- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus.
- The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions.
- This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I   DIFFERENTIAL CALCULUS   **12**
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES   **12**
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS   **12**
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS   **12**
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS   **12**
Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

TOTAL : 60 PERIODS

OUTCOMES:

1. After completing this course, students should demonstrate competency in the following skills: Use both the limit definition and rules of differentiation to differentiate functions.
2. Apply differentiation to solve maxima and minima problems.

   Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus. Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
3. Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
4. Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
5. Apply various techniques in solving differential equations.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications,New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. ViswanathanPublishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

CO's-PO's&PSO's MAPPING :

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO2	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO3	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO4	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO5	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
Avg	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-

1- Low,2-Medium,3-High,"-"-no correlation

20149S13	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streamsof Engineering and Technology.

UNIT I   PROPERTIES OF MATTER   9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II   WAVES AND FIBER OPTICS   9

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNIT III   THERMAL PHYSICS   9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV   QUANTUM PHYSICS   9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

UNIT V   CRYSTAL PHYSICS   9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL: 45 PERIODS

OUTCOMES:

1. Upon completion of this course,the students will gain knowledge on the basics of properties of matter and its applications, the students will acquire knowledge on the concepts of waves and optical devices and theirapplications in fibre optics,
2. The students will have adequate knowledge on the concepts of thermal properties of materials andtheir applications in expansion joints and heat exchangers,
3. The students will get knowledge on advanced physics concepts of quantum theory and its applicationsin tunneling microscopes, and
4. The students will understand the basics of crystals, their structures and different crystal growthtechniques.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics'. W.H.Freeman, 2007.

CO's-PO's&PSO's MAPPING :

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	1	1	1	-	-	-	-	-	-	-	-	-
2	3	3	2	1	2	1	-	-	-	-	-	-	-	-	-
3	3	3	2	2	2	1	-	-	-	-	-	1	-	-	-
4	3	3	1	1	2	1	-	-	-	-	-	-	-	-	
5	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-
AVG	3	3	1.6	1.2	1.8	1	-	-	-	-	-	1	-	-	-

1- Low,2-Medium,3-High,"-"-no correlation

| 20149S14 | ENGINEERING CHEMISTRY | L T P C |
| | | 3 0 0 3 |

COURSE OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and watertreatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels. Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuelcells.

UNIT I WATER AND ITS TREATMENT   9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS   9

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis– Menten equation.

UNIT III ALLOYS AND PHASE RULE   9

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION   9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES   9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H_2-O_2 fuel cell.

OUTCOMES:

1. The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques.
2. It will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & CompanyLTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD,New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD,New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

CO's-PO's&PSO's MAPPING :

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-
2	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-
3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-
5	3	1	2	1	-	2	2	-	-	-	-	2	-	-	-
Avg.	2.8	1.3	1.6	1	-	1.5	1.8		-	-	-	1.5	-	-	-

1   - Low,2-Medium,3-High,"-"-no correlation

20154S15   **ENGINEERING GRAPHICS**   **L T P C**
                                                                            2 0 4 4

COURSE OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING   **7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE   **6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS   **5+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED AND DEVELOPMENT OF SURFACES   **5+12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT VI SOMETRIC AND PERSPECTIVE PROJECTIONS   **6+12**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:

1. On successful completion of this course, the student will be able to
2. familiarize with the fundamentals and standards of Engineering graphics.
3. perform freehand sketching of basic geometrical constructions and multiple views of objects.
4. project orthographic projections of lines and plane. surfaces. draw projections and solids and development of surfaces.
5. visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited,2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition,2010.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore,2007.
4. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi,2015.
6. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will bepermitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

CO's-PO's&PSO's MAPPING :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-
2	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-
3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-
5	3	1	2	1	-	2	2	-	-	-	-	2	-	-	-
Avg.	2.8	1.3	1.6	1	-	1.5	1.8		-	-	-	1.5	-	-	-

1- Low,2-Medium,3-High,"-"-no correlation

20150S16   **PROBLEM SOLVING AND PYTHON PROGRAMMING**   **L T P C**
3 0 0 3

COURSE OBJECTIVES:
1. To know the basics of algorithmic problem solving To read and write simple Python programs.
2. To develop Python programs with conditionals and loops. To define Python functions and call them.
3. To use Python data structures –- lists, tuples, dictionaries. To do input/output with files in Python.

UNIT I   ALGORITHMIC PROBLEM SOLVING   9
Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II   DATA, EXPRESSIONS, STATEMENTS   9
Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS   9
Conditionals: Boolean values and operators, conditional (if), alternative (if-else),chained
conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES   9
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V   FILES, MODULES, PACKAGES   9
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL : 45 PERIODS

OUTCOMES:
   Upon completion of the course, students will be able to
1. Develop algorithmic solutions to simple computational problems Read, write, execute by hand simple Python programs.
2. Structure simple Python programs for solving problems. Decompose a Python program into functions.
3. Represent compound data using Python lists, tuples, dictionaries. Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers,LLC,2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,, 2015.

CO's-PO's&PSO's MAPPING :

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
AVg.	2	2	-	-	2	-	-	-	-	-	1	-	2	-	-
	2	3	3	3	2	-	-	-	-	-	2	2	3	3	-

1 -low,2-medium,3-high,'-'-no correlation

20150L17   **PROBLEM SOLVING AND PYTHON PROGRAMMING
LABORATORY**   **L T P C
0 0 3 2**

COURSE OBJECTIVES:

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method).
3. Exponentiation (power of a number).
4. Find the maximum of a list of numbers.
5. Linear search and Binary search.
6. Selection sort, Insertion sort.
7. Merge sort.
8. First n prime numbers.
9. Multiply matrices.
10. Programs that take command line arguments (word count).
11. Find the most frequent words in a text read from a file.
12. Simulate elliptical orbits in Program.
13. Simulate bouncing ball using Program.

TOTAL: 60 PERIODS

PLATFORM NEEDED
Python 3 interpreter for Windows/Linux

OUTCOMES:
Upon completion of the course, students will be able to
• Write, test, and debug simple Python programs.
• Implement Python programs with conditionals and loops.
• Develop Python programs step-wise by defining functions and calling them.

CO's-PO's&PSO's MAPPING :

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	-	-	-	-	-	3	2	3	3	-
2	3	3	3	3	3	-	-	-	-	-	3	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	3	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
6	2	-	-	-	2	-	-	-	-	-	1	-	2	-	-
AVg.	2	3	3	3	2	-	-	-	-	-	2	2	3	3	-

1 -low,2-medium,3-high,'-'-no correlation

20149L18	**PHYSICS LABORATORY**	**L T P C**
		0 0 3 2

COURSE OBJECTIVE:

1. To introduce different experiments to test basic understanding of physics concepts applied in optics, thermalphysics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum.
2. Determination of Young's modulus by non-uniform bending method.
3. (a) Determination of wavelength, and particle size using Laser.
   (b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
7. Determination of wavelength of mercury spectrum – spectrometer grating Determination of band gap of a semiconductor.
8. Determination of thickness of a thin wire – Air wedge method.

TOTAL: 30 PERIODS

OUTCOMES:

CO1 Understand the functioning of various physics laboratory equipment.
CO2 Use graphical models to analyze laboratory data.
CO3 Access process and analyze scientific information.
CO4 Solve problems individually and collaboratively.

TEXT BOOKS:

1. J.Mendham,R.C.Denney,J.D.Barnes, M.Thomas and B.Sivasankar.

CO's-PO's&PSO's MAPPING :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
2	3	1	2	-	-	1	2	-	-	-	-	1	-	-	-
3	3	2	1	1	-	-	1	-	-	-	-	-	-	-	-
4	2	1	2	-	-	2	2	-	-	-	-	-	-	-	-
5	2	1	2	-	1	2	2	-	-	-	-	1	-	-	-
Avg.	2.6	1.3	1.6	1	1	1.4	1.8	-	-	-	-	1.3	-	-	-

- **1-low,2-medium,3-high,'-"-no correlation**

CHEMISTRY LABORATORY L T P C
                                                                    0 0 3 2

COURSE OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometery.
-

LIST OF EXPERIMENTS: CHEMISTRY LABORATORY (Any 7 experiments to be conducted)

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argen to metric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/ thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conduct metric titration of strong acid vs strong base.

TOTAL: 30 PERIODS

OUTCOMES:

    CO1 To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
    CO2 To determine the amount of metal ions through volumetric and spectroscopic techniques
    CO3 To analyse and determine the composition of alloys.
    CO4 To learn simple method of synthesis of nano particles
    CO5 To quantitatively analyse the impurities insolutionbyelectroanalyticaltechniques''40

TEXT BOOKS:
    1. Vogel's Textbook of Quantitative Chemical Analysis (8ᵀᴴ edition, 2014).

CO's-PO's&PSO's MAPPING :

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
2	3	1	2	-	-	1	2	-	-	-	-	1	-	-	-
3	3	2	1	1	-	-	1	-	-	-	-	-	-	-	-
4	2	1	2	-	-	2	2	-	-	-	-	-	-	-	-
5	2	1	2	-	1	2	2	-	-	-	-	1	-	-	-
Avg.	**2.6**	**1.3**	**1.6**	**1**	**1**	**1.4**	**1.8**	**-**	**-**	**-**	**-**	**1.3**	**-**	**-**	**-**

1-low,2-medium,3-high,'-"-no correlation

201AGIT **INTRODUCTION TRAINING PROGRAMME**

COURSE OBJECTIVE:

1. The Introduction Program is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding with in them, build relations between teachers and students, give a broader view of life, and building of character.

Introduction program	3 weeks duration
Introduction program for students to be offered right at the start of the first year.	• Physical activity. • Creative Arts. • Universal Human Values. • Literary. • Proficiency Modules. • Lectures by Eminent People. • Visits to local Areas. • Familiarization to Dept./Branch &Innovations.

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a ClosingPhase. The Initial and Closing Phases would be two days each.

20147S21	**TECHNICAL ENGLISH**	**L T P C**
		4 0 0 4

COURSE OBJECTIVES:
The Course prepares second semester engineering and Technology students to:
- Develop strategies and skills to enhance their ability to read and comprehend engineering and technologytexts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations , participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas ofspecialisation.

UNIT I INTRODUCTION TECHNICAL ENGLISH   12
Listening- Listening to talks mostly of a scientific/technical nature and completing information-gapexercises- Speaking –Asking for and giving directions- Reading – reading short technical texts from journals- newsapapers- Writing- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-Vocabulary Development- technical vocabulary Language Development –subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS   12
Listening- Listening to longer technical talks and completing exercises based on them-Speaking – describing a process-Reading – reading longer technical texts- identifying the various transitions in a text- paragraphing- Writing- interpreting cgarts, graphs- VocabularyDevelopment - vocabulary used in formal letters/emails and reports Language Development-impersonal passive voice, numerical adjectives.

UNIT III   TECHNICAL WRITING AND GRAMMAR   12
Listening- Listening to classroom lectures/ talkls on engineering/technology -Speaking –introduction to technical presentations- Reading – longer texts both general and technical, practice in speed reading; Writing-Describing a process, use of sequence words- VocabularyDevelopment- sequence words- Misspelled words. Language Development- embeddedsentences.

UNIT IV   REPORT WRITING   12
Listening- Listening to documentaries and making notes. Speaking –mechanics ofpresentations- Reading – reading for detailed comprehension- Writing- email etiquette- job application – cover letter –Résumé preparation(via email and hard copy)- analytical essays and issue based essays-- Vocabulary Development- finding suitable synonyms-paraphrasing-. Language Development- clauses- if conditionals.

UNIT V   GROUP DISCUSSION AND JOB APPLICATIONS   12
Listening- TED/Ink talks; Speaking –participating in a group discussion -Reading–reading andunderstanding technical articles Writing– Writing reports- minutes of a meeting- accident and survey-Vocabulary Development- verbal analogies Language Development- reported speech.

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course learners will be able to:

1. Read technical texts and write area- specific texts effortlessly.
2. Listen and comprehend lectures and talks in their area of specialisation successfully.Speak appropriately and effectively in varied formal and informal contexts.
3. Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan,Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: NewDelhi, 2016.

REFERENCES:

1. Booth-L. Diana**, Project Work,** Oxford University Press**,** Oxford: 2014.
2. Grussendorf, Marion, **English for Presentations,** Oxford University Press, Oxford: 2007
3. Kumar, Suresh. E. **Engineering English**. Orient Blackswan: Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA:2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**OxfordUniversity Press: New Delhi, 2014.

CO's-PO's&PSO's MAPPING :

CO	PO									PSO					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
2	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
3	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
4	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
5	2	3	3	3	-	3	3	3	2	3	-	3	-	-	-
AVg.	1.6	2.2	1.8	2.2	1.5	3	3	3	1.6	3	3	3	-	-	-

1-low,2-medium,3-high,'-"-no correlation

20148S22A   **ENGINEERING MATHEMATICS-II**   **L T P C**
                                                                          4 0 0 4

COURSE OBJECTIVES:
1. This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering.
2. Vector calculus can be widely used for modeling the various laws of physics.
3. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I   MATRICES   12
Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS   12
Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS   12
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions $\overline{w} \square\ z \square\ c$, cz, $\frac{1}{z}$, z^2 - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION   12
Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS   12
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

                                                          TOTAL: 60 PERIODS
OUTCOMES:

1. After successfully completing the course, the student will have a good understanding of the
2. following topics and theirapplications:
3. Eigen values and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices andsimilar matrices.
4. Gradient, divergence and curl of a vector point function and related identities.
5. Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and theirverification.
6. Analytic functions, conformal mapping and complex integration.
7. Laplace transform and inverse transform of simple functions, properties, various related theorems andapplication to differential equations with constant coefficients.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi , 3rd Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

CO's-PO's&PSO's MAPPING :

CO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO2	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO3	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO4	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
CO5	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-
Avg	3	3	1	1	0	0	0	0	2	0	2	3	-	-	-

1-low,2-medium,3-high,'-"-no correlation

20149S23D   **PHYSICS FOR CIVIL ENGINEERING**   **L T P C**
                                    (for B.E. Civil Engineering)   **3 0 0 3**

COURSE OBJECTIVE:
1. To introduce the principles of thermal, acoustics, optics and new materials for civil engineering applications.

UNIT I   THERMAL PERFORMANCE OF BUILDINGS   **9**

Heat transfer through fenestrations, thermal insulation and its benefits - heat gain and heat loss estimation - factors affecting the thermal performance of buildings, thermal measurements, thermal comfort, indices of thermal comfort, climate and design of solar radiation, shading devices central heating. Principles of natural ventilation - ventilation measurements, design for natural ventilation - Window types and packaged air conditioners - chilled water plant - fan coil systems - water piping - cooling load - Air conditioning systems for different types of buildings - Protection against fire to be caused by A. C. Systems.

UNIT II   ACOUSTICS   **9**

Classification of sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Methods of sound absorptions - absorbing materials - noise and its measurements, sound insulation and its measurements, impact of noise in multi-storeyed buildings.

UNIT III LIGHTING DESIGNS   **9**

Radiation quantities – spectral quantities – relationship between luminescence and radiant quantities – hemispherical reflectance and transmittance – photometry: cosines law, inverse square law. Vision – photobic, mesophic, scotopic visions. Colour – luminous efficiency function - Visual field glare, colour - day light calculations - day light design of windows, measurement of day-light and use of models and artificial skies, principles of artificial lighting, supplementary artificial lighting.

UNIT IV NEW ENGINEERING MATERIALS   **9**

Composites - definition and classification - Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - Metallic glasses - Shape memory alloys - Ceramics - Classification - Crystalline - Non Crystalline - Bonded ceramics, Manufacturing methods - Slip casting - Isostatic pressing - Gas pressure bonding - Properties - thermal, mechanical, electrical and chemical ceramic fibres - ferroelectric and ferromagnetic ceramics - High Aluminium ceramics.

UNIT V HAZARDS   **9**

Seismology and Seismic waves - Earth quake ground motion - Basic concepts and estimation techniques - site effects - Probabilistic and deterministic Seismic hazard analysis - Cyclone and flood hazards - Fire hazards and fire protection, fire-proofing of materials, fire safety regulations and firefighting equipment - Prevention and safety measures.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course,

1. The students will have knowledge on the thermal performance of buildings, the students will acquire knowledge on the acoustic properties of buildings.
2. The students will get knowledge on various lighting designs for buildings,
3. The students will gain knowledge on the properties and performance of engineering materials, and the students will understand the hazards of buildings.

TEXT BOOKS:

1. Alexander, D. "Natural disaster", Springer (1993).
2. Budinski, K.G. & Budinski, M.K. "Engineering Materials Properties and Selection", Prentice Hall, 2009.
3. Severns, W.H. & Fellows, J.R. "Air conditioning and Refrigeration", John Wiley and Sons, London, 1988.
4. Stevens, W.R., "Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press, 2013.

REFERENCES:

1. Gaur R.K. and Gupta S.L., Engineering Physics. Dhanpat Rai publishers, 2012.
2. Reiter, L. "Earthquake hazard analysis - Issues and insights", Columbia University Press, 1991.
3. Shearer, P.M. "Introduction to Seismology", Cambridge University Press, 1999.

CO's-PO's&PSO's MAPPING :

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1					1					-	-	-
2	2	1	1					1					-	-	-
3	2	1	1					1					-	-	-
4	2	1	1					1					-	-	-
5	2	1	1					1					-	-	-
Avg.	2	1	1					1					-	-	-

1-low,2-medium.

20149S24A   **ENVIRONMENTAL SCIENCE AND ENGINEERING**   **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To study the nature and facts about environment.
2. To finding and implementing scientific, technological, economic and political solutions to environmentalproblems.
3. To study the interrelationship between living organism and environment.
4. To appreciate the importance of environment by assessing its impact on the human world; envision thesurrounding environment, its functions and its value.
5. To study the dynamic processes and understand the features of the earth"s interior and surface.
6. To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY   14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION   8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES   10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT   7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of

people; its problems and concerns, case studies – role of non-governmental organization-environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

        Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

                                                    TOTAL: 45 PERIODS

OUTCOMES:
1. Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection.
2. One will obtain knowledge on the following after completing the course. Public awareness of environmental is at infant stage.
3. Ignorance and incomplete knowledge has lead to misconceptions. Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:
1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education,2004.

REFERENCES :
1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt, Ltd, Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

CO's-PO's&PSO's MAPPING :

CO	PO									PSO					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
2	3	2	-	-	-	3	3	-	-	-	-	2	-	-	-
3	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
4	3	2	1	1	-	2	2	-	-	-	-	2	-	-	-
5	3	2	1	-	-	2	2	-	-	-	-	1	-	-	-
AVg.	2.8	1.8	1	1	-	2.2	2.4	-	-	-	-	1.8	-	-	-

- 1-low,2-medium,3-high,'-"-no correlation

20153S25E   BASIC OF ELECTRICAL AND ELECTRONICS ENGINEERING   L T P C
3 0 0 3

COURSE OBJECTIVES:
1. To explain the basic theorems used in Electrical circuits and the different components and function ofelectrical machines.
2. To explain the fundamentals of semiconductor and applications. To explain the principles of digital electronics
3. To impart knowledge of communication.

UNIT I   ELECTRICAL CIRCUITS & MEASURMENTS   9
Fundamental laws of electric circuits– Steady State Solution of DC Circuits – Introduction to AC Circuits –Sinusoidal steady state analysis– Power and Power factor – Single Phase and Three Phase Balanced Circuits. Classification of instruments – Operating Principles of indicating Instruments

UNIT II   ELECTRICAL MACHINES   9
Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS   9
Introduction - Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS   9
Binary Number System – Boolean Algebra theorems– Digital circuits - Introduction to sequential Circuits– Flip-Flops – Registers and Counters – A/D and D/A Conversion – digital processing architecture.

UNIT V   FUNDAMENTALS OF COMMUNICATION ENGINEERING   9
Introduction – Elements of Communication Systems– Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Digital Communication - Communication Systems: Radio, Antenna, TV, Fax, ISDN, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL: 45 PERIODS

OUTCOMES:
1. Ability to identify the electrical components and explain the characteristics of electrical machines.
2. Toability to identify electronics components and understand the characteristics.

TEXT BOOKS:
1. D P Kothari and I.J Nagarath, "Electrical Machines "Basic Electrical and Electronics Engineering", McGrawHill Education(India) Private Limited, Third Reprint ,2016.
2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson India, 2011
3. Sedha R.S., "Applied Electronics", S. Chand & Co., 2006.

REFERENCES:
1. A.E. Fitzgerald, David E Higginbotham and Arvin Grabel, "Basic Electrical Engineering", McGraw HillEducation(India) Private Limited, 2009.
2. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2007.
3. Leonard S Bobrow, " Foundations of Electrical Engineering", Oxford University Press, 2013.
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
5. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, 1994.

CO's-PO's&PSO's MAPPING :

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1					1					-	-	-
2	2	1	1					1					-	-	-
3	2	1	1					1					-	-	-
4	2	1	1					1					-	-	-
5	2	1	1					1					-	-	-
Avg	2	1	1					1					-	-	-

- 1-low,2-medium,3-high,'-"-no correlation

20154S26D   **ENGINEERING MECHANICS**   **L T P C**
                                                                                   3 2 0 4

COURSE OBJECTIVE:
1. To develop capacity to predict the effect of force and motion in the course of carrying out the designfunctions of engineering.

UNIT I   STATICS OF PARTICLES   9+6
Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces - additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II EQUILIBRIUM OF RIGID BODIES   9+6
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS   9+6
Centroids and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES   9+6
Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND RIGID BODY DYNAMICS   9+6
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

                                          TOTAL : (45+30)=75 PERIODS

OUTCOMES:
1. On successful completion of this course, the student will be able to illustrate the vectorial and scalar representation of forces and momentsanalyse the rigid body in equilibrium.
2. Evaluate the properties of surfaces and solids calculate dynamic forces exerted in rigid body.
3. To determine the friction and the effects by the laws of friction.

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES:

1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, PearsonEducation 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics-Volume 2", Third Edition, John Wiley & Sons,1993.
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

CO's-PO's&PSO's MAPPING :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	1	2							2	3	1	1
2	3	2	2	1	2							2	3	1	1
3	3	2	3	1	2							2	3	1	2
4	3	2	3	1	2							2	3	1	2
5	3	2	3	1	2							2	3	1	2
Avg	3	2	3	1	2							2	3	1	2
	Low(1);Medium(2);High(3)														

20154L27	ENGINEERING PRACTICES LABORATORY	L T P C
		0 0 3 2

COURSE OBJECTIVE:

1. To provide exposure to the students with hands on experience on various basic engineering practices inCivil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE   **14**
Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safetyaspects.
(b) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows inhousehold fittings.
(c) Study of pipe connections requirements for pumps and turbines.
(d) Preparation of plumbing line sketches for water supply and sewage works.
(e) Hands-on-exercise:
(f) Basic pipe connections – Mixed pipe material connection – Pipe connections with differentjoining components.

(g)Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
   Wood work, joints by sawing, planing and cutting.

II   MECHANICAL ENGINEERING PRACTICE   **18**
Welding:

(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
(b) Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning
(b) Drilling Practice

Sheet Metal Work:

(a) Forming & Bending:
(b) Model making – Trays and funnels.
(c) Different type of joints.

(a) Study of centrifugal pump
(b) Study of air conditioner

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise –Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III   ELECTRICAL ENGINEERING PRACTICE   **12**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC

circuit.
        5. Measurement of energy using single phase energy meter.
        6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE   16
        1. Study of Electronic components and equipments – Resistor, colour coding
           measurement of AC signalparameter (peak-peak, rms period, frequency) using CR.
        2. Study of logic gates AND, OR, EX-OR and NOT.
        3. Generation of Clock Signal.
        4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
        5. Measurement of ripple factor of HWR and FWR.

                                                          TOTAL: 60 PERIODS
OUTCOMES:
On successful completion of this course, the student will be able to
        1. Fabricate carpentry components and pipe connections including plumbing works. use
        welding equipments to join the structures.
        2. Carry out the basic machining operations Make the models usinsheet metal works
        Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and
        fittings.
         3. Carry out basic home electrical works and appliancesMeasure the electrical quantities
        4. Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
CIVIL
  1. Assorted components for plumbing consisting of metallic pipes,
 plastic pipes,flexible pipes, couplings, unions, elbows, plugs and

other fittings.	15	Sets.
2. Carpentry vice (fitted to work bench)	15	Nos.
3. Standard woodworking tools	15	Sets.
4. Models of industrial trusses, door joints, furniture joints 5 each		
5. Power Tools:		
(a) Rotary Hammer	2	Nos
(b) Demolition Hammer	2	Nos
(c) Circular Saw	2	Nos
(d) Planer	2	Nos
(e) Hand Drilling Machine	2	Nos
(f) Jigsaw	2	Nos

MECHANICAL

1. Arc welding transformer with cables and holders	5	Nos.
2. Welding booth with exhaust facility	5	Nos.
3. Welding accessories like welding shield, chipping hammer,		
wire brush, etc.	5	Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other		
welding outfit.	2	Nos.
5. Centre lathe	2	Nos.
6. Hearth furnace, anvil and smithy tools	2	Sets.
7. Moulding table, foundry tools	2	Sets.
8. Power Tool: Angle Grinder	2	Nos
9. Study-purpose items: centrifugal pump, air-conditioner	One each.	

ELECTRICAL

1. Assorted electrical components for house wiring	15	Sets

2. Electrical measuring instruments	10	Sets

3. Study purpose items: Iron box, fan and regulator, emergency lamp — 1 each

4.Megger (250V/500V) — 1 No.

5.Power Tools: (a) Range Finder — 2 Nos

    (b) Digital Live-wire detector — 2 Nos

ELECTRONICS

1 Soldering guns — 10 Nos.

2 Assorted electronic components for making circuits — 50 Nos.

3 Small PCBs — 10 Nos.

4. Multimeters — 10 Nos.

5. Study purpose items: Telephone, FM radio, low-voltage power supply

CO's-PO's&PSO's MAPPING :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2			1	1	1					2	2	1	1
2	3	2			1	1	1					2	2	1	1
3	3	2			1	1	1					2	2	1	1
Avg	3	2			1	1	1					2	2	1	1
Low(1);Medium(2);High(3)															

20155L28E   **COMPUTER AIDED BUILDING DRAWING**   **L T P C**
                                                                    0 0 3 2

COURSE OBJECTIVE:
1. To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

LIST OF EXPERIMENTS:
1. Principles of planning, orientation and complete joinery details (Paneled and Glazed Doors and Windows)
2. Buildings with load bearing walls
3. Buildings with sloping roof
4. R.C.C. framed structures.
5. Industrial buildings – North light roof structures

TOTAL: 60 PERIODS

OUTCOMES:
1. The students will be able to draft the plan, elevation and sectional views of the buildings, industrial structures,and framed buildings using computer softwares.

TEXTBOOKS:
1. Sikka V.B., A Course in Civil Engineering Drawing, 4th Edition, S.K.Kataria and Sons, 2015.
2. George Omura, Mastering in Autocad 2005 and Autocad LT 2005– BPB Publications, 2008

REFERENCES:
1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, BIM Handbook:A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc.,2011.
2. Marimuthu V.M., Murugesan R. and Padmini S., Civil Engineering Drawing-I, Pratheeba Publishers, 2008.
3. Shah.M.G., Kale. C.M. and Patki.S.Y., Building Drawing with an Integrated Approach to Built Environment,Tata McGraw Hill Publishers Limited, 2007.
   Verma.B.P., Civil Engineering Drawing and Hous

4. E.Planning, Khanna Publishers, 2010.

CO's-PO's&PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	-	2	2	2	2	2
PO3	Design/development to solutions	-	-	-	-	-	-
PO4	Investigation	-	-		2	2	2
PO5	Modern Tool Usage	2	2	2	2	2	2
PO6	Engineer and Society	-	3	3	3	3	3
PO7	Environment and Sustainability	-	-	-	-	-	-
PO8	Ethics	1	2	2	1	2	2
PO9	Individual and Teamwork	-	3	3	3	3	3
PO10	Communication	-	2	2	2	2	2
PO11	Project Management and Finance	-	-	-	-	-	-
PO12	Life Long Learning	1	2	2	2	2	2
PROGRAMSPECIFICOUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering Discipline.	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and Innovation.	2	2	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues.	-	2	2	2	2	2

Low(1);Medium(2);High(3)

201AGIC   **INDIAN CONSTITUTION**

Aim:

- To understand the salient features of the Indian Constitution.

COURSE OBJECTIVES:

1. To make the students understand about the Democratic Rule and Parliamentarian Administration.
2. To appreciate the salient features of the Indian Constitution.
3. To know the fundamental Rights and Constitutional Remedies.
4. To make familiar with powers and positions of the Union Executive, Union Parliament and the Supreme Court.
5. To exercise the adult franchise of voting and appreciate the Electoral system of Indian Democracy.

UNIT I: The Making Of Indian constitution   **9**

The Constituent Assembly Organization Character – Work – Salient features of the constitution – Written and Detailed Constitution – Socialism – Secularism – Democracy and Republic.

UNIT II: Fundamental Rights And Fundamental Duties Of The Citizens   **9**

Right of Equality – Right of Freedom – Right against Exploitation – Right to Freedom of Religion – Cultural and Educational Rights – Right to Constitutional Remedies – Fundamental Duties.

UNIT III: Directive Principles Of State Policy   **9**

Socialism Principles – Gandhian Principles – Liberal and General Principles – Differences between Fundamental Rights and Directive principles.

UNIT IV: The Union Executive, UnionparliamentAnd Supreme Court   **9**

Powers and positions of the President – Qualification Method of Election of President and vice president – Prime Minister RajyaSabha- LokSabha – The Supreme Court – High Court – Functions and position of Supreme court and High Court.

UNIT V: State Council – Election System AndPartliamentary Democracy In India   **9**

State council of Ministers – Chief Minister – Election system in India- Main features – Election Commission - Features of Indian Democracy.

                                         TOTAL: 45 PERIODS

Outcomes:

1. Democratic values and citizenship Training are gained.
2. Awareness on Fundamental Rights are established.
3. The functions of union Government and State Governments are learnt.
4. The power and functions of the Judiciary learnt thoroughly.
5. Appreciation of Democratic Parliamentary Rule is learnt.

References:

1. Palekar S.A. Indian Constitution Government and politics, ABD Publications, India.
2. AiyerAlladi, Krishnaswami, Constitution and fundamental rights 1955.
3. Markandan K.C. Directive Principles in the Indian Constitution 1966.
4. KashyapSubash C Our Parliament, National Book, Trust New Delhi 1989.

CO's-PO's&PSO's MAPPING :

CO	PO									PSO					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
2	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
3	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
4	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
5	2	3	3	3	-	3	3	3	2	3	-	3	-	-	-
Avg	1.6	2.2	1.8	2.2	1.5	3	3	3	1.6	3	3	3	-	-	-

- 1-low,2-medium,3-high,'-"-no correlation

20148S31C   TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS   L T P C
4 0 0 4

COURSE OBJECTIVES:

1. To introduce the basic concepts of PDE for solving standard partial differential equations.
2. To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
3. To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations. To acquaint the student with Fourier transform techniques used in wide variety of situations.
4. To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I   PARTIAL DIFFERENTIAL EQUATIONS   12
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II   FOURIER SERIES   12
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS   12
Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS   12
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS   12
Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

OUTCOMES :

1. Understand how to solve the given standard partial differential equations.

2. Solve differential equations using Fourier series analysis which plays a vital role   in engineering applications. Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

3. Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

4. Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for EngineeringStudents", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES :

1. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt.Ltd, 2014.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

CO's-PO's&PSO's MAPPING :

CO	PO01	PO02	PO03	PO'04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	0	0	0	0	2	0	0	3	-	-	-
CO2	3	3	1	1	0	0	0	0	2	0	0	3	-	-	-
CO3	3	3	1	1	0	0	0	0	2	0	0	3	-	-	-
CO4	3	3	1	1	0	0	0	0	2	0	0	3	-	-	-
CO5	3	3	1	1	0	0	0	0	2	0	0	3	-	-	-
Avg	3	3	1	1	0	0	0	0	2	0	0	3	-	-	-

Low(1);Medium(2);High(3).

20155C32   **ENGINEERING GEOLOGY**   **L T P C**
                                                                          3 0 0 3

COURSE OBJECTIVE:
1. At the end of this course the students will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor.

UNIT I PHYSICAL GEOLOGY   **9**
Geology in civil engineering – branches of geology – structure of earth and its composition weathering of rocks – scale of weathering – soils - landforms and processes associated with river, wind, groundwater and sea – relevance to civil engineering. Plate tectonics – Earth quakes – Seismic zones in India.

UNIT II MINEROLOGY   **9**
Physical properties of minerals – Quartz group, Feldspar group, Pyroxene - hypersthene and augite, Amphibole – hornblende, Mica – muscovite and biotite, Calcite, Gypsum and Clay minerals.

UNIT III PETROLOGY   **9**
Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks. Description, occurrence, engineering properties, distribution and uses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS   **9**
Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to civil engineering. Geophysical methods – Seismic and electrical methods for subsurface investigations.

UNIT V APPLICATION OF GEOLOGICAL INVESTIGATIONS   **9**
Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings - Hydrogeological investigations and mining - Coastal protection structures. Investigation of Landslides, causes and mitigation.

                                                          TOTAL: 45 PERIODS

OUTCOMES:
The students completing this course
1. To understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.
2. Basics knowledge on properties of minerals.
3. Gain knowledge about types of rocks, their distribution and uses. Will understand the methods of study on geological structure.
4. To understand the application of geological investigation in projects such as dams, tunnels, bridges, roads, airport and harbor

TEXT BOOKS:
1. Varghese, P.C., Engineering Geology for Civil Engineering Prentice Hall of India Learning Private Limited, New Delhi, 2012.
2. Venkat Reddy. D. Engineering Geology, Vikas Publishing House Pvt. Lt, 2010.
3. Gokhale KVGK, "Principles of Engineering Geology", B.S. Publications, Hyderabad 2011.
4. Chenna Kesavulu N. "Textbook of Engineering Geology", Macmillan India Ltd., 2009.
5. Parbin Singh. A "Text book of Engineering and General Geology", Katson publishing house, Ludhiana 2009.

REFERENCES:
1. Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2010.

2. Bell .F.G.. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.

CO's-PO's&PSO's MAPPING :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
2	3	2	-	-	-	3	3	-	-	-	-	2	-	-	-
3	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
4	3	2	1	1	-	2	2	-	-	-	-	2	-	-	-
5	3	2	1	-	-	2	2	-	-	-	-	1	-	-	-
AVg.	2.8	1.8	1	1	-	2.2	2.4	-	-	-	-	1.8	-	-	-

- 1-low,2-medium,3-high,'-"-no correlation.

20155C33   **CONSTRUCTION MATERIALS**   **L T P C**
                                                                         3 0 0 3

COURSE OBJECTIVE:
1. To introduce students to various materials commonly used in civil engineering construction and their properties.

UNIT I STONES – BRICKS – CONCRETE BLOCKS   **9**
Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Concrete blocks – Lightweight concrete blocks.

UNIT II LIME – CEMENT – AGGREGATES – MORTAR   **9**
Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – fine aggregates – river sand – crushed stone sand – properties – coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading

UNIT III CONCRETE   **9**
Concrete – Ingredients – Manufacturing Process – Batching plants –mixing – transporting – placing – compaction of concrete –curing and finishing – Ready mix Concrete – Mix specification.

UNIT IV TIMBER AND OTHER MATERIALS   **9**
Timber – Market forms – Industrial timber– Plywood – Veneer – Thermocol – Panels of laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumens.

UNIT V MODERN MATERIALS   **9**
Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories –Composite materials – Types – Applications of laminar composites – Fibre textiles– Geomembranes and Geotextiles for earth reinforcement.

                                            TOTAL: 45 PERIODS

OUTCOMES:
- Compare the properties of most common and advanced building materials. understand the typical and potential applications of lime, cement and aggregates.
- Know the production of concrete and also the method of placing and making of concrete elements.understand the applications of timbers and other materials.
- Understand the importance of modern material for construction.

TEXT BOOKS:
1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2015.
2. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
4. Duggal.S.K., "Building Materials", 4th Edition, New Age International, 2008.

REFERENCES:
1. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
2. Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
3. IS456 - 2000: Indian Standard specification for plain and reinforced concrete, 2011.
4. IS4926 - 2003: Indian Standard specification for ready–mixed concrete, 2012.
5. IS383 - 1970: Indian Standard specification for coarse and fine aggregate from natural Sources forconcrete, 2011.
6. IS1542-1992: Indian standard specification for sand for plaster, 2009.
7. IS 10262-2009: Indian Standard Concrete Mix Proportioning –Guidelines, 2009.

CO's-PO's&PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	2	3	3	2	2	2
PO2	Problem analysis	2				3	2
PO3	Design/development of solutions					2	1
PO4	Investigation	3	2	2		3	2
PO5	Modern Tool Usage					2	1
PO6	Engineer and Society	2		2			1
PO7	Environment and Sustainability	2	2	3			2
PO8	Ethics						
PO9	Individual and Teamwork					2	1
PO10	Communication						
PO11	Project Management and Finance			2	2	3	2
PO12	Life Long Learning	2	2			2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	2	2	2	2	3	2

- 1-low,2-medium,3-high,'-"-no correlation.

20155C34   **STRENGTH OF MATERIALS I**   **L T P C**
                                                                                3 0 0 3

COURSE OBJECTIVES:
1. To learn the fundamental concepts of Stress, Strain and deformation of solids.
2. To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
3. To understand the effect of torsion on shafts and springs.
4. To analyze plane and space trusses

UNIT I   STRESS, STRAIN AND DEFORMATION OF SOLIDS   12
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   TRANSFER OF LOADS AND STRESSES IN BEAMS   12
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. Theory of Simple Bending – Stress Distribution due to bending moment and shearing force - Flitched Beams - Leaf Springs.

UNIT III   DEFLECTION OF BEAMS   12
Elastic curve – Governing differential equation - Double integration method - Macaulay's method - Area moment method - conjugate beam method for computation of slope and deflection of determinant beams.

UNIT IV TORSION   12
Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel – Design of buffer springs.

UNIT V ANALYSIS OF TRUSSES   12
Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient – Analysis of Space trusses by tension coefficient method.

                                                          TOTAL: 60 PERIODS

OUTCOMES:
1. Identify the good quality brick, stone and blocks for construction.
2. Recognize the market forms of timber, steel, aluminum and applications of various composite materials.
3. Identify the best construction and service practices such as thermal insulations and air conditioning of the building.
4. Select various equipments for construction works conditioning of building.
   Understand the construction planning and scheduling techniques.

TEXTBOOKS:

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2015.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications.New Delhi, 2015
3. Rattan . S. S, "Strength of Materials", Tata McGraw Hill Education Private Limited, New Delhi, 2012
4. Bansal. R.K. "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2010

REFERENCES:

1. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van Nos Reinbhold, New Delhi1999.
2. Vazirani.V.N and Ratwani.M.M, "Analysis of Structures", Vol I Khanna Publishers, New Delhi,1995.
3. Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol I, Charotar Publishing House,New Delhi 2016.
4. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016
5. Basavarajaiah, B.S. and Mahadevappa, P., Strength of Materials, Universities Press, Hyderabad, 2010.
6. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.

CO's-PO's&PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	2	2	2	2	2	2
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	3	3	3	3	3	3
PO9	Individual and Team work	2	2	2	2	2	2
PO10	Communication	3	3	3	3	3	3
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	3	3	3	3	3	3
PROGRAMSPECIFICOUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155C35   **FLUID MECHANICS**   **L T P C**
                                                                              3 2 0 4

COURSE OBJECTIVES:
- To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyze andappreciate the complexities involved in solving the fluid flow problems.
- Flow measurements.
- Flow through pipes (both laminar and turbulent) and c) forces on pipe bends with an exposure to the significance of boundary layer theory and its applications.

UNIT I   FLUID PROPERTIES AND FLUID STATICS   **12**
Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers-forces on planes – centre of pressure – buoyancy and floatation.

UNIT II FLUID KINEMATICS AND DYNAMICS   **12**
Fluid Kinematics – Classification and types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- stream line-streak line-path line- stream function - velocity potential function - flow net. Fluid dynamics - equations of motion -Euler's equation along a streamline - Bernoulli's equation – applications - venturi meter, orifice meter and Pitot tube- linear momentum equation and its application to pipe bend.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES   **12**
Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-theorem - dimensionless parameters - similitudes and model studies - distorted models.

UNIT IV FLOW THROUGH PIPES   **12**
Reynold's experiment - laminar flow through circular pipe (Hagen poiseulle's) - hydraulic and energy gradient – flow through pipes - Darcy - Weisbach's equation - pipe roughness -friction factor-Moody's diagram- major and minor losses of flow in pipes - pipes in series and in parallel.

UNIT V BOUNDARY LAYER   **12**
Boundary layer – definition- boundary layer on a flat plate – laminar and turbulent boundary layer-displacement, energy and momentum thickness – Momentum integral equation-Boundary layer separation and control – drag on flat plate.

                                                                TOTAL: 60 PERIODS

OUTCOMES:

1. Get a basic knowledge of fluids in static, kinematic and dynamic equilibrium. Understand and solve the problems related to equation of motion.
2. Gain knowledge about dimensional and model analysis.Learn types of flow and losses of flow in pipes.
3. Understand and solve the boundary layer problems.

TEXT BOOKS:
1. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book HouseNew Delhi, 2009.
2. Jain.A.K.., "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
3. Subramanya.K " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill

Education Private Limited, New Delhi, 2010.

4. Rajput.R.K. "Fluid Mechanics", S.Chand and Co, New Delhi, 2008.

REFERENCES:

1. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw Hill, 2000.
2. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2013.
3. White, F.M., "Fluid Mechanics", Tata McGraw Hill, 5th Edition, New Delhi, 2017.
4. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2015.
5. Bansal.R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., NewDelhi, 2013.

COs-PO's&PSO'sMAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	2	2	2	3	3	2
PO3	Design/development of solutions	1	1	3	3	2	3
PO4	Investigation	1	1	2	2	2	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	3	3	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management And Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	2	3	3	3

1-low,2-medium,3-high,'-"-no correlation

20155C36   **SURVEYING**   **L T P C**
                                                                                     4 0 0 3

COURSE OBJECTIVES:

1. To introduce the rudiments of plane surveying and geodetic principles to Civil Engineers.
2. To learn the various methods of plane and geodetic surveying to solve the real world Civil Engineering problems.
3. To introduce the concepts of Control Surveying To introduce the basics of Astronomical Surveying.

UNIT I FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING   12
Classifications and basic principles of surveying - Equipment and accessories for ranging and chaining - Methods of ranging - Compass - Types of Compass - Basic Principles- Bearing – Types - True Bearing - Magnetic Bearing - Levelling- Principles and theory of Levelling – Datum- - Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling- Booking – Reduction - Sources of errors in Levelling - Curvature and refraction.

UNIT II   THEODOLITE AND TACHEOMETRIC SURVEYING   12
Horizontal and vertical angle measurements - Temporary and permanent adjustments - Heights and distances - Tacheometer - Stadia Constants - Analytic Lens -Tangential and Stadia Tacheometry surveying - Contour – Contouring – Characteristics of contours – Methods of contouring – Tacheometric contouring - Contour gradient – Uses of contour plan and map

UNIT III CONTROL SURVEYING AND ADJUSTMENT   12
Horizontal and vertical control – Methods – specifications – triangulation- baseline – satellite stations – reduction to centre- trigonometrical levelling – single and reciprocal observations – traversing – Gale's table. - Errors Sources- precautions and corrections – classification of errors – true and most probable values - weighed observations – method of equal shifts – principle of least squares - normal equation – correlates- level nets- adjustment of simple triangulation networks.

UNIT IV ADVANCED TOPICS IN SURVEYING   12
Hydrographic Surveying – Tides – MSL – Sounding methods – Three point problem – Strength of fix – astronomical Surveying – Field observations and determination of Azimuth by altitude and hour and methods- Astronomical terms and definitions-coordinate systems-different time systems-Nautical corrections-Field observations and determination altitude and hour angle method

UNIT V MODERN SURVEYING   12

Total Station : Advantages - Fundamental quantities measured- Parts and a principle On board calculations - Field procedure - Errors and good station GPS Surveying : Different segments – space control configuration-signal structure - Orbit determination and representation. Selective availability- Task of control segment –processing – traversing and triangulation.

TOTAL: 60 PERIODS

OUTCOMES:
- At the end of the course the student will be able to understand The use of various surveying instruments and mapping.
- Measuring Horizontal angle and vertical angle using different instruments Methods of Leveling and setting Levels with different instruments.
- Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuthConcept and principle of modern surveying.

TEXTBOOKS:

1. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008
2. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, NewDelhi, 2005
3. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001.
4. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2004.
5. Laurila, S.H. "Electronic Surveying in Practice", John Wiley and Sons Inc, 1993
6. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2014

REFERENCES:

1. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 3rd Edition, 2004.
2. Guocheng Xu, "GPS Theory , Algorithms and Applications", Springer – Berlin, 2003.
3. SatheeshGopi, rasathishkumar, N. madhu, "Advanced Surveying, Total Station GPS and Remote Sensing"Pearson education, 2007
4. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2004.
5. Arora K.R.,"Surveying Vol I & II", Standard Book house, 10th Edition 2008.

COs-PO's&PSO'sMAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	2	2	2	3	3	2
PO3	Design/development of solutions	1	1	3	3	2	3
PO4	Investigation	1	1	2	2	2	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	3	3	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management And Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	2	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155L37	**SURVEYING LABORATORY**	**L T P C** **0 0 3 2**

COURSE OBJECTIVE:

1. At the end of the course the student will posses knowledge about Survey field techniques

LIST OF EXPERIMENTS:

Chain Survey   **12**

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset.
2. Setting out works – Foundation marking using tapes single Room and Double Room.

Compass Survey   **12**

3. Compass Traversing – Measuring Bearings & arriving included angles.

Levelling - Study of levels and levelling staff

4. Fly levelling using Dumpy level &Tilting level.
5. Check leveling.

Theodolite - Study of Theodolite   **12**

6. Measurements of horizontal angles by reiteration and repetition and vertical angles.
7. Determination of elevation of an object using single plane method when base is accessible/inaccessible.

Tacheometry – Tangential system – Stadia system   **12**

8. Determination of Tacheometric Constants
9. Heights and distances by stadia Tacheometry
10. Heights and distances by Tangential Tacheometry

Total Station - Study of Total Station, Measuring Horizontal and vertical angles   **12**

12. Traverse using Total station and Area of Traverse
13. Determination of distance and difference in elevation between two inaccessible points using Total station

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

Sl.No.	Description of Equipment	Quantity
1.	Total Station	3 Nos
2.	Theodolites	Atleast 1 for every 5 students.
3.	Dumpy level / Filling level	Atleast 1 for every 5 students.
4.	Pocket stereoscope	1

5.	Ranging rods	
6.	Levelling staff	
7.	Cross staff	
8.	Chains	1 for a set of 5 students.
9.	Tapes	
10.	Arrows	
11.	Prismatic Compass	10 nos.
12.	Surveyor Compass	2 nos
13.	Survey grade or Hand held GPS	3 nos.

OUTCOME:

1. Impart knowledge on the usage of basic surveying instruments like chain/tape, compass and levelling instruments.
2. Able to use levelling instrument for surveying operations.
3. Able to use theodolite for various surveying operations.
4. Able to carry out necessary surveys for social infrastructures.

REFERENCES:

1. T.P.KanetkarandS.V.Kulkarni,SurveyingandLevelling,Parts1&2,PuneVidyarthiGriha Prakashan, Pune, 24th Reprint, 2015.

2. Dr.B.C.Punmia,AshokK.JainandArunKJain,SurveyingVol.I&II,LakshmiPublications Pvt Ltd, New Delhi, 17th Edition, 2016.

3. JamesM.AndersonandEdwardM.Mikhail,Surveying,TheoryandPractice,SeventhEdition, McGraw Hill 2001.

COs-PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	2	2	2	2	2	2
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	3	3	3	3	3	3
PO9	Individual and Team work	2	2	2	2	2	2
PO10	Communication	3	3	3	3	3	3
PO11	Project Management and Finance	1	1	1	1	1	1

PO12	Life Long Learning	3	3	3	3	3	3
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low, 2-medium,3-high,'-"-no correlation.

20155L38　　　　　　**CONSTRUCTION MATERIALS LABORATORY**　　　**L T P C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　0　0　3　2

COURSE OBJECTIVE:

☐　　• Facilitate the understanding of the behavior of construction materials.

I. TEST ON FINE AGGREGATES　　　　　　　　　　　　　　　　　　　　　**12**
1. Grading of fine aggregates
2. Test for specific gravity and test for bulk density
3. Compacted and loose bulk density of fine aggregate

II. TEST ON COARSE AGGREGATE　　　　　　　　　　　　　　　　　　**12**
1. Determination of impact value of coarse aggregate
2. Determination of elongation index
3. Determination of flakiness index
4. Determination of aggregate crushing value of coarse aggregate

III. TEST ON CONCRETE　　　　　　　　　　　　　　　　　　　　　　**12**
1. Test for Slump
2. Test for Compaction factor
3. Test for Compressive strength - Cube & Cylinder
4. Test for Flexural strength

IV. TEST ON BRICKS AND BLOCKS　　　　　　　　　　　　　　　　　**12**
1. Test for compressive strength of bricks and blocks.
2. Test for Water absorption of bricks and blocks.
3. Determination of Efflorescence of bricks.
4. Test on tiles.　　　　　　　　　　　　　　**TOTAL: 60 PERIODS**

OUTCOME:

• The students will have the required knowledge in the area of testing of construction materials and components of construction elements experimentally.

REFERENCES:

1. Construction Materials Laboratory Manual, Anna University, Chennai-600 025.
2. IS 4031 (Part 1) – 1996 – Indian Standard Method for determination of fineness by dry sieving.
3. IS 2386 (Part 1 to Part 6) – 1963 – Indian Standard methods for test for aggregate for concrete
4. IS 383 – 1970 Indian Standard specification for coarse and fine aggregates from natural sources for concrete.

COs-PO's & PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	2	2	2	3	3	2
PO3	Design/development of solutions	1	1	3	3	2	3
PO4	Investigation	1	1	2	2	2	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	3	3	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management And Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	2	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20147L39   INTERPERSONAL SKILLS/LISTENING AND SPEAKING   L T P C
0 0 2 1

COURSE OBJECTIVES:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- Improve general and academic listening skills.
- Make effective presentations.

UNIT I MAKING COMPARISONS   6
Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING   6
Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III PROBLEMSOLVING   6
Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

UNIT IV REPORTING OF EVENTS AND RESEARCH   6
Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY   6
Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course Learners will be able to:

- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal.

TEXTBOOKS:

1. Brooks,Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards,C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010.

REFERENCES:

1. Bhatnagar, Nitin and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson:New Delhi, 2010.
3. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford,2014.Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014.

COs-PO's & PSO's MAPPING:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
2	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
3	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
4	3	3	3	3	2	3	3	3	2	3	3	3	-	-	-
5	-	-	-	-	-	-	-	-	3	3	3	3	-	-	-
AVg.	3	3	3	3	2.75	3	3	3	2.2	3	3	3	-	-	-

- 1-low,2-medium,3-high,'-"-no correlation.

201AGGS   **INTRODUCTION TO GENDER STUDIES**

COURSE OBJECTEVES:

- Improve general and academic listening skills.
- Make effective presentations.

Unit-I Concepts
Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.

Unit-II Feminist Theory
Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, eco-feminist.

Unit-III Women's Movements: Global, National and Local
Rise of Feminism in Europe and America. Women's Movement in India.

Unit-IV Gender and Language
Linguistic Forms and Gender. Gender and narratives.

Unit-V Gender and Representation
Advertising and popular visual media. Gender and Representation in Alternative Media. Gender and social media.

OUTCOMES:
At the end of the course learners will be able to:

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully. Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

TEXT BOOKS:

- Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
- Sudharshana.N.P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: New Delhi, 2016.

REFERENCES:

- Booth-L. Diana**, Project Work,** Oxford University Press**,** Oxford: 2014.
- Grussendorf, Marion, **English for Presentations,** Oxford University Press, Oxford: 2007
- Kumar, Suresh. E. **Engineering English**. Orient Blackswan: Hyderabad,2015
- Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.** Cengage Learning, USA: 2007
- Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.** Oxford University Press: New Delhi, 2014.

CO's-PO's & PSO's MAPPING :

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
2	1	1	1	1	1	3	3	3	1	3	-	3	-	-	-
3	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
4	2	3	2	3	2	3	3	3	2	3	3	3	-	-	-
5	2	3	3	3	-	3	3	3	2	3	-	3	-	-	-
AVg.	1.6	2.2	1.8	2.2	1.5	3	3	3	1.6	3	3	3	-	-	-

1-low,2-medium,3-high,'-"-no correlation

20148S41C   **NUMERICAL METHODS**   L T P C
                                                                  4 0 0 4

COURSE OBJECTIVES:
1. To introduce the basic concepts of solving algebraic and transcendental equations.
2. To introduce the numerical techniques of interpolation in various intervals in real life situations.
3. To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
4. To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
5. To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   12
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by power method and Jacobi's method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION   12
Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation- Cubic Splines - Difference operators and relations Interpolation intervals-with equal - Newton's forward and backward difference formulae.

UNIT IIII NUMERICAL DIFFERENTIATION AND INTEGRATION   12
Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rule – Romberg's Method - Two point and three point simpson's 1/3 rule.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS
                                                                  12
Single step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS   12
Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

                                                        TOTAL: 60 PERIODS

OUTCOMES :

- Upon successful completion of the course, students should be able to:

- Understand the basic concepts and techniques of solving algebraic and transcendental equations.

- Appreciate the numerical techniques of interpolation and error approximations in

various intervalsin real life situations.

- Apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second orderordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by usingcertain techniques with engineering applications.

TEXTBOOKS:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES:

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, NewDelhi, 2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th
Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition,Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd,3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition,2015.

COs-PO's & PSO's MAPPING:

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO2	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO3	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO4	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
CO5	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-
Avg	3	3	1	1	1	0	0	0	2	0	2	3	-	-	-

- 1-low,2-medium,3-high,'-"-no correlation.

20155C42   CONSTRUCTION TECHNIQUES AND PRACTICES   L T P C
3 0 0 3

COURSE OBJECTIVES:

- The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.
- At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

UNIT I CONSTRUCTION TECHNIQUES   9
Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism – floor system - Development of construction techniques - High rise Building Technology - Seismic effect - Environmental impact of materials – responsible sourcing - Eco Building (Green Building) - Material used - Construction methods - Natural Buildings - Passive buildings - Intelligent(Smart) buildings - Meaning - Building automation - Energy efficient buildings for various zones-Case studies of residential, office buildings and other buildings in each zones.

UNIT II CONSTRUCTION PRACTICES   9
Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick — weather and water proof – roof finishes – acoustic and fire protection.

UNIT III SUB STRUCTURE CONSTRUCTION   9
Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.

UNIT IV SUPER STRUCTURE CONSTRUCTION   9
Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks.

UNIT V CONSTRUCTION EQUIPMENT   9
Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching, mixing and concreting - Equipment for material handling and erection of structures – types of cranes - Equipment for dredging, trenching, tunneling.

TOTAL: 45 PERIODS

OUTCOMES:
- know the different construction techniques and structural systems.
- Understand various techniques and practices on masonry construction, flooring, and roofing.Plan the requirements for substructure construction.
- Know the methods and techniques involved in the construction of various types of super structuresSelect, maintain and operate hand and power tools and equipment used in the building constructionsites.

TEXTBOOKS:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment andMethods", 5th Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method ofConstruction", Dhanpat Rai and Sons, 1997.

REFERENCES:

1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi,2002.

CO's-PO's & PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	-	2	2	2	2	2
PO3	Design/development to solutions	-	-	-	-	-	-
PO4	Investigation	-	-		2	2	2
PO5	Modern Tool Usage	2	2	2	2	2	2
PO6	Engineer and Society	-	3	3	3	3	3
PO7	Environment and Sustainability	-	-	-	-	-	-
PO8	Ethics	1	2	2	1	2	2
PO9	Individual and Teamwork	-	3	3	3	3	3
PO10	Communication	-	2	2	2	2	2
PO11	Project Management and Finance	-	-	-	-	-	-
PO12	Life Long Learning	1	2	2	2	2	2
PROGRAMSPECIFICOUTCOMES(PSO)							
PSO1	Knowledge of Civil Engineering Discipline.	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and Innovation.	2	2	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues.	3	2	3	3	2	3

Low(1);Medium(2);High(3)

20155C43   **STRENGTH OF MATERIALS II**   **L T P C**
                                                                                4 0 0 4

COURSE OBJECTIVES:
- To know the method of finding slope and deflection of beams and trusses using energy theorems andto know the concept of analysing indeterminate beam.
- To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and varioustheories for failure of material.

UNIT I   ENERGYPRINCIPLES   **12**
Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings) , shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorem - Principle of virtual work – unit load method - Application of energy theorems for computing deflections in determinate beams , plane frames and plane trusses – lack of fit and temperature effects - Williot Mohr's Diagram.

UNIT II INDETERMINATEBEAMS   **12**
Concept of Analysis - Propped cantilever and fixed beams - fixed end moments and reactions – sinking and rotation of supports - Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT III COLUMNSANDCYLINDERS   **12**
Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations - Rankine-Gordon formula - Eccentrically loaded columns – middle third rule - core of a section – Thin cylindrical and spherical shells – stresses and change in dimensions - Thick cylinders – Compound cylinders – shrinking on stresses.

UNIT IV STATEOFSTRESSINTHREEDIMENSIONS   **12**
Stress tensor at a point – Stress invariants - Determination of principal stresses and principal planes - Volumetric strain. Theories of failure: Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Total Strain energy theory – Maximum distortion energy theory – Application problem

UNIT V ADVANCEDTOPICS   **12**
Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula – stresses in hooks.

                                                                        TOTAL: 60 PERIODS

OUTCOMES:
- Determine the strain energy and compute the deflection of determinate beams, frames and trussesusing energy principles.
- Analyze propped cantilever, fixed beams and continuous beams using theorem of three momentequation for external loadings and support settlements.
- Find the load carrying capacity of columns and stresses induced in columns and cylinders.
- Determine principal stresses and planes for an element in three dimensional state of stress and studyvarious theories of failure.
- Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and find thestresses in curved beams.

TEXTBOOKS:
1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi,2015.
2. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.
3. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II,Laxmi Publishing Pvt Ltd, New Delhi 2017.

4. Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016.

REFERENCES:
1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
2. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series,Tata McGraw Hill Publishing company, 2007.
3. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016
4. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi,2012

COs-PO's &PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	2	2	2	3	3	2
PO3	Design/development of solutions	1	1	3	3	2	3
PO4	Investigation	1	1	2	2	2	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	3	3	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management And Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	2	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155C44   **APPLIED HYDRAULIC ENGINERRING**   **L T P C**

                                                              3 0 0 3

COURSE OBJECTIVE:
- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

UNIT I   UNIFORM FLOW   12
Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow – Wide open channel - Specific energy and specific force – Critical flow .

UNIT II GRADUALLY VARIED FLOW   12
Dynamic equations of gradually varied flows – Types of flow profiles - Classifications: Computation by Direct step method and Standard step method – Control section – Break in Grade – Computation.

UNIT III RAPIDLY VARIED FLOW   12
Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation – Celerity – Rapidly varied unsteady flows (positive and negative surges)

UNIT IV TURBINES   12
Impact of Jet on flat, curved plates, Stationary and Moving –Classification of Turbines – Pelton wheel – Francis turbine – Kaplan turbine - Specific speed – Characteristic Curves of Turbines-Draft tube and cavitation.

UNIT V PUMPS   12
Classification of Pumps - Centrifugal pumps – Work done - Minimum speed to start the pump - NPSH - Multistage pumps – Characteristics curve - Reciprocating pumps - Negative slip - Indicator diagrams and its variations – Air vessels - Savings in work done.

                                              TOTAL: 60 PERIODS
OUTCOMES:
On completion of this course the students will be able to
1. Apply their knowledge of fluid mechanics in addressing problems in open channels.
2. Able to identify a effective section for flow in different cross sections.
3. To solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
4. Understand the principles, working and application of turbines.
5. Understand the principles, working and application of pumps.

TEXTBOOKS:
1. Subramanya.K ,"Flow in open channels", Tata McGraw Hill, New Delhi, 2000.
2. Modi P.N and Seth.S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", StandardBook House New Delhi, 2009.
3. Chandramouli P.N.,"Applied Hydraulic Engineering", Yes Dee Publishing Pvt. Ltd., 2017.

REFERENCES:
1. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Hanif Chaudhry.M., "Open Channel Flow", Second Edition, Springer, 2007.
3. Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.
4. Jain.A.K., " Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition,2016.
5. Subramanya.K., " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education PrivateLimited, New Delhi, 2010.

COs-PO's &PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	2	2	2	3	3	2
PO3	Design/development of solutions	1	1	3	3	2	3
PO4	Investigation	1	1	2	2	2	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	3	3	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management And Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	2	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155C45   **CONCRETE TECHNOLOGY**   **L T P C**
                                                                               3 0 0 3

COURSE OBJECTIVE:
1. To impart knowledge to the students on the properties of materials for concrete by suitable tests, mixdesign for concrete and special concretes.

UNIT I   CONSTITUENT MATERIALS   **9**
Cement - Different types - Chemical composition and Properties – Hydration of cement - Tests on cement - IS Specifications - Aggregates – Classification - Mechanical properties and tests as per BIS - Grading requirements – Water - Quality of water for use in concrete.

UNIT II CHEMICAL AND MINERAL ADMIXTURES   **9**
Accelerators – Retarders - Plasticizers - Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Effects on concrete properties.

UNIT III PROPORTIONING OF CONCRETE MIX   **9**
Principles of Mix Proportioning - Properties of concrete related to Mix Design - Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - BIS Method of Mix Design - Mix Design Examples

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE   **9**
Workability - Tests for workability of concrete - Segregation and Bleeding - Determination of strength Properties of Hardened concrete - Compressive strength – split tensile strength - Flexural strength - Stress-strain curve for concrete - Modulus of elasticity – durability of concrete – water absorption – permeability – corrosion test – acid resistance.

UNIT V SPECIAL CONCRETES   **9**
Light weight concretes - foam concrete- self compacting concrete – vacuum concrete - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Polymer concrete - High performance concrete - Geopolymer Concrete.

                                                                  TOTAL: 45 PERIODS

OUTCOMES:
1.The various requirements of cement, aggregates and water for making concrete The effect of admixtures on properties of concrete.
2.The concept and procedure of mix design as per IS method The properties of concrete at fresh and hardened state
3.The importance and application of special concretes.

TEXTBOOKS:
1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003.
3. Bhavikatti.S.S, " Concrete Technology", I.K.International Publishing House Pvt. Ltd., New Delhi, 2015.
4. Santhakumar. A.R., "Concrete Technology", Oxford University Press India, 2006.

REFERENCES:
1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995
2. Gambhir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, NewDelhi, 2007.
3. IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, NewDelhi, 1998.
4. Job Thomas, "Concrete Technology", Cengage Learning India Pvt. Ltd., Delhi, 2015
5. Kumar P Mehta., Paulo J M Monterio., "Concrete - Microstructure, Properties and Materials", McGraw Hill Education (India) Private Limited, New Delhi, 2016.

COs-PO's &PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	2	2	2	3	3	2
PO3	Design/development of solutions	1	1	3	3	2	3
PO4	Investigation	1	1	2	2	2	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	3	3	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management And Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	2	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155C46   **SOIL MECHANICS**   **L T P C**
                                                                       3 0 0 3

COURSE OBJECTIVES:
- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
- To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. To impart knowledge of design of both finite and infinite slopes.

UNIT I   SOIL CLASSIFICATION AND COMPACTION   9

History – formation and types of soil – composition - Index properties – clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship – Compaction – theory – laboratory and field technology – field Compaction method – factors influencing compaction.

UNIT II EFFECTIVE STRESS AND PERMEABILITY   9

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena– – Permeability – Darcy's law – Determination of Permeability – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow – Laplace's equation – Introduction to flow nets – Simple problems Sheet pile and weir.

UNIT III STRESS DISTRIBUTION AND SETTLEMENT   9

Stress distribution in homogeneous and isotropic medium – Boussines of theory – (Point load, Line load and udl) Use of Newmarks influence chart –Components of settlement – Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. – $\sqrt{t}$ and log t methods. e-log p relationship consolidation settlement N-C clays – O.C clays – Computation.

UNIT IV SHEAR STRENGTH   9

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Factors influences shear strength of soil.\

UNIT V SLOPE STABILITY   9

Infinite slopes and finite slopes — Friction circle method – Use of stability number –Guidelines for location of critical slope surface in cohesive and c - ϕ soil – Slope protection measures.

TOTAL: 45 PERIODS

OUTCOMES:
1. Classify the soil and assess the engineering properties, based on index. properties. Understand the stress concepts in soils.
2. Understand and identify the settlement in soils.Determine the shear strength of soil.
3. Analyze both finite and infinite slopes.

TEXTBOOKS:
1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBSPublishers Distribution Ltd., New Delhi. 2014
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers andDistributors, New Delhi, 7th Edition, 2017(Reprint).
3. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi,16th Edition, 2017.

REFERENCES:
1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics".Prentice-Hall, 2006.
2. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of IndiaPvt. Ltd. New Delhi, 2010.
3. Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India PrivateLimited, 8th Edition, 2014.
4. Palanikumar.M., "Soil Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private LimitedDelhi, 2013.

COs-PO's &PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	2	2	2	3	3	2
PO3	Design/development of solutions	1	1	3	3	2	3
PO4	Investigation	1	1	2	2	2	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	3	3	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management And Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	2	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155L47   **STRENGTH OF MATERIALS LABORATORY**   **L T P C**

                                                          0 0 3 2

COURSE OBJECTIVE:
- To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

LIST OF EXPERIMENTS
1. Tension test on steel rod.
2. Compression test on wood.
3. Double shear test on metal.
4. Torsion test on mild steel rod.
5. Impact test on metal specimen (Izod and Charpy).
6. Hardness test on metals (Rockwell and Brinell Hardness Tests).
7. Deflection test on metal beam.
8. Compression test on helical spring
9. Deflection test on carriage spring

                                                    TOTAL: 60 PERIODS

COURSE OUTCOME:
- The students will have the required knowledge in the area of testing of materials and components ofstructural elements experimentally.
- On completion of the course, the student is expected to
- Determine the mechanical properties of steel.
- Determine the physical properties of cement.
- Determine the physical properties of fine and coarse aggregate.
- Determine the workability and compressive strength of concrete.
- Determine the strength of brick and wood.

REFERENCES:
- Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
- IS1786-2008 (Fourth Revision, Reaffirmed 2013), 'High strength deformed bars and wires forconcrete reinforcement – Specification', 2008.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl. No.	Description of Equipment	Quantity
1.	UTM of minimum 400 KN capacity.	1
2.	Torsion testing machine.	1
3.	Izod impact testing machine.	1
4.	Hardness testing machine. Rowell Vicker's (any 2) Brinnel	1 each
5.	Beam deflection test apparatus.	1
6.	Extensometer.	1
7.	Compressometer.	1
8.	Dial gauges.	Few
9.	Le Chatelier's apparatus.	2

10.	Vicat's apparatus.		2
11.	Mortar cube moulds.		1 0

COs-PO's & PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	2	2	2	3	3	2
PO3	Design/developme nt of solutions	1	1	3	3	2	3
PO4	Investigation	1	1	2	2	2	2
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	3	3	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management And Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	2	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155L48	HYDRAULIC ENGINEERING LABORATORY	L T P C
		0 0 3 2

COURSE OBJECTIVE:

- Students should be able to verify the principles studied in theory by performing the experiments in lab.

LIST OF EXPERIMENTS

A. Flow Measurement
1. Calibration of Rotameter.
2. Calibration of Venturimeter / Orificemeter.
3. Bernoulli's Experiment.

B. Losses in Pipes
4. Determination of friction factor in pipes.
5. Determination of min or losses.

C. Pumps
6. Characteristics of Centrifugal pumps.
7. Characteristics of Gear pump.
8. Characteristics of Submersible pump.
9. Characteristics of Reciprocating pump.

D. Turbines
10. Characteristics of Pelton wheel turbine.
11. Characteristics of Francis turbine/Kaplan turbine.

E. Determination of Metacentric height
12. Determination of Metacentric height of floating bodies.

TOTAL: 60 PERIODS

OUTCOMES:
1. The students will be able to measure flow in pipes and determine frictional losses.
2. The students will be able to develop characteristics of pumps and turbines.

REFERENCES:

1. Sarbjit Singh."Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning PrivateLimited, Delhi, 2009.
2. "Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.
3. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi,2000.
4. Subramanya K. "Flow in open channels", Tata McGraw Hill Publishing.Company, 2001.

LIST OF EQUIPMENTS

1. One set up of Rotometer.
2. One set up of Venturimeter/Orifice meter.
3. One Bernoulli's Experiment set up.
4. One set up of Centrifugal Pump.
5. One set up of Gear Pump.
6. One set up of Submersible pump.

7. One set up of Reciprocating Pump.
8. One set up of Pelton Wheel turbine.
9. One set up of Francis turbines/one set of kaplon turbine.
10. One set up of equipment for determination of Metacentric height of floating bodies.
11. One set up for determination of friction factor in pipes.
12. One set up for determination of minor losses.

COs-PO's & PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	3	3	3	3	3
PO2	Problem analysis	2	2	3	3	3	3
PO3	Design/development of solutions	1	1	2	2	2	2
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	2	2	2
PO7	Environment and Sustainability	2	2	2	2	2	2
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Team work	2	2	3	3	3	2
PO10	Communication	1	1	1	1	1	1
PO11	Project Management And Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PSO1	Knowledge of Civil Engineering discipline	2	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	1	1	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	1	1	1	1	1

- 1-low,2-medium,3-high,'-"-no correlation.

20147L49   **ADVANCED READING AND WRITING**   **L T P C**
                                                                  0 0 2 1

COURSE OBJECTIVES:
- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I MAKING COMPARISONS   6

Reading - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph.

UNIT II EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING   6

Reading-Read for details-Use of graphic organizers to review and aid comprehension Writing-State reasons and examples to support ideas in writing- Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT III PROBLEMSOLVING   6

Reading- Understanding pronoun reference and use of connectors in a passage- speed reading techniques-Writing- Elements of a good essay-Types of essays- descriptive-narrative- issue-based-argumentative-analytical.

UNIT IV REPORTING OF EVENTS AND RESEARCH   6

Reading- Genre and Organization of Ideas- Writing- Email writing- visumes – Job application-project writing-writing convincing proposals.

UNIT V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY   6

Reading- Critical reading and thinking- understanding how the text positions the reader-identify Writing- Statement of Purpose- letter of recommendation- Vision statement

TOTAL: 30 PERIODS

OUTCOMES:
- Write different types of essays.
- Write winning job applications. Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

TEXT BOOKS:
1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press:Oxford, 2011.
2. Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford UniversityPress: Oxford, 2011.

REFERENCES
1. Davis, Jason and Rhonda LIss.Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006.
2. Suresh Kumar.E and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Blackswan: Hyderabad, 2012.
3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004.
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000.
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2004.

COs-PO's & PSO's MAPPING:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
2	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
3	3	3	3	3	3	3	3	3	2	3	3	3	-	-	-
4	3	3	3	3	2	3	3	3	2	3	3	3	-	-	-
5	-	-	-	-	-	-	-	-	3	3	3	3	-	-	-
AVg.	3	3	3	3	2.75	3	3	3	2.2	3	3	3	-	-	-

- 1-low,2-medium,3-high,'-"-no correlation.

20155C51   DESIGN OF REINFORCED CEMENT CONCRETE ELEMENTS   L T P C
                                                                          4 0 0 4

COURSE OBJECTIVE:

- To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

UNIT I INTRODUCTION   **9+6**
Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC –Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT II DESIGN OF BEAMS   **9+6**
Analysis and design of Flanged beams for – Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shear and Torsion.

UNIT II DESIGN OF SLABS AND STAIRCASE   **9+6**
Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams-Two way slab- Design of simply supported and continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.

UNIT IV DESIGN OF COLUMNS   **9+6**
Types of columns –Axially Loaded columns – Design of short Rectangular Square and circular columns –Design of Slender columns- Design for Uniaxial and Biaxial bending using Column Curves

UNIT V DESIGN OF FOOTINGS   **9+6**
Concepts of Proportioning footings and foundations based on soil properties-Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.

                                                              TOTAL: 75 PERIODS

OUTCOMES:

- Understand the various design methodologies for the design of RC elements.
- Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion.
- Design the various types of slabs and staircase by limit state method.
- Design columns for axial, uniaxial and biaxial eccentric loadings.
- Design of footing by limit state method.

TEXT BOOKS:
- Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
- Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India

PrivateLimited, New Delhi, 2006.

REFERENCES:

1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998.
2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002.
3. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009.

CO's-PO's&PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155C52 **STRUCTURAL ANALYSIS I** **L T P C**
3 2 0 4

COURSE OBJECTIVE:

• To introduce the students to basic theory and concepts of classical methods of structural analysis.

UNIT I STRAIN ENERGY METHOD **9**
Determination of Static and Kinematic Indeterminacies – Analysis of continuous beams, plane frames and indeterminate plane trusses by strain energy method (up to two degree of redundancy).

UNIT II SLOPE DEFLECTION METHOD **9**
Slope deflection equations – Equilibrium conditions - Analysis of continuous beams and rigid frames – Rigid frames with inclined members - Support settlements- symmetric frames with symmetric and skew-symmetric loadings.

UNIT III MOMENT DISTRIBUTION METHOD **9**
Stiffness and carry over factors – Distribution and carryover of moments - Analysis of continuous Beams- Plane rigid frames with and without sway – Support settlement - symmetric frames with symmetric and skew-symmetric loadings.

UNIT IV FLEXIBLITY METHOD **9**
Primary structures - Compatibility conditions – Formation flexibility matrices - Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.

UNIT V STIFFNESS METHOD **9**
Restrained structure –Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.

TOTAL: 45 PERIODS
OUTCOMES:
- Analyze continuous beams, pin-jointed indeterminate plane frames and rigid plane frames by strainenergy method.
- Analyze the continuous beams and rigid frames by slope defection method.
- Understand the concept of moment distribution and analysis of continuous beams and rigid frameswith and without sway.
- Analyze the indeterminate pin jointed plane frames continuous beams and rigid frames usingmatrix flexibility method.
- Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointedtrusses and rigid plane frames.

TEXTBOOKS:
1. Bhavikatti, S.S,Structural Analysis,Vol.1,& 2, Vikas Publishing House Pvt.Ltd.,NewDelhi-4, 2014.
2. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International PublishingHouse Pvt.Ltd.,New Delhi-4, 2014.
3. Vazrani.V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.

REFERENCES:
- Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications,New Delhi, 2004.
- William Weaver, Jrand James M.Gere, Matrix analysis of framed structures, CBS Publishers &Distributors, Delhi,1995.

- Hibbeler, R.C.,Structural Analysis, VII Edition, Prentice Hall, 2012.

CO's-PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155C53   **WATER SUPPLY ENGINEERING**   **L T P C**
                                                                        3 0 0 3

COURSE OBJECTIVE:
  • To equip the students with the principles and design of water treatment units
    anddistribution system.

UNIT I   SOURCES OF WATER   12
Public water supply system – Planning, Objectives, Design period, Population forecasting; Water
demand – Sources of water and their characteristics, Surface and Groundwater – Impounding
Reservoir – Development and selection of source – Source Water quality – Characterization –
Significance – Drinking Water quality standards.
UNIT II CONVEYANCE FROM THE SOURCE   12
Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials –
Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes –
appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.
UNIT III WATER TREATMENT   12
Objectives – Unit operations and processes – Principles, functions, and design of water treatment
plant units, aerators of flash mixers, Coagulation and flocculation –Clarifloccuator-Plate and tube
settlers - Pulsator clarifier - sand filters - Disinfection - Residue Management –Construction,
Operation and Maintenance aspects.
UNIT IVADVANCED WATER TREATMENT   12
Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange–
Membrane Systems – RO Reject Management - Iron and Manganese removal - Defluoridation -
Construction and Operation & Maintenance aspects – Recent advances - MBR process
UNIT VWATER DISTRIBUTION AND SUPPLY   12
Requirements of water distribution – Components – Selection of pipe material – Service reservoirs
– Functions – Network design – Economics – Analysis of distribution networks -Computer
applications – Appurtenances – Leak detection. Principles of design of water supply in buildings –
House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.
                                                          TOTAL: 60 PERIODS
OUTCOMES:
  • An insight into the structure of drinking water supply systems, including water transport,
    treatment and distributionthe knowledge in various unit operations and processes in water
    treatment.
  • An ability to design the various functional units in water treatment.
  • An understanding of water quality criteria and standards, and their relation to public health
    the ability to design and evaluate water supply project alternatives on basis of chosen criteria.

TEXTBOOKS:
  • Garg, S.K. Environmental Engineering, Vol.IKhanna Publishers, New Delhi, 2010.
  • Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.
  • Punmia, B.C.,Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications
  • (P) Ltd., New Delhi, 2014.
REFERENCES:
  • Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development,
    Governmentof India, New Delhi, 1999.
  • Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning,
    Design andOperation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155C56   **FOUNDATION ENGINEERING**   **L T P C**
                                                                                3 0 0 3

COURSE OBJECTIVES:

- To impart knowledge to plan and execute a detail site investigation programe, to select geotechnicaldesign parameters and type of foundations.
- To familiarize the students for the geotechnical design of different type of foundations and retaining walls.

UNIT I   SITE INVESTIGATION AND SELECTION OF FOUNDATION   9
Scope and objectives – Methods of exploration – Auguring and boring – Wash boring and rotary drilling – Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Data interpretation - Strength parameters - Bore log report and Selection of foundation.

UNIT II SHALLOW FOUNDATION   9
Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Factors affecting bearing capacity – Bearing capacity from in-situ tests (SPT, SCPT and plate load) – Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS   9
Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum thickness for rigid behaviour – Applications – Compensated foundation – Codal provision.

UNIT IV PILE FOUNDATION   9
Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity-Group capacity by different methods (Feld's rule, Converse – Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift – Cohesive – expansive – non expansive – Cohesionless soils – Codal provisions.

UNIT V RETAINING WALLS   9
Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls – Codal provisions.

TOTAL: 45 PERIODS

OUTCOMES:

1. Understand the site investigation, methods and sampling.
2. Get knowledge on bearing capacity and testing methods.
3. Design shallow footings.
4. Determine the load carrying capacity, settlement of pile foundation.
5. Determine the earth pressure on retaining walls and analysis for stability.

TEXTBOOKS:

1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).
3. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition 2017.

REFERENCES:

1. Braja M Das, "Principles of Foundation Engineering" (Eigth edition), Cengage Learning 2014.
2. Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2014.
3. Joseph E bowles, "Foundation Analysis and design", McGraw Hill Education, 5th Edition, 28th August 2015

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	2	2	2	3	2	2
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	2	2	2	1	2	2
PO7	Environment and Sustainability	1	2	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	1	1	1	1	1	1
PO10	Communication	1	1	1	1	1	1
PO11	Project Management and Finance	1	1	2	2	2	2
PO12	Life Long Learning	3	3	3	3	3	3
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	2	2	2	2	2
PSO2	Critical analysis of Civil Engineering problems and innovation	2	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	2	2	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.
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20155L57	**SOIL MECHANICS LABORATORY**	**L T P C** **0 0 3 2**

COURSE OBJECTIVE:

- o To develop skills to test the soils for their index and engineering properties and to characterise the soil based on their properties..

EXERCISES:

1. DETERMINATION OF INDEX PROPERTIES 20

a. Specific gravity of soil solids.
b. Grain size distribution – Sieve analysis.
c. Grain size distribution - Hydrometer analysis.
d. Liquid limit and Plastic limit tests.
e. Shrinkage limit and Differential free swell tests.

2. DETERMINATION OF INSITU DENSITY AND COMPACTION 12 CHARACTERISTICS
a. Field density Test (Sand replacement method and core cutter method).
b. Determination of moisture – density relationship using standard Proctor compaction test.
c. Determination of relative density (Demonstration only).

3. DETERMINATION OF ENGINEERING PROPERTIES 28
a. Permeability determination (constant head and falling head methods).
b. One dimensional consolidation test (Determination of Co-efficient of consolidation only) c. Direct shear test in cohesionless soil.
d. Unconfined compression test in cohesive soil.
e. Laboratory vane shear test in cohesive soil
f. Tri-axial compression test in cohesionless soil (Demonstration only).
g. California Bearing Ratio Test.

TOTAL: 60 PERIODS

OUTCOME:

- • Students are able to conduct tests to determine both the index and engineering properties of soils and to characterize the soil based on their properties. Conduct tests to determine the index properties of soils.
- • Determine the in situ density and compaction characteristics.
- • Conduct tests to determine the compressibility, permeability and shear strength of soils.
- • Understand the various tests on Geo synthetics.

REFERENCES:
1. "Soil Engineering Laboratory Instruction Manual" published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
2. Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1951. Digitized2008.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

Sl.No.	Description of Equipment	Quantity
1.	Sieves	2 sets
2.	Hydrometer	2 sets
3.	Liquid and Plastic limit apparatus	2 sets
4.	Shrinkage limit apparatus	3 sets
5.	Proctor Compaction apparatus	2 sets
6.	UTM of minimum of 20kN capacity	1

7.	Direct Shear apparatus	1
8.	Thermometer	2
9.	Sand replacement method accessories and core cutter method accessories	2
10.	Tri-axial Shear apparatus	1
11.	Three Gang Consolidation test device	1
12.	Relative Density apparatus	1
13.	Van Shear apparatus	1
14.	Weighing machine – 20kg capacity	1 No
15.	Weighing machine – 1kg capacity	3 No

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	2	1	3	1	1	2
PO2	Problem analysis	2	2	3	2	2	3
PO3	Design/development of solutions	3	3	3	2	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	2	1	1
PO6	Engineer and Society	1	1	1	1	1	2
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	1
PO10	Communication	1	2	1	1	1	1
PO11	Project Management and Finance	1	1	1	1	1	2
PO12	Life Long Learning	3	3	3	3	3	3
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	2	2	2	2	2
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	2	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	2	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

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20155L58   WATER AND WASTE WATER ANALYSIS LABORATORY   L T P C
0 0 3 2

COURSE OBJECTIVES:

1. To analyse the physical, chemical and biological characteristics of water and waste water.
2. To quantify the dosage requirement for coagulation process.
3. To study the growth of micro-organism and its quantification
4. To quantify the sludge.

Course Content:
1. Physical, Chemical and biological characteristics of water and wastewater.
2. Jar test.
3. Chlorine demand and residual test.
4. Growth of micro-organism.

List of Experiments:
1. Determination of pH, Turbidity and conductivity.
2. Determination of Hardness.
3. Determination of Alkalinity and Acidity.
4. Determination of Chlorides.
5. Determination of Phosphates and Sulphates.
6. Determination of iron and fluoride.
7. Determination of Optimum Coagulant dosage.
8. Determination of residual chlorine and available chlorine in bleaching powder.
9. Determination of Oil, and Grease.
10. Determination of suspended, settleable, volatile and fixed solids.
11. Determination Dissolved Oxygen and BOD for the given sample.
12. Determination of COD for given sample.
13. Determination of SVI of Biological sludge and microscopic examination.
14. Determination of MPN index of given water sample.

TOTAL: 60 PERIODS

COURSE OUTCOME:
- Calibrate and standardize the equipment.
- Collect proper sample for analysis.
- To know the sample preservation methods.
- To perform field oriented testing of water, wastewater.
- To perform coli form analysis.
- Concentration in water and wastewater.
- Suggest the type of treatment required and amount of dosage required for the treatment.
- Examine the conditions for the growth of micro-organisms.

REFERENCES:

1. APHA,"StandardMethodsfortheExaminationofWaterandWastewater",22nd Ed. Washington, 2012.
2. "LaboratoryManualfor theExaminationofwater, wastewatersoilRump", H.H.andKrist,H. – Second Edition, VCH, Germany, 3rd Edition, 1999.
3. "Methodsofairsampling&analysis",JamesP.Lodge Jr(Editor)3rdEdition,Lewis publishers,Inc,USA,1989.

CO's-PO's & PSO's MAPPING :

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-
2	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-
3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-
5	3	1	2	1	-	2	2	-	-	-	-	2	-	-	-
Avg.	**2.8**	**1.3**	**1.6**	**1**	**-**	**1.5**	**1.8**		**-**	**-**	**-**	**1.5**	-	-	-

1 - Low,2-Medium,3-High,"-"-no correlation.

20155L59	**SURVEY CAMP**	**L T P C**
	(During IV semester Summer Vacation 2 weeks)	**0 0 2 2**

COURSE OBJECTIVE:

The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus). At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

Two weeks Survey Camp will be conducted during summer vacation in the following activities:

1. Traverse - using Total station
2. Contouring
    (i). Radial tachometric contouring - Radial Line at Every 45 Degree and Length not less than 60 Meteron each Radial Line
    (ii). Block Level/ By squares of size at least 100 Meter x 100 Meter atleat 20 Meter interval
    (III). L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter atleast L.S atEvery 30M and C.S at every 90 M
3. Offset of Buildings and Plotting the Location
4. Sun observation to determine azimuth (guidelines to be given to the students)
5. Use of GPS to determine latitude and longitude and locate the survey camp location
6. Traversing using GPS
7. Curve setting by deflection angle

 Apart from above students may be given survey exercises in other area also based on site conditionto give good exposure on survey.

20155CRM   **RESEARCH METHODOLOGY**   **L T P C**
                                                         0 0 2 3

COURSE OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features.
- To carry out basic literature survey using the common data-bases.
- To give exposure to standard laboratory precautions and best practices for experimental work.
- To provide orientation for basic mathematical computation useful in basic research.

UNIT I   **9**

Introduction to Research – Definition, Objectives, Motivation and purpose – types of research – Pure and applied, survey, case study experimental, exploratory – Research Design – Steps in selection and formulation of research problem - Steps in research – Criteria of Good Research, Problems Encountered by Researchers in India.

UNIT II   **9**

Research Problem: Definition of research problem, selecting the problem - Necessity of defining the problem - Techniques involved in defining the problem - Research design - Needs and features of good design - Different research design - Basic principles of experimental designs. Development of a research plan, Formulation of Hypothesis – Sampling techniques –Sampling error and sample size. Literature types- compendia and tables of information, Reviews, General treatises, Monographs.

UNIT III   **9**

Methods of data collection – Primary and secondary data – observation – interview –Questionnaire – Tools for questionnaire; surveying & literature survey, spreadsheets, Technical writing, Construction of tools for data collection – testing validity – pilot study and pre-testing, Survey vs Experiment, Practical Exercises. Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software utilization in literature collection.

UNIT IV   **9**

Processing and analysis of data – editing – coding – transcription – tabulation –outline of statistical analysis-Uncertainty, accuracy and precision- Mean value; standard deviation; error on the mean-Using a spreadsheet for data analysis- Graphs and graph plotting-Least squares methods – descriptive statistics – elements of processing through computer- packages for analysis (Excel).

UNIT V   **9**

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure - writing research abstract - introduction, review of literature, result, conclusions, Concepts of Bibliography and references, Technical Presentation.

TOTAL: 45 PERIODS

OUTCOME:

- Ability to carry out independent literature survey corresponding to the specific publication type andassess basic experimental as well as conceptual set up.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. Rajammal.P. Devadas, 1976, A hand book of methodology of research, RMM Vidyalaya Press.
3. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. W.J. DeCoursey, Statistics and Probability for Engineering Applications With Microsoft® Excel, Newnes,2003.
6. Archibald Fripp, Jon Fripp, Michael Fripp; Just-in-Time Math for Engineers, Elsevier Science &Technology Books, 2003.

201AGIE   **INNOVATION AND ENTREPRENEURSHIP**   **L T P C**
                                                                           - - - 2

Course Outcomes

After the completion of the course, the students will be able to:
- Comprehend the role of bounded rationality, framing, causation and effectuation in entrepreneurialdecision making.
- Demonstrate an ability to design a business model canvas.
- Evaluate the various sources of raising finance for startup ventures.
- Understand the fundamentals of developing and presenting business pitching to potentialinvestors.

Course Content**Module – I**

Introduction to Entrepreneurship: Entrepreneurs; entrepreneurial personality and intentions-characteristics,traits and behavioral; entrepreneurial challenges.

Module-II

Module Entrepreneurial Opportunities: Opportunities. discovery/ creation, Pattern identification andrecognition for venture creation: prototype and exemplar model, reverse engineering.

Module –III

Entrepreneurial Process and Decision Making: Entrepreneurial ecosystem, Ideation, development and exploitation of opportunities; Negotiation, decision making process and approaches, Effectuation and Causation.

Module-IV

Crafting business models and Lean Start-ups: Introduction to business models; Creating value propositions-conventional industry logic, value innovation logic; customer focused innovation; building and analyzing business models; Business model canvas, Introduction to lean startups, Business Pitching.

Module – V

Organizing Business and Entrepreneurial Finance: Forms of business organizations; organizational structures; Evolution of Organisation, sources and selection of venture finance options and its managerial implications.Policy Initiatives and focus; role of institutions in promoting entrepreneurship.

Books for References

- Ries, Eric(2011), The lean Start-up: How constant innovation creates radically successful businesses,Penguin BooksLimited.
- Blank, Steve (2013), The Startup Owner's Manual: The Step by Step Guide for Building a GreatCompany, K&S Ranch.
- S. Carter and D. Jones-Evans, Enterprise and small business- Principal Practice and Policy, PearsonEducation(2006)
- T. H. Byers, R. C. Dorf, A. Nelson, Technology Ventures: From Idea to Enterprise, McGraw Hill(2013)
- Osterwalder, Alex and Pigneur, Yves (2010) Business ModelGeneration.
- Kachru, Upendra, India Land of a Billion Entrepreneurs,Pearson.
- Bagchi, Subroto, (2008), Go Kiss the World: Life Lessons for the Young Professional, Port folioPenguin.

- Bagchi, Subroto, (2012). MBA At 16: a Teenager's Guide to Business, Penguin Books.
- Bansal, Rashmi, Stay Hungry Stay Foolish, CIIE, IIM Ahmedabad.
- Bansal, Rashmi, (2013). Follow Every Rainbow,Westland.
- Mitra, Sramana (2008), Entrepreneur Journeys (Volume 1), Book surge Publishing
- Abrams, R. (2006). Six-week Start-up, Prentice-Hall of India.
- Verstraete, T. and Laffitte, E.J. (2011). a Business Model of Entrepreneurship, Edward Elgar Publishing.
- Johnson, Steven (2011). Where Good Ideas comes from, Penguin Books Limited.
- Gabor, Michael E. (2013), Awakening the Entrepreneur Within, Primento.
- Guillebeau, Chris (2012), The $100 startup: Fire your Boss, Do what you love and work better to livemore, Pan Macmillan.
- Kelley, Tom (2011), The ten faces of innovation, Currency Double day Prasad, Rohit (2013), Start-up sutra: what the angels won't tell you about business and life, Hachette India.

20155C61   **DESIGN OF STEEL STRUCTURAL ELEMENTS**   **L T P C**
                                                                       3 0 0 3

COURSE OBJECTIVES:
- To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections.
- Design of structural systems such as roof trusses, gantry girders as per provisions of current code (IS 800 - 2007) of practice for working stress and Limit state Method.

UNIT I INTRODUCTION AND ALLOWABLE STRESS DESIGN   9
Structural steel types – Mechanical Properties of structural steel- Indian structural steel products-Steps involved in the Deign Process -Steel Structural systems and their Elements- -Type of Loads on Structures and Load combinations- Code of practices, Loading standards and Specifications - Concept of Allowable Stress Method, and Limit State Design Methods for Steel structures-Relative advantages and Limitations-Strengths and Serviceability Limit states. Allowable stresses as per IS 800 section 11 -Concepts of Allowable stress design for bending and Shear –Check for Elastic deflection-Calculation of moment carrying capacity –Design of Laterally supported Solid Hot Rolled section beams-Allowable stress deign of Angle Tension and Compression Members and estimation of axial load carrying capacity.

UNIT II   CONNECTIONS IN STEEL STRUCTURES   9
Type of Fasteners- Bolts Pins and welds- Types of simple bolted and welded connections Relative advantages and Limitations-Modes of failure-the concept of Shear lag-efficiency of joints- Axially loaded bolted connections for Plates and Angle Members using bearing type bolts –Prying forces and Hanger connection– Design of Slip critical connections with High strength Friction Grip bolts.-Design of joints for combined shear and Tension- Eccentrically Loaded Bolted Bracket Connections-Welds-symbols and specifications- Effective area of welds-Fillet and but Welded connections-Axially Loaded connections for Plate and angle truss members and Eccentrically Loaded bracket connections.

UNIT III TENSION MEMBERS   9
Tension Members - Types of Tension members and sections –Behaviour of Tension Members-modes of failure-Slenderness ratio- Net area – Net effective sections for Plates ,Angles and Tee in tension –Concepts of Shear Lag- Design of plate and angle tension members-design of built up tension Members-Connections in tension members – Use of lug angles – Design of tension splice.

UNIT IV COMPRESSION MEMBERS   9
Types of compression members and sections–Behaviour and types of failures-Short and slender columns- Current code provisions for compression members- Effective Length, Slenderness ratio – Column formula and column curves- Design of single section and compound Angles-Axially Loaded solid section Columns- Design of Built up Laced and Battened type columns – Design of column bases – Plate and Gusseted bases for Axially loaded colums- Splices for colums.

UNIT V DESIGN OF FLEXURAL MEMBERS   9
Types of steel Beam sections- Behaviour of Beams in flexure- Codal Provisions – Classification of cross sections- Flexural Strength and Lateral stability of Beams –Shear Strength-Web Buckling, Crippling and defection of Beams- Design of laterally supported Beams- Design of solid rolled section Beams- Design of Plated beams with cover plates - Design Strength of Laterally unsupported Beams – Design of laterally unsupported rolled section Beams- Purlin in Roof Trusses-Design of Channel and I section Purlins.

                                                                    TOTAL: 45 PERIODS

OUTCOMES:

1. Understand the concepts of various design philosophies.
2. Design common bolted and welded connections for steel structures.
3. Design tension members and understand the effect of shear lag.
4. Understand the design concept of axially loaded columns and column base connections. Understand specific problems related to the design of laterally restrained and unrestrained steel beams.

TEXTBOOKS:

1. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.
2. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd.,2013.
3. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of SteelPublications, 2002.
2. Sai Ram. K.S. "Design of Steel Structures " Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2nd Edition, 2015, www.pearsoned.co.in/kssairam.
3. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, LearningPvt. Ltd., 2nd Edition, 2013.
4. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800– 2007, IK International Publishing House Pvt. Ltd., 2009.
5. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007, Structures Publications, 2009.
6. IS800 :2007, General Construction in Steel - Code of Practice, (Third Revision), Bureau of IndianStandards, New Delhi, 2007.
7. SP 6(1) Hand book on structural Steel Sections.

COs-PO's & PSO's MAPPING :

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	2	2	3	2	2	3
PO2	Problem analysis	2	2	2	2	3	3
PO3	Design/development of solutions	3	3	3	3	3	2
PO4	Investigation	3	3	3		2	3
PO5	Modern Tool Usage		2	2	2		1
PO6	Engineer and Society				2		2
PO7	Environment and	2			2		2

	Sustainabilit y						
PO8	Ethics				2		1
PO9	Individual and Team work				2		2
PO10	Communication					1	1
PO11	Project Management And Finance		2	2	2		1
PO12	Life Long Learning	2	2	2	3	3	2
PSO1	Knowledge of Civil Engineering discipline	3	2	2	2	2	2
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues				3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155C62   **STRUCTURAL ANALYSIS II**   **L T P C**
                                                        3 2 0 4

COURSE OBJECTIVES:

- To learn the method of drawing influence lines and its uses in various applications like beams andplane trusses.
- To analyse the arches, suspension bridges and space trusses.
- Also to learn Plastic analysis of beams and rigid frames.

UNIT I   INFLUENCE LINES FOR DETERMINATE BEAMS   9

Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.

UNIT II   INFLUENCE LINES FOR INDETERMINATE BEAMS   9

Muller Breslau's principle– Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams.

UNIT III ARCHES   9

Arches - Types of arches – Analysis of three hinged, two hinged and fixed arches - Parabolic and circular arches – Settlement and temperature effects.

UNIT IV CABLES AND SUSPENSION BRIDGES   9

Equilibrium of cable – length of cable - anchorage of suspension cables – stiffening girders-cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

UNIT V PLASTIC ANALYSIS   9

Plastic theory – statistical indeterminate structures-plastic moment of resistance-plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.
.

TOTAL: 45 PERIODS

OUTCOMES:

1. Draw influence lines for statically determinate structures and calculate critical stress resultants. Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams.
2. Analyse of three hinged, two hinged and fixed arches.
3. Analyse the suspension bridges with stiffening girders.
4. Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames.

TEXTBOOKS:

1. Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd., NewDelhi-4,2014.
2. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2004.
3. Vazrani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publishers,2015.

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REFERENCES:

1. Negi.L.S and Jangid R.S., Structural Analysis, Tata McGraw-Hill Publishers, 2004.
2. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2002.
3. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHIL earning Pvt. Ltd.,2011.
4. Prakash Rao D.S., Structural Analysis, Universities Press,1996.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2	2	2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	1	1	1	1	1
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

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20155C63	**IRRIGATION ENGINEERING**	**L T P C**
		3 0 0 3

COURSE OBJECTIVES:

- The student is exposed to different phases in irrigation practices and Planning and management of irrigation.
- Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigation management.

UNIT I CROP WATER REQUIREMENT   9

Need and classification of irrigation- historical development and merits and demerits of irrigation-types of crops-crop season-duty, delta and base period- consumptive use of crops- estimation of Evapotranspiration using experimental and theoretical methods

UNIT II IRRIGATION METHODS   9

Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system- Irrigation efficiencies.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES   9

Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earth dams, Arch dams- Diversion Head works - Weirs and Barrages-

UNIT IV CANAL IRRIGATION   9

Canal regulations – direct sluice - Canal drop – Cross drainage works-Canal outlets – Design of prismatic canal-canal alignments-Canal lining - Kennedy's and Lacey's Regime theory-Design of unlined canal

UNIT V WATER MANAGEMENT IN IRRIGATION   9

Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses- On form development works-Participatory irrigation management- Water resources associations-Changing paradigms in water management-Performance evaluation-Economic aspects of irrigation

TOTAL: 45 PERIODS

OUTCOMES:

- Have knowledge and skills on crop water requirements. Understand the methods and management of irrigation.
- Gain knowledge on types of Impounding structures Understand methods of irrigation including canal irrigation.
- Get knowledge on water management on optimization of water use.

TEXTBOOKS:

1. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, NewDelhi, 2009.
3. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd RevisedEdition, New Delhi, 2009.

REFERENCES:

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New AgeInternational Publishers, 2005.
2. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000.
3. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc.,New Delhi, 1997.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	2	2	3	3	2	2
PO2	Problem analysis	1	1	3	3	1	2
PO3	Design/development of solutions	2	2	3	3	1	2
PO4	Investigation	2	1	3	2	2	2
PO5	Modern Tool Usage	-	2	2	2	2	2
PO6	Engineer and Society	-	-	3	3	3	3
PO7	Environment and Sustainability	1	3	1	1	2	2
PO8	Ethics	-	-	-	-	1	1
PO9	Individual and Teamwork	-	-	-	-	3	3
PO10	Communication	-	-	-	-	2	2
PO11	Project Management and Finance	-	2	3	3	3	3
PO12	Life Long Learning	2	2	1	1	3	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	3	3	3	2	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	2	2	2	2	2

- 1-low,2-medium,3-high,'-"-no correlation.

20155C64   **HIGHWAY ENGINEERING**   **L T P C**
                                                             3 0 0 3

COURSE OBJECTIVES:
- To give an overview about the highway engineering with respect to, planning, design.
- construction and maintenance of highways as per IRC standards, specifications and methods.

UNIT I HIGHWAY PLANNING AND ALIGNMENT   **9**
Significance of highway planning – Modal limitations towards sustainability - History of road development in India – factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods - Classification of highways – Locations and functions – Typical cross sections of Urban and Rural roads

UNIT II GEOMETRIC DESIGN OF HIGHWAYS   **9**
Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS   **9**
Pavement components and their role - Design principles -Design practice for flexible and rigid Pavements (IRC methods only) – Embankments- Problems in Flexible pavement design.

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE   **9**
Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – Test on Bituminous mixes-Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) – Quality control measures - Highway drainage — Construction machineries.

UNIT V EVALUATION AND MAINTENANCE OF PAVEMENTS   **9**
Pavement distress in flexible and rigid pavements – Types of maintenance – Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Highway Project formulation.

                                                TOTAL: 45 PERIODS

OUTCOMES:

- Get knowledge on planning and aligning of highway.Geometric design of highways.
- Design flexible and rigid pavements.
- Gain knowledge on Highway construction materials, properties, testing methods.
- Understand the concept of pavement management system, evaluation of distress and maintenance ofpavements.

TEXTBOOKS:

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers,2014.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications(India), Chennai, 2010.
3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications,8th edition Delhi, 2013.

REFERENCES:

1. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision),IRC: 37-2012.
2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements forHighways, (Third Revision), IRC: 58-2012.
3. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression, SouthAsia, 2012.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	2	2	3	3	2	2
PO2	Problem analysis	1	1	3	3	1	2
PO3	Design/development of solutions	2	2	3	3	1	2
PO4	Investigation	2	1	3	2	2	2
PO5	Modern Tool Usage	-	2	2	2	2	2
PO6	Engineer and Society	-	-	3	3	3	3
PO7	Environment and Sustainability	1	3	1	1	2	2
PO8	Ethics	-	-	-	-	1	1
PO9	Individual and Teamwork	-	-	-	-	3	3
PO10	Communication	-	-	-	-	2	2
PO11	Project Management and Finance	-	2	3	3	3	3
PO12	Life Long Learning	2	2	1	1	3	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	3	3	3	2	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	1	2	2	2	2	2

- 1-low,2-medium,3-high,'-"-no correlation.

20155C65   **WASTE WATER ENGINEERING**   **L T P C**
                                                                               3 0 0 3

COURSE OBJECTIVE:
- The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants.

UNIT I PLANNING AND DESIGN OF SEWERAGE SYSTEM   9

Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design – Storm drainage-Storm runoff estimation – sewer appurtenances – corrosion in sewers – prevention and control – sewage pumping-drainage in buildings-plumbing systems for drainage - Rain Water ting.

UNIT II PRIMARY TREATMENT OF SEWAGE   9

Objectives – Unit Operations and Processes – Selection of treatment processes –- Onsite sanitation - Septic tank- Grey water harvesting – Primary treatment – Principles, functions and design of sewage treatment units - screens - grit chamber-primary sedimentation tanks – Construction, Operation and Maintenance aspects.

UNIT II SECONDARY TREATMENT OF SEWAGE   9

Objectives – Selection of Treatment Methods – Principles, Functions, - Activated Sludge Process and Extended aeration systems -Trickling filters– Sequencing Batch Reactor(SBR) – Membrane Bioreactor - UASB – Waste Stabilization Ponds – - Other treatment methods -Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment – Construction, Operation and Maintenance aspects.

UNIT IV DISPOSAL OF SEWAGE   9

Standards for– Disposal - Methods – dilution – Mass balance principle - Self purification of river-Oxygen sag curve – de oxygenation and re aeration - Streeter–Phelps model - Land disposal – Sewage farming – sodium hazards - Soil dispersion system.

UNIT V SLUDGE TREATMENT AND DISPOSAL   9

Objectives - Sludge characterization – Thickening - Design of gravity thickener- Sludge digestion– Standard rate and High rate digester design- Biogas recovery – Sludge Conditioning and Dewatering – Sludge drying beds- ultimate residue disposal – recent advances.

                                                           TOTAL: 45 PERIODS
OUTCOMES:
- An ability to estimate sewage generation and design sewer system including sewage pumpingstations.
- The required understanding on the characteristics and composition of sewage, self-purification ofstreams.
- An ability to perform basic design of the unit operations and processes that are used in sewagetreatment.

TEXTBOOKS:
1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers,New Delhi, 2015.
2. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi,2014.
3, Punmia, B.C., Jain, A.K., and Jain.A.K.., Environmental Engineering, Vol.II, Laxmi Publications,2010.

REFERENCES:
1. Manual on Sewerage and Sewage Treatment Systems Part A,B and C, CPHEEO, Ministry of UrbanDevelopment, Government of India, New Delhi, 2013.
2. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company,New Delhi, 2010.

3. Syed R. Qasim "Wastewater Treatment Plants", CRC Press, Washington D.C.,2010.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	2	2	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions			3	3	3	3
PO4	Investigation	2	2			2	2
PO5	Modern Tool Usage				2	2	2
PO6	Engineer and Society			3	3	3	3
PO7	Environment and Sustainability			2	3	3	3
PO8	Ethics	1	1	2	2	2	2
PO9	Individual and Teamwork	1	1	2	3	3	2
PO10	Communication					2	2
PO11	Project Management and Finance			2	2	2	2
PO12	Life Long Learning					3	3
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation			2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

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20155L67	**HIGHWAY ENGINEERING LABORATORY**	**L T P C**
		0 0 3 2

COURSE OBJECTIVE:

- To learn the principles and procedures of testing of highway materials.

EXCERCISES :

I TEST ON AGGREGATES
  a) Specific Gravity.
  b) Los Angeles Abrasion Test.
  c) Water Absorption of Aggregates.

II TEST ON BITUMEN
  a) Specific Gravity of Bitumen.
  b) Penetration Test.
  c) Viscosity Test.
  d) Softening Point Test.
  e) Ductility Test.

III TESTS ON BITUMINOUS MIXES
  a) Stripping Test.
  b) Determination of Binder Content.
  c) Marshall Stability and Flow Values.

IV DEMONSTRATION OF ANY ONE FIELD TESTING EQUIPMENT LIKE SKID RESISTANCE TESTER/ BENKELMAN BEAM ETC

TOTAL: 60 PERIODS

OUTCOME:
  - Student knows the techniques to characterize various pavement materials through relevant tests.
  - Characterize Pavement Aggregate through relevant test.
  - As certain the Quality of Bitumen.
  - Determine the Optimum Binder Content Using Marshall Method.
  - Evaluate the Consistency and Properties of Bitumen.
  - Determine the Bitumen Content in the Bituminous Mixes

REFERENCES:
  1. Highway Materials and Pavement Testing, Nem Chand and Bros., Roorkee, Revised Fifth Edition,2009.
  2. Methods for testing tar and bituminous materials, IS 1201–1978 to IS 1220– 1978, Bureau of IndianStandards.
  3. Methods of test for aggregates, IS 2386 – 1978, Bureau of Indian Standards.
  4. Mix Design Methods Asphalt Institute Manual Series No. 2, Sixth Edition,1997, Lexington, KY,USA.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S.no	Description of Equipment	Quantity
1	Concrete cube moulds	6
2	Concrete cylinder moulds	3
3	Concrete Prism moulds	3
4	Sieves	1set
5	Concrete Mixer	1
6	Slump cone	3
7	Flow table	1
8	Vibrator	1
9	Trovels and planers	1 set
10	UTM – 400 kN capacity	1
11	Vee Bee Consistometer	1
12	Aggregate impact testing machine	1
13	CBR Apparatus	1
14	Blains Apparatus	1
15	Los - Angeles abrasion testing machine	1
16	Marshall Stability Apparatus	1

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	2	2	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions			3	3	3	3
PO4	Investigation	2	2			2	2
PO5	Modern Tool Usage				2	2	2
PO6	Engineer and Society			3	3	3	3
PO7	Environment and Sustainability			2	3	3	3
PO8	Ethics	1	1	2	2	2	2
PO9	Individual and Teamwork	1	1	2	3	3	2
PO10	Communication					2	2
PO11	Project Management and Finance			2	2	2	2
PO12	Life Long Learning					3	3
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3

PSO2	Critical analysis of Civil Engineering problems and innovation			2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155L68   IRRIGATION AND ENVIRONMENTAL ENGINEERING DRAWING   L T P C
                                                                          0 0 3 2

COURSE OBJECTIVE:

- At the end of the semester, the student shall conceive, design and draw the irrigation and environmental engineering structures in detail showing the plan, elevation and Sections.

PART A: IRRIGATION ENGINEERING

1. TANK COMPONENTS 9

Fundamentals of design - Tank surplus weir – Tank sluice with tower head - Drawings showing foundation details, plan and elevation

2. IMPOUNDING STRUCTURES 6

Design principles - Earth dam – Profile of Gravity Dam.

3. CROSS DRAINAGE WORKS 6

General design principles - Aqueducts – Syphon aqueduct (Type III) – Canal drop (Notch Type) – Drawing showing plan, elevation and foundation details.

4. CANAL REGULATION STRUCTURES 9

General Principles - Direct Sluice - Canal regulator - Drawing showing detailed plan, elevation and foundation details.

PART B: ENVIRONMENTAL ENGINEERING

1. WATER SUPPLY AND TREATMENT   15

Design and Drawing of flash mixer, flocculator, clarifier – Rapid sand filter – Service reservoirs – Pumping station – House service connection for water supply and drainage.

4. SEWAGE TREATMENT & DISPOSAL   15

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank – Trickling filter – Sludge digester – Sludge drying beds – Septic tanks and disposal arrangements.

TOTAL: 60 PERIODS

OUTCOME:

- The students after completing this course.
- It will be able to design and draw various units of Municipal water treatment plants and sewage treatment plants.

TEXTBOOKS:

1. Satya Narayana Murthy Challa, "Water Resources Engineering: Principles and Practice", New Age International Publishers, New Delhi, 2002.
2. Garg, S.K., "Irrigation Engineering and Design of Structures", New Age International Publishers, New Delhi, 1997.
3. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.
4. Manual on "Sewerage and Sewage Treatment Systems- Part A, B and C" CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.

REFERENCES:

1. Mohanakrishnan. A, "A few Novel and Interesting Innovative Irrigation Structures: Conceived, Designed and Executed in the Plan Projects in Tamil Nadu", Publ. No. 44 and Water Resources Development & Management Publ.No.43, IMTI Thuvakudy, Trichy,2011.
2. Raghunath, H.M. "Irrigation Engineering", Wiley India Pvt. Ltd., New Delhi, 2011.
3. Sharma R.K., "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co.,New Delhi, 2002.
4. Peary, H.S., ROWE, D.R., Tchobanoglous, G., "Environmental Engineering", McGraw-HillBookCo., New Delhi, 1995.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	2	2	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions			3	3	3	3
PO4	Investigation	2	2			2	2
PO5	Modern Tool Usage				2	2	2
PO6	Engineer and Society			3	3	3	3
PO7	Environment and Sustainability			2	3	3	3
PO8	Ethics	1	1	2	2	2	2
PO9	Individual and Teamwork	1	1	2	3	3	2
PO10	Communication					2	2
PO11	Project Management and Finance			2	2	2	2
PO12	Life Long Learning					3	3
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation			2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20147L69 **PROFESSIONAL COMMUNICATION** **LTPC**
0 0 2 1

COURSE OBJECTIVES:

The course aims to:

1. Enhance the Employability and Career Skills of students Orient the students towards grooming as a professional Make them Employable Graduates.
2. Develop their confidence and help them attend interviews successfully.

UNIT I **6**
Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills Grooming as a professional with values—Time Management—General awareness of Current Affairs.

UNIT II **6**
Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations.

UNIT III **6**
Introduction to Group Discussion— Participating in group discussions – understanding group dynamics – brainstorming the topic -– questioning and clarifying –GD strategies- activities to improve GD skills.

UNIT IV **6**
Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews.

UNIT V **6**
Recognizing differences between groups and teams- managing time-managing stress- networking professionally-respecting social protocols-understanding career management- developing a long-term career plan-making career changes.

TOTAL :30 PERIODS

OUTCOMES:
At the end of the course Learners will be able to:

- Make effective presentations.
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace.

Recommended Software:
1. Globearena.
2. Win English.

TEXT BOOKS:
1. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015.
2. Interact English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014.
5. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

COs-PO's & PSO's MAPPING :

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	3	3	1	3	3	3	3	1	3	1	3	-	-	-
2	2	3	3	2	3	3	3	3	1	3	3	3	-	-	-
3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-
4	2	2	2	2	2	2	2	2	3	3	3	3	-	-	-
5	2	2	2	2	2	2	2	2	2	3	2	3	-	-	-
Avg.	**2**	**2.6**	**2.6**	**2**	**2.6**	**2.6**	**2.6**	**2.6**	**2**	**3**	**2.4**	**3**	**-**	**-**	**-**

1- low,2-medium,3-high,'-"-no correlation.

20155C71   ESTIMATION, COSTING AND VALUATION ENGINEERING   L T P C
4 0 0 4

COURSE OBJECTIVE:
1. The students will acquire knowledge in estimation, tender practices, contract procedures, and valuation and will be able to prepare estimates, call for tenders and execute works.

UNIT I   QUANTITY ESTIMATION   9
Philosophy – Purpose – Methods of estimation – Types of estimates – Approximate estimates – Detailed estimate – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining walls – culverts (additional practice in class room using computer softwares).

UNIT II RATE ANALYSIS AND COSTING   9
Standard Data – Observed Data – Schedule of rates – Market rates – Standard Data for Man Hours and Machineries for common civil works – Rate Analysis for all Building works, canals, and Roads– Cost Estimates (additional practice in class room using Computer softwares) - (Analysis of rates for the item of work asked, the data regarding labour, rates of material and rates of labour to be given in the Examination Question Paper).

UNIT III SPECIFICATIONS, REPORTS AND TENDERS   9
Specifications – Detailed and general specifications – Constructions – Sources – Types of specifications – Principles for report preparation – report on estimate of residential building – Culvert – Roads – TTT Act 2000 – Tender notices – types – tender procedures – Drafting model tenders , E-tendering-Digital signature certificates- Encrypting -Decrypting – Reverse auctions.

UNIT IV CONTRACTS   9
Contract – Types of contracts – Formation of contract – Contract conditions – Contract for labour, material, design, construction – Drafting of contract documents based on IBRD / MORTH Standard bidding documents – Construction contracts – Contract problems – Arbitration and legal requirements.

UNIT V VALUATION   9
Definitions – Various types of valuations – Valuation methods - Necessity – Capitalised value – Depreciation – Escalation – Valuation of land – Buildings – Calculation of Standard rent – Mortgage – Lease.

TOTAL: 45 PERIODS

OUTCOMES:
1. Estimate the quantities for buildings.
2. Rate Analysis for all Building works, canals, and Roads and Cost Estimate.
3. Understand types of specifications, principles for report preparation, tender notices types.Gain knowledge on types of contracts.
4. Evaluate valuation for building and land.

TEXTBOOKS:
1. B.N Dutta 'Estimating and Costing in Civil Engineering', UBS Publishers & Distributors
   (P) Ltd, 2010.
2. B.S.Patil, 'Civil Engineering Contracts and Estimates', University Press, 2006.
3. D.N. Banerjee, 'Principles and Practices of Valuation', V Edition, Eastern Law House, 1998.

REFERENCES:
1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD.
2. Tamil Nadu Transparencies in Tenders Act, 1998.
3. Arbitration and Conciliation Act, 1996.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	2	1	1	2	2
PO3	Design/development of solutions	3	3	2	1	2	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	3	3	1	1	3	3
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	3	3	2	2	2	2
PO8	Ethics	2	2	2	2	2	2
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2	2	2	2
PO11	Project Management and Finance	3	3	2	2	2	2
PO12	Life Long Learning	3	3	3	3	3	3
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155C72 RAILWAYS, AIRPORTS, DOCKS AND HARBOUR ENGINEERING   L T P C
                                                                                        3 2 0 4

COURSE OBJECTIVE:

- To introduce the students about Railways planning, design, construction and maintenance andplanning design principles of airport and harbor.

UNIT I   RAILWAY PLANNING AND CONSTRUCTION   10
Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods--Geometric design of railway, gradient, super elevation, widening of gauge on curves- Level Crossings.

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE   8
Earthwork – Stabilization of track on poor soil - Track drainage – Calculation of Materials required for track laying - Construction and maintenance of tracks – Railway Station and yards and passenger amenities-Signalling.

UNIT III AIRPORT PLANNING   7
Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area.

UNIT IV AIRPORT DESIGN   10
Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings.

UNIT V HARBOUR ENGINEERING   10
Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Coastal Regulation Zone, 2011.

TOTAL: 45 PERIODS

OUTCOMES:
- Understand the methods of route alignment and design elements in Railway Planning and Constructions.
- Understand the Construction techniques and Maintenance of Track laying and Railway stations.
- Gain an insight on the planning and site selection of Airport Planning and design.
- Analyze and design the elements for orientation of runways and passenger facility systems. Understand the various features in Harbours and Ports, their construction, coastal protection worksand coastal Regulations to be adopted.

TEXTBOOKS:
1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, V Scitech Publications(India), Chennai, 2010
2. Saxena Subhash, C.and Satyapal Arora, A Course in Railway Engineering, Dhanapat Rai and Sons,Delhi, 1998

REFERENCES:
1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours,Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.
2. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi,2013.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	3	2	2	3		2
PO2	Problem analysis		3	3			3
PO3	Design/development of solutions		3	2		3	3
PO4	Investigation	2	2	2			2
PO5	Modern Tool Usage		2	2		2	2
PO6	Engineer and Society	3		3	3		3
PO7	Environment and Sustainability	1	2	3			2
PO8	Ethics	3	3	3	3		3
PO9	Individual and Teamwork		2			2	2
PO10	Communication	`			1		1
PO11	Project Management and Finance		2	3			3
PO12	Life Long Learning		3	3		2	3
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	2	3	3	2	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues				2	3	2

- 1-low,2-medium,3-high,'-"-no correlation.

20155C73   **STRUCTURAL DESIGN AND DRAWING**   **L T P C**
                                                                                3 2 0 4

COURSE OBJECTIVES:
- This course aims at providing students with a solid background on the principles of structuralengineering design.
- Students will be acquire the knowledge of liquid retaining structures, bridges components, retaining wall and industrial structures.

UNIT I RETAINING WALLS   **9+6**
Reinforced concrete Cantilever and Counter fort Retaining Walls–Horizontal Backfill with Surcharge–Design of Shear Key-Design and Drawing.

UNIT II FLAT SLAB and BRIDGES   **9+6**
Design of Flat Slabs with and without drops by Direct Design Method of IS code- Design and drawing.

UNIT III LIQUID STORAGE STRUCTURE   **9+6**
RCC Water Tanks - On ground, Elevated Circular, underground Rectangular Tanks–Hemispherical Bottomed Steel Water Tank –-Design and Drawing

UNIT IV INDUSTRIAL STRUCTURES   **9+6**
Structural steel Framing - Steel Roof Trusses – Roofing Elements – Beam columns – Codal provisions - Design and Drawing.

UNIT V GIRDERS AND CONNECTIONS   **9+6**
Plate Girders – Behaviour of Components-Deign of Welded Plate Girder-Design of Industrial Gantry Girders – Design of Eccentric Shear and Moment Resisting connections.

TOTAL: 75 PERIODS

OUTCOMES:

1. Design and draw reinforced concrete Cantilever and Counter fort Retaining Walls Design and draw flat slab as per code provisions.
2. Design and draw reinforced concrete and steel bridges.
3. Design and draw reinforced concrete and steel water tanks.
4. Design and detail the various steel trusses and cantry girders.

TEXTBOOKS:

1. Krishnaraju N, Structural Design and Drawing, Universities Press, 2009.
2. Punmia B.C,Ashok Kumar Jain and Arun KumarJain,Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

REFERENCES:

1. Krishnamurthy D,Structural Design and Drawing VolI,IIandIII,CBS Publishers, 2010.
2. Shah V L and Veena Gore,Limit State Design of Steel Structures
3. IS800-2007,Structures Publications, 2009.
4. IS 456(2000) Indian Standard Plain and Reinforced Concrete-Code of Practice, Bureau of IndianStandards, New Delhi.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	2	2	3	2	2	2
PO2	Problem analysis	2	2	2	2	3	2
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3		2	2
PO5	Modern Tool Usage		2	2	2		2
PO6	Engineer and Society				2		2
PO7	Environment and Sustainability	2			2		2
PO8	Ethics				2		2
PO9	Individual and Teamwork				2		2
PO10	Communication					1	1
PO11	Project Management and Finance		2	2	2		2
PO12	Life Long Learning	2	2	2	3	3	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	2	2	2	2	2
PSO2	Critical analysis of Civil Engineering problems and innovation	2	2	2	2	2	2
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues				3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155L76	**CREATIVE AND INNOVATIVE PROJECT**	**L T P C**
	(Activity Based - Subject Related)	**0 0 4 2**

COURSE OBJECTIVE:

- To use the knowledge acquired in Civil Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

TOTAL: 60 PERIODS

STRATEGY

- To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

20155L77	**INDUSTRIAL TRAINING**	**L T P C**
	(4 Weeks During VI Semester – Summer)	**0 0 0 2**

COURSE OBJECTIVE:

- To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems.

STRATEGY:

- The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOMES:

At the end of the course the student will be able to understand
- The intricacies of implementation textbook knowledge into practice.
- The concepts of developments and implementation of new techniques.

20155PW83	**PROJECT WORK**	**L T P C**
		0 0 30 10

COURSE OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review tillthe successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.

STRATEGY:

- The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL:300 PERIODS

OUTCOME:

- On Completion of the project work students will be in a position to take up any challenging practicalproblems and find solution by formulating proper methodology.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAM OUTCOMES (PO)							
PO1	Knowledge of Engineering Sciences	3	3	2	3	3	3
PO2	Problem analysis	1	3	2	2	1	3
PO3	Design/development of solutions	1	1	2	1	1	1
PO4	Investigation	1	1	2	1	1	1
PO5	Modern Tool Usage	3	3		3	3	3
PO6	Engineer and Society	3	3	2	3	3	3
PO7	Environment and Sustainability	3	3	2	3	3	3
PO8	Ethics	2		2	2	2	
PO9	Individual and Teamwork	2		2	2	2	
PO10	Communication	2		2	2	2	
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	1	1	1	1	1	1
PROGRAM SPECIFIC OUTCOMES (PSO)							

PSO1	Knowledge of Civil Engineering discipline	3	3	1	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	1	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	1	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

201AGPE	PROFESSIONAL ETHICS AND HUMAN	L T P C
		- - - 2

COURSE OBJECTIVE:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral andSocial Values and Loyalty and to appreciate the rights of others.

UNIT I   HUMAN VALUES   9

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II   ENGINEERING ETHICS   9

Senses of ̳Engineering Ethics‛ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg‛s theory – Gilligan‛s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III   ENGINEERING AS SOCIAL EXPERIMENTATION   9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlookon Law.

UNIT IV   SAFETY, RESPONSIBILITIES AND RIGHTS   9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority

– Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights –Employee Rights – Intellectual Property Rights (IPR)– Discrimination.

UNIT V   GLOBAL ISSUES   9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of the course, the student should be able to apply ethics in society. Discuss the ethical issues related to engineering and realize the responsibilities and rights in   the society.

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, ― Ethics in Engineering‖, Tata McGraw Hill,
2. New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ― Engineering Ethics‖, Prentice Hall of   India, New Delhi,2004.

REFERENCES:

1. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖,Cengage Learning, 2009.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E55A   **CONSTRUCTION EQUIPMENT AND AUTOMATION**   **L T P C**
3 0 0 3

COURSE OBJECTIVES:
- The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.
- At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

UNIT I CONSTRUCTION TECHNIQUES   9
   Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism – floor system - Development of construction techniques - High rise Building Technology - Seismic effect - Environmental impact of materials – responsible sourcing - Eco Building (Green Building) - Material used - Construction methods - Natural Buildings - Passive buildings - Intelligent(Smart) buildings - Meaning - Building automation - Energy efficient buildings for various zones-Case studies of residential, office buildings and other buildings in each zones.

UNIT II CONSTRUCTION PRACTICES   9
   Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick –– weather and water proof – roof finishes – acoustic and fire protection.

UNIT III SUB STRUCTURE CONSTRUCTION   9
   Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.

UNIT IV SUPER STRUCTURE CONSTRUCTION   9
   Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks.

UNIT V CONSTRUCTION EQUIPMENT   9
   Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching, mixing and concreting - Equipment for material handling and erection of structures – types of cranes - Equipment for dredging, trenching, tunneling,

                                                    TOTAL: 45 PERIODS

OUTCOMES:
- On successful completion of this course, students will be able to:
- know the different construction techniques and structural systems
- Understand various techniques and practices on masonry construction, flooring, and roofing.
- Plan the requirements for substructure construction.
- Know the methods and techniques involved in the construction of various types of super

structures.
- Select, maintain and operate hand and power tools and equipment used in the building construction sites.

TEXTBOOKS :
1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.

REFERENCES:
1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi,2002.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E55B   **PRINCIPLES OF ARCHITECTURE**

L T P C
3 0 0 3

AIM &OBJECTIVE:

- This course deals with the principles and design of architecture, Safety standards, Building rules and regulations, impacts of climate types in architecture , Principles of Landscape design.

UNIT I   ARCHITECTURAL DESIGN   **9**
Architectural Design – an analysis – integration of function and aesthetics – Introduction to basic elements and principles of design.

UNIT II   SITE PLANNING   **9**
Surveys – Site analysis – Development Control – Layout regulations- Layout design concepts.

UNIT III   BUILDING TYPES   **9**
Residential, institutional, commercial and Industrial – Application of anthropometry and space standards-Inter relationships of functions – Safety standards – Building rules and regulations – Integration of building services – Interior design

UNIT IV   CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN   **9**
Man and environment interaction- Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls – Green building concept

UNIT V   TOWN PLANNING   **9**
Planning – Definition, concepts and processes- Urban planning standards and zoning Regulations- Urban renewal – Conservation – Principles of Landscape design

TOTAL: 45 PERIODS

OUTCOMES:

- Get knowledge about data input and topology. Gain knowledge on data quality and standards.
- Understand data management functions and data output.

TEXT BOOKS:
1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2ndEdition, 2011.

REFERENCES
1. Francis D.K. Ching, "Architecture: Form, Space and Order", VNR, N.Y., 1999.
2. Givoni B., "Man Climate and Architecture", Applied Science, Barking ESSEX, 1982.
3. Edward D.Mills, "Planning and Architects Handbook", Butterworth London, 1995.
4. Gallian B.Arthur and Simon Eisner, "The Urban Pattern – City Planning and Design",Affiliated Press Pvt. Ltd., New Delhi, 1995.

5. Margaret Robert, "An Introduction to Town Planning Techniques".

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E55C	GEOGRAPHIC INFORMATION SYSTEM	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- To introduce the fundamentals and components of Geographic Information System.
- To provide details of spatial data structures and input, management and output processes.

UNIT I   FUNDAMENTALS OF GIS   9

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT II   SPATIAL DATA MODELS   9

Database Structures – Relational, Object Oriented – Entities – ER diagram - data models - conceptual, logical and physical models - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models.

UNIT III DATA INPUT AND TOPOLOGY   9

Scanner - Raster Data Input – Raster Data File Formats – Geo referencing – Vector Data Input – Digitiser – Datum Projection and re projection -Coordinate Transformation – Topology - Adjacency, connectivity and containment – Topological Consistency – Non topological file formats - Attribute Data linking – Linking External Databases – GPS Data Integration

UNIT IV   DATA QUALITY AND STANDARDS   9

Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards –Interoperability - OGC - Spatial Data Infrastructure

UNIT V   DATA MANAGEMENT AND OUTPUT   9

Import/Export – Data Management functions- Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GIS- distributed GIS.

TOTAL: 45 PERIODS

OUTCOMES:

- Have basic idea about the fundamentals of GIS.Understand the types of data models.
- Get knowledge about data input and topology. Gain knowledge on data quality and standards.
- Understand data management functions and data output.

TEXT BOOKS:

- Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2ndEdition, 2011.
- Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical InformationSystems, Pearson Education, 2nd Edition,2007.

REFERENCE:

- Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-HallIndia Publishers, 2006.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E55D	FORENSIC ENGINEERING & REHABILITATION	L T P C
		3 0 0 3

COURSE OBJECTIVE:

- To acquire the knowledge on Quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

UNIT I   FAILURE OF STRUCTURES   9

Review of the construction theory – performance problems – responsibility and accountability - Causes of distress in structural members -Design and material deficiencies – over loading

UNIT II   ENVIRONMENTAL PROBLEMS AND NATURAL HAZARDS   9

Quality assurance for concrete–Strength, Durability- Cracks, different types, causes–Effects due to climate, temperature, Sustained elevated temperature, Corrosion

UNIT III SPECIAL CONCRETES   9

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geo polymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT IV TECHNIQUES AND PROTECTION METHODS   9

Non-destructive Testing Techniques, Load Test for Stability-Epoxy injection, Shoring, Underpinning, Corrosion protection techniques–Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT V   RETROFITTING OF STRUCTURES   9

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage, earthquake-Transportation of Structures from one place to other –Structural Health Monitoring- demolition techniques-Engineered demolition methods-Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- The importance of maintenance and assessment method of distressed structures.
- The strength and durability properties ,their effects due to climate and temperature.
- Recent development in concretethe techniques for repair rand protection methods,repair, rehabilitation and retrofitting of structures and demolition methods.

TEXT BOOKS:

1. Shetty.M.S.ConcreteTechnology-Theory and Practice,S.Chandand Company, 2008..
2. Vidivelli.B Rehabilitation of Concrete Structures Standard Publishes Distribution.1st edition 2009.
3. Varghese.P.C Maintenance Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd 2014.
4. Dodge Woodson.R Concrete Structures, Protection, Repair and Rehabilitation, Butterworth- Heinemann,Elsevier,New Delhi 2012.

REFERENCES:

1. Dov Kominetzky.M.S.,-Design and Construction Failures, Galgotia,Publications Pvt.Ltd.,2001
2. Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair And Rehabilitation of Concrete Structures, Allied Publishers, 2004.

3. Hand book on Seismic Retrofit of Buildings,CPWD and Indian Buildings Congress, Narosa Publishers, 2008.

CO's- PO's & PSO's MAPPING:

PO/PSO		CO1	CO2	CO3	CO4	CO5	Overall Correlation of CO s to POs
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E55E   **ENERGY EFFICIENT BUILDINGS**   **L T P C**

                                                                      3 0 0 3

COURSE OBJECTIVE:

- To provide an understanding of the concept of energy consumption in buildings and design anenergy efficient building.

UNIT I   INTRODUCTION   9

Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent and sensible heat — Psychrometry Chart — Thermal Comfort — Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

UNIT IIPASSIVE SOLAR HEATING AND COOLING   9

General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trom be Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principlesof Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds– Cool Pools Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategiesfor Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers –Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

UNIT III   DAYLIGHTING AND ELECTRICAL LIGHTING   9

Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts – Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design – Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings –Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – PowerAdjustment Factors.

UNIT IV   HEAT CONTROL AND VENTILATION   9

Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation –Calculation of probable indoor wind speed.

UNIT V   DESIGN FOR CLIMATIC ZONES   9

Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Downdraft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis anddesign - Energy Audit ─ Certification.

                                                              TOTAL: 45 PERIODS

COURSE OUTCOMES :
- Environmental energy supplies on buildings.
- The passives heating, cooling system.

- Discuss the various aspects of day-lighting and electrical lighting in a building.
- Predict and design building ventilation and heat control for indoor comfort.
- Design a building for climatic zone and apply simulation programs of buildings to perform energy calculations.

REFERENCES :

- Energy Conservation Building Code, cau of Energy Efficiency, New Delhi, 2018.
- Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 (S and T) 1995.
- Residential Energy: Cost Savings and Comfort for Existing Buildings by John Krigger and ChrisDorsi, Published by Saturn Resource Management, 2013.
- Brown, G.Z. and DeKay, M., Sun, Wind and Light - Architectural Design Strategies, John Wileyand Sons Inc,3rd Edition, 2014.
- Majumdar, M (Ed), Energy - Efficient Buildings in India, Tata Energy Research Institute, Ministryof Non-Conventional Energy Sources, 2009.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E66A	ENERGY AND ENVIRONMENT	LTPC
		3 00 3

COURSE OBJECTIVES:

- Understanding of energy conservation options in various industrial processes.
- The knowledge of tools and techniques for energy auditing.
- About Energy Audit report including economic feasibility.

UNIT I: ENERGY SCENARIO 9

Primary and Secondary Energy, Commercial and Non-commercial Energy, Renewable and Non-Renewable Energy, Global and Indian Energy Scenario, Growing Energy Needs and Long-Term Energy Scenario for India, Energy Pricing in India, Energy Sector Reforms, Energy Security, Energy Strategy for the Future, Basics of Energy and Its Various Forms: Various Forms of Energy, Electrical Energy Basics, Thermal Energy Basics, Units and Conversions Energy

UNIT II: MATERIAL AND ENERGY BALANCE 9

Basic Principles, The Sankey Diagram and its Use, Material Balances, Energy Balances, Process Flow Chart, Facility as an Energy System, Energy Action Planning: Key elements, Formulation, Ratification. **Energy Audit:** ESCOs Energy Management & Government Programmes: BEE & State Development Agencies, Government & EESL Programmes, PAT Scheme, Ujala & SEEP Programmes, Municipal & Agriculture DSM Initiatives, Standards and Labelling Programme. Energy Audit: Types and Methodology, Energy Audit Report, Understanding Energy Costs, Maximizing System Efficiency, Fuel and Energy Substitution, Energy Audit Instruments

UNIT III: ENVIRONMENTAL AUDITING 9

Definition and types of audits, Guidelines for environmental auditing, methodologies for Environmental Auditing, Matrix methods and Battelle method of auditing, Types of projects requiring Environmental Clearance, EAC, EIA M. Tech. Energy & Environmental Engineering Scheme and Syllabus (w.e.f. 2020-21) 40 case studies, Legal requirements for environmental auditing. Restoration and rehabilitation technologies, Environmental planning, urban planning, rural planning and land use pattern.

UNIT IV: ENVIRONMENTAL IMPACT ASSESSMENT 9

Environment Impact Assessment (EIA) - Principles, Origin, development, types, issues, problems and limitations, environmental management plan, environmental impact statement (EIS), Strategic Environmental Assessment (SEA), EIA guidelines (1994) and notifications (Govt. of India 2006), Scope of EIA in project planning and implementation, Indian directions of EIA. Monitoring tools for EIA, surveys, spatial databases, experiments, models, Decision support system, Sources and collection of data for EIA, various appendices and forms for application.

UNIT V: COMPONENTS OF EIA 9

EIA methodology – project screening, scoping, base line data, impact identification, prediction, evaluation, mitigation. Assessment techniques – cost benefit analysis, analysis of alternatives, methods of prediction matrices, networks, checklists and overlays and assessment of impacts – air, water, soil, noise, biological, social, cultural, economical, environmental factors. EIA standards and guidelines, public participation- procedure of public hearing, presentation, review and decision making. Quality control – trends in EIA practice, evaluation criteria, expert system in EIA, use of regulations. Documentation and monitoring – Generic structure of EIA Document, planning, collection, use of display materials, team writing, checklist, environmental monitoring guidelines and policies, post audit.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- To identify the key aspects of energy and environmental audit Lay foundation on the concept and components of energy and environmental auditing and environmental impact assessment.
- Develop skill to evaluate the issues and problems in energy and environmental auditing and environmental impact assessment from the perspective of process, methods, and goals.

REFERENCES:

1. LC Witte, PS Schmidt and DR Brown: Industrial Energy Management and Utilization (Hemisphere Publishing Corporation, Washington, 1998).
2. Howard E. Jordan, Energy-Efficient Electric Motors and Their Applications., Plenum Pub Corp;   2ndedition (1994).
3. Giovanni Petrecca. Industrial Energy Management: Principles and Applications. The Kluwer   international series -207, 1999.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E66B   ENVIRONMENTAL POLICIES AND LEGISLATION   L T P C
3 0 0 3

COURSE OBJECTIVE:

- To impart knowledge on the policies, legislations, institutional frame work and enforcement mechanisms for environmental management in India.

UNIT I INTRODUCTION   9
Indian Constitution and Environmental Protection – National Environmental policies – Precautionary Principle and Polluter Pays Principle – Concept of absolute liability – multilateral environmental agreements and Protocols – Montreal Protocol, Kyoto agreement, Rio declaration – Environmental Protection Act, Water (P&CP) Act, Air (P&CP) Act – Institutional framework (SPCB/CPCB/MoEF)

UNIT II WATER (P&CP) ACT, 1974   8
Power & functions of regulatory agencies - responsibilities of Occupier Provision relating to prevention and control Scheme of Consent to establish, Consent to operate – Conditions of the consents – Outlet – Legal sampling procedures, State Water Laboratory – Appellate Authority – Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.

UNIT III AIR (P&CP) ACT, 1981   8
Power & functions of regulatory agencies - responsibilities of Occupier Provision relating to prevention and control Scheme of Consent to establish, Consent to operate – Conditions of the consents – Outlet – Legal sampling procedures, State Air Laboratory – Appellate Authority – Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.

UNIT IV ENVIRONMENT (PROTECTION) ACT 1986   13
Genesis of the Act – delegation of powers – Role of Central Government - EIA Notification – Sitting of Industries – Coastal Zone Regulation - Responsibilities of local bodies mitigation scheme etc., for Municipal Solid Waste Management - Responsibilities of Pollution Control Boards under Hazardous Waste rules and that of occupier, authorisation – Biomedical waste rules – responsibilities of generators and role of Pollution Control Boards

UNIT V OTHER TOPICS   7
Relevant Provisions of Indian Forest Act, Public Liability Insurance Act, CrPC, IPC -Public Interest Litigation - Writ petitions - Supreme Court Judgments in Landmark cases.
                                          TOTAL: 45 PERIODS
OUTCOMES:
- On completion of the course the students will have the knowledge on the National environmental legislations and the policies be able to plan programmes to comply with the legal requirements related to organizations.

REFERENCES:
1. CPCB "Pollution Control acts, Rules and Notifications issued there under "Pollution Control Series – PCL/2/1992, Central Pollution Control Board, Delhi, 1997. 9
2. Shyam Divan and Armin Roseneranz "Environmental law and policy in India "Oxford University Press, New Delhi, 2001.
3. Greger I.Megregor "Environmental law and enforcement", Lewis Publishers, London. 1994.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E66C   **SUSTAINABLE URBAN DEVELOPMENT CONCEPTS AND STRATEGIES**

L T P C
3 0 0 3

COURSE OBJECTIVES:
- To have an increased awareness among students on issues in the area of Sustainability.
- To understand the role of engineering and technology within sustainable development.
- To know the methods, tools and incentives for sustainable product-service system development.

UNIT I INTRODUCTION   9
Sustainability-Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable Development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act

UNIT II SUSTAINABLE DESIGN   9
Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport.

UNIT III SUSTAINABLE DESIGN   9
Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design. Sustainable cities, Sustainable transport.

UNIT IV SUSTAINABLE DESIGN   9
Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design. Sustainable cities, Sustainable transport.

UNIT V CLEAN TECHNOLOGY AND ENERGY   9
Energy sources: Basic conceptsConventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, biofuels, Energy Derived from oceans, Geothermal energy. Rain water harvesting.

TOTAL: 45 PERIODS

OUTCOMES:
- The students will gain understanding of sustainability concepts and development goals related to urban design and development.
- Students will be well versed with resilient strategies to combat global climate change and other emergencies.

REFERNCES:

1. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System

3. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
4. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E66D INSTRUMENTAL METHODS AND ANALYSIS OF ENVIRONMENTAL POLLUTANTS

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To impart knowledge on types and sources of air pollution, its effects and design of control methods

UNIT I AIR POLLUTION MONITORING AND MODELLING   8
Ambient and stack sampling and analysis of particulate and gaseous pollutants -effects of meteorology on air pollution - fundamentals, atmospheric stability, inversion, wind profiles and stack plume patterns- transport & dispersion of air pollutants – modelling techniques – Air Pollution climatology.

UNIT II CONTROL OF PARTICULATE POLLUTANTS   10
Factors affecting selection of control equipment; gas particle interaction, – working principle, design and performance equations of gravity separators, cyclones, Fabric filters, particulate scrubbers, electrostatic precipitators – operational considerations - costing of APC equipment – recent advances

UNIT III CONTROL OF GASEOUS POLLUTANTS   10
Factors affecting selection of control equipment -working principle, design and performance equations of absorption, adsorption, condensation, incineration, bio-scrubbers, bio-filters –control technologies-SO_2,NO_x CO, H_2S; process control and monitoring - operational considerations - costing of APC equipment –emerging trends,

UNIT IV AUTOMOBILE AND NOISE POLLUTION   9
Vehicular Pollution: Automobile emission- types of emissions- prevention and control of vehicular pollution. Noise Pollution: Sources and effects of noise pollution – measurement – standards – control and preventive measures. Indoor Air Pollution: Sources and effects –control and preventive measures

UNIT V CONTINUOUS MONITORING INSTRUMENTS   8
Principles, techniques and applications of NDIR analyzer for CO, chemiluminescent analyzer for NO_x, fluorescent analyzer for SO_2- particulates analysis- auto analyzer for water quality using flow injection analysis.

TOTAL: 45 PERIODS

OUTCOMES:
After completion of this course, the student is expected to be able to understand:
- Various types and sources of air pollution and its effects.
- Methods of source and ambient monitoring and dispersion of pollutants and their modeling.
- The principles and design of control of particulate pollutants.
- The principles and design of control of gaseous pollutant.
- Sources, effects and control of vehicular, indoor air and noise pollution.

REFERENCES:

1. Noel de Nevers, "Air Pollution Control Engg", McGraw Hill, New York, 2016.
2. Daniel Vallero "Fundamentals of Air Pollution", Fourth Edition, 2008.
3. Arthur C.Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
4. Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, 2004.
5. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.

6. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc., 2000.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E66E   **AIR POLLUTION AND CONTROL ENGINEERING**   **L T P C**
                                                                          3 0 0 3

COURSE OBJECTIVES:
- The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics. Students become conversant with the definition, purpose, location and materials of coastal structures such as piers, breakwaters, wharves, jetties, quays and spring fenders.
- The students acquire knowledge on site investigation for location and planning of harbours.

UNIT I AIRPORT PLANNING AND DESIGN   **8**
Components of airports – Airport planning – Runway design – Orientation – Wind rose diagram – Taxiway design – Separation distances – Design speed – Drainage.

UNIT II AIRPORT AND LAYOUTS   **10**
Airport zoning – Clearance over highways and railways – Airport layouts – Apron – Hangars – Terminal buildings – Airports buildings – Passenger flow – Passenger facilities.

UNIT III AIR TRAFFIC CONTROL   **8**
Visual aids – Runway and taxiway markings – Wind direction indicators – Runway and taxiway lightings – Air traffic control network – Helipads – Service equipments.

UNIT IV CONVEYANCE FROM THE SOURCE   **10**
Water supply — intake structures — Functions; Pipes and conduits for water — Pipe materials — Hydraulics of flow in pipes — Transmission main design — Laying, jointing and testing of pipes — appurtenances — Types and capacity of pumps — Selection of pumps and pipe materials.

UNIT V COASTAL STRUCTURES   **9**
Piers – Sliways – Breakwaters – Wharves – Jetties – Quays – Spring fenders – Coastal shipping – Inland water transport – Container transportation – Pipe ways – Rope ways.

                                                            TOTAL: 45 PERIODS
OUTCOMES:

- Develop skill to evaluate the issues and problems in energy and environmental auditing and environmental impact assessment from the perspective of process, methods, and goals.

TEXT BOOKS:
1. Khanna, S.K., Arora, M.G. and Jain, S.S., "Airport Planning and Design", Namchand and Brother,1999.
2. Bindra, S.P., "A course in Docks and Harbour Engineering", Dhanpat Rai and Sons, 1993.

REFERENCES:
1. Seetha Raman, S., "Docks and Harbour Engineering ", Umesh Publications, 1992.
2. Ranga Wala, S., "Airport Engineering ", Chasotar Publishing House , 1996.
3. Vazirani and Chandolas, S.P., "Transportation Engineering", Khanna Publications, 1991.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E75A   BUILDING AUTOMATION AND MANAGEMENT SYSTEMS   L T P C
                                                              3 0 0 3

COURSE OBJECTIVES:

- To give introduction to automation and management systems in buildings.
- To give knowledge about specific systems in the field of fire safety, security, communication, HVAC, lighting, climate control, etc.,
- To give information about integration of systems with each other and with building construction.

UNIT I INTRODUCTION TO BUILDING AUTOMATION AND CONTROL SYSTEMS   9

Introduction to and History of Building Automation Systems (BAS). Building Types and Key Requirements. Different systems in BAS which includes HVAC, security and surveillance, communication, fire, lighting systems, climate control, etc. Ideas of intelligent buildings, Human Machine Interface (HMI), facilities management and life cycle costs. The fundamental concepts of building control, and building automation. Control Theory. Building automation topics include device 97 technology (sensors, control elements), direct digital control, control applications, communication systems, and Building Automation Protocols. Role of different stakeholders (Architect, contractor, consultant, application engineer and engineer) in BAS system design.

UNIT II FIRE SAFETY SYSTEMS   9

Statutory Standards and codes for fire safety. Objective and essential components and working of a Fire Alarm System. Type of detection technology in the Fire alarm system. Basic knowledge on working, design and installation of Fire alarm system.Fire suppression systems. Components, working andinstallation. various types of technologies currently in use.

UNIT III SECURITY, SURVEILLENCE AND COMMUNCATION SYSTEMS   6

Introduction to Access Control, Intruder Alarm, Essential Components of each System, and Various types of Technologies employed in the system, Basic knowledge as how they work, are designed and installed. Introduction to CCTV, Perimeter protection system, Essential Components of each System, and Various types of Technologies employed in the system, Basic knowledge as how they work, are designed and installed. Public Address System and other communication systems and their requirements.

UNIT IV HVAC, LIGHTING, CLIMATE CONTROL   12

Building Automation and Control Systems for HVAC, Lighting and Climate Control. Energy Conservation Control Strategies.

UNIT V INTEGRATED BUILDING MANAGEMENT SYSTEM   9

Overview of various components, technology, sensors, etc., that are common to more than one system. Integrated Building Management System IBMS. Integrated approach in design, maintenance and management system. Current trend and innovation in building automation systems. Impact of Information Technology.

TOTAL: 45 PERIODS

OUTCOME:

- Overall knowledge of building automation and managements systems.
- Knowledge about different building automation control systems.
- Overall understanding of integration of different systems with each other and with architecture.

TEXTBOOKS:
  1. Building Automation Systems – A Practical Guide to Selection and Implementation, Maurice Eyke.
  2. National Building Code of India.

REFERENCES:
    1. George Clifford , Modern Heating Ventilating and Air Conditioning.
    2. Vaughn Bradshaw , Building control Systems.
    3. Roger W. Haines, HVAC Systems Design Handbook, Fifth Edition by 5.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

  - 1-low,2-medium,3-high,'-"-no correlation.

20155E75B   DESIGN OF PRESTRESSED CONCRETE STRUCTURES   L T P C
3 0 0 3

COURSE OBJECTIVES:
- To introduce the need for prestressing in a structure.
- To explain the methods, types and advantages of prestressing to the students.
- To make the students to design a prestressed concrete structural elements and systems.
- To introduce the students the effect of prestressing in the flexural and shear behaviour of structural elements.

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR   12
Basic concepts – Advantages and disadvantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width.

UNIT II DESIGN FOR FLEXURE AND SHEAR   12
Basic assumptions of flexural design – Permissible stresses in steel and concrete as per I.S.1343 Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE   12
Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAM   12
Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V TENSION AND COMPRESSION MEMBERS   12
Role of prestressing in members subjected to Tensilr forces and compressive forces - Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL: 60 PERIODS

OUTCOMES:
- Understand the behaviour of prestressed concrete members and able to analyze the prestressed concrete beams.
- Design the prestressed concrete members for flexure and shear as per the relevant design code (IS1343).
- Analyze for deflection of prestressed concrete members and design the anchorage zone. Analyze and design of composite beams and continuous beams.
- Design of prestressed concrete structures - sleepers, Tanks, pipes and poles.

TEXTBOOKS:
1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012.
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt.

REFERENCES:
1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E75C   **PAVEMENT DESIGN**   **L T P C**
                                                     3 0 0 3

COURSE OBJECTIVE:
   • Student gains knowledge on various IRC guidelines for designing rigid and flexible
   pavements. Further, the student will be in a position to assess quality and serviceability
   conditions of roads.

UNIT I PAVEMENT MATERIALS AND SUBGRADE ANALYSIS   **8**
Introduction – Pavement as layered structure – Pavement types -rigid and flexible-Subgrade
analysis- Stress and deflections in pavements- Pavement Materials and Testing- Modified
Binders.

UNIT II DESIGN OF FLEXIBLE PAVEMENTS   **10**
Flexible pavement design – Advantages and disadvantages -Factors influencing design of flexible
pavement, Empirical – Mechanistic empirical and theoretical methods – Design procedure as per
IRC guidelines – Design and specification of rural roads.

UNIT III DESIGN OF RIGID PAVEMENTS   **9**
Cement concrete pavements Factors influencing CC pavements – Modified Westergaard approach
– Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT IV PAVEMENT CONSTRUCTION, EVALUATION AND MAINTENANCE   **10**
Construction Techniques practice of flexible and concrete pavement Pavement Evaluation -
Causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance,
Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural
Evaluation by Deflection Measurements - Pavement Serviceability index, - Pavement
maintenance (IRC Recommendations only).

UNIT V STABILIZATION OF PAVEMENTS   **8**
Stabilization with special reference to highway pavements – Choice of stabilizers – Testing and
field control - Stabilization for rural roads in India – Use of Geosynthetics in roads.
                                                TOTAL: 45 PERIODS

COURSE OUTCOMES
   • Get knowledge about types of rigid and flexible pavements.
   • Able to design of rigid pavements.
   • Able to design of flexible pavements.
   • Determine the causes of distress in rigid and flexible pavements.
   • Understand stabilization of pavements, testing and field control.

TEXTBOOKS:
   1. Khanna, S.K. and Justo C.E.G.and Veeraragavan, A, "Highway Engineering", New Chand
      and Brothers, Revised 10th Edition,2014.
   2. Kadiyali, L.R., "Principles and Practice of Highway Engineering", Khannatech.
      Publications, New Delhi,2015. REFERENCES: 1. Yoder, R.J. and Witchak M.W.
      "Principles of Pavement Design", John Wiley2000. 2. Guidelines for the Design of Flexible
      Pavements, IRC-37–2012, The Indian roads Congress, NewDelhi.
   3. Guideline for the Design of Rigid Pavements for Highways, IRC 58-2018, The Indian
      Road Congress, NewDelhi.

REFERENCES:
- John L. Bryan, Fire Suppression Detection System.
- Vivian Capel, Security Systems and Intruder Alarm System.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E75D   **TOWN PLANNING**   **L T P C**
                                                                3 0 0 3

COURSE OBJECTIVE:
- To enable students to have the knowledge on planning process and to introduce to the students about the regulations and laws related to Urban Planning.

UNIT I BASIC ISSUES   8
Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri-urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanisation at International, National, Regional and State level.

UNIT II PLANNING PROCESS   8
Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Surveys and Questionnaire Design.

UNIT III DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION 10
Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights , Special Economic Zones- Development of small town and smart cities-case studies.

UNIT IV PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS   9
Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.

UNIT V LEGISLATION, DEVELOPMENT AND MANAGEMENT OF URBAN SYSTEM   10
Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.

TOTAL : 45 PERIODS

OUTCOMES:
- The students completing the course will have the ability to
- Understand the basic concepts in urban planning and development.
- Knowledge on principles of planning, surveys and analysis. in developing an urban area.
- Knowledge on development of regional, master plan and norms for development of smart cities.
- Planning of standards, implanting and financing of Urban projects.
  Understand the norms, legal aspects and stakeholders role in planning an urban area.

TEXTBOOKS:

1. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi 2002
2. George Chadwick, A Systems view of planning, Pergamon press, Oxford 1978
3. Singh V.B, Revitalised Urban Administration in India, Kalpaz publication, Delhi, 2001 4. Edwin S.Mills and Charles M.Becker, Studies in Urban development, A World Bank publication, 1986.

REFERENCES:

1. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu, Chennai.
2. Goel S.L., Urban Development and Management, Deep and Deep Publications, New Delhi,2002.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E75E   **SMART MATERIALS AND SMART STRUCTURES**   **L T P C**
                                                                         2   0 0 3

COURSE OBJECTIVES:
- Overview of smart materials, Piezoelectric Ceramics, Piezo-polymers, Magnetostrictive Materials,
- Electroactive Polymers, Shape Memory Alloys, Electro and Magneto Rheological Fluids, Modelling of smart materials, introduction to composite smart materials, Mechanics of smart composite materials,
- Smart sensors based on high bandwidth low strain smart materials, Low-bandwidth high strain smart actuators, Micro-electro mechanical Smart Systems, Intelligent devices based on smart materials, Applications of Smart Actuators.
- Active and Hybrid Vibration Control, Active Shape Control, Distributed Sensing and Control of Smart Beams.

UNIT I OVERVIEW OF SMART MATERIALS   9
Introduction to Smart Materials, Principles of Piezoelectricty, Perovskyte Piezoceramic Materials, Single Crystals vs Polycrystalline Systems, Piezoelectric Polymers, Principles of Magnetostriction, Rare earth Magnetostrictive materials, Giant Magnetostriction and Magneto-resistance Effect, Introduction to Electro-active Materials, Electronic Materials, Electro-active Polymers, Ionic Polymer Matrix Composite (IPMC), Shape Memory Effect, Shape Memory Alloys, Shape Memory Polymers, Electro-rheological Fluids, Magneto Rhelological Fluids.

UNIT II HIGH-BAND WIDTH, LOW STRAIN SMART SENSORS   9
Piezoelctric Strain Sensors, In-plane and Out-of Plane Sensing, Shear Sensing, Accelerometers, Effect of Electrode Pattern, Active Fibre Sensing, Magnetostrictive Sensing, Villari Effect, Matteuci Effect and Nagoka-Honda Effect, Magnetic Delay Line Sensing, Application of Smart Sensors for Structural Health Monitoring (SHM), System Identification using Smart Sensors.

UNIT III SMART ACTUATORS   9
Modelling Piezoelectric Actuators, Amplified Piezo Actuation – Internal and External Amplifications, Magnetostrictive Actuation, Joule Effect, Wiedemann Effect, Magnetovolume Effect, Magnetostrictive Mini Actuators, IPMC and Polymeric Actuators, Shape Memory Actuators, Active Vibration Control, Active Shape Control, Passive Vibration Control, Hybrid Vibration Control.

UNIT IV SMART COMPOSITES   9
Review of Composite Materials, Micro and Macro-mechanics, Modelling Laminated Composites based on Classical Laminated Plate Theory, Effect of Shear Deformation, Dynamics of Smart Composite Beam, Governing Equation of Motion, Finite Element Modelling of Smart Composite Beams.

UNIT V ADVANCES IN SMART STRUCTURES & MATERIALS   9
Self-Sensing Piezoelectric Transducers, Energy Harvesting Materials, Autophagous Materials, SelfHealing Polymers, Intelligent System Design, Emergent System Design.

TOTAL: 45 PERIODS

OUTCOMES:

1. Understand the concepts of various design philosophies.
2. Design common bolted and welded connections for steel structures.
3. Design tension members and understand the effect of shear lag.
4. Understand the design concept of axially loaded columns and column base connections. Understand specific problems related to the design of laterally restrained and unrestrained steelbeams.

TEXT BOOKS:
1. Subramanya.K " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited,New Delhi, 2010.
2. Rajput.R.K. "Fluid Mechanics", S.Chand and Co, New Delhi, 2008.

REFERENCES:
1. Brian Culshaw, Smart Structures and Materials, Artech House, 2000.
2. Gauenzi, P., Smart Structures, Wiley, 2009.
3. Cady, W. G., Piezoelectricity, Dover Publication.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3

| PSO2 | Critical analysis of Civil Engineering problems and innovation | 3 | 3 | 3 | 3 | 3 | 3 |
| PSO3 | Conceptualization and evaluation of engineering solutions to Civil Engineering Issues | 3 | 3 | 3 | 3 | 3 | 3 |

- 1-low,2-medium,3-high,'-"-no correlation.

ELECTIVE IV

20155E81A	ENVIRONMENTAL ECONOMICS	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- To provide a sufficient understanding of economic thinking so as to critically evaluate environmental issues and provide policy recommendations to improve related problems
- To apply the basic economic theory to issues involving the joint interaction of economic activity,the environment, and use of natural resources including valuing environment to introduce market based instruments and economic policies for environmental management.

UNITI INTRODUCTION TO ECONOMICS   10
Principles of Economics – Economics, Ecology and Ethics - Wealth, Welfare, Scarcity, Growth and Sustainability definitions -– Concepts of Costs, Benefits, Opportunity costs , Social Costs – Marginal Costs and Marginal Benefits - Positive and Normative criteria for decision making - Consumer Choice theory –Supply and Demand– Economic Efficiency and Markets–Static and dynamic efficiency - market failures – property rights, externalities and environmental problems – Coase Theorem - Public Goods and Externalities - Free rider problem – Tragedy of the commons.

UNITII VALUATION OF ENVIRONMENTAL COSTS AND BENEFITS   9
Types of Economic value - Environmental Benefits and Environmental Costs - Valuing the Environment – Direct and indirect methods – Surrogate markets – Stated Preference and Revealed Preference methods- hedonic prices, travel cost models, contingent valuation, benefit transfer – economic valuation of ecosystem services- Assessment of Loss of Ecology - Valuation of Health impacts - Environmental accounting.

UNITIII ECONOMICS OF POLLUTION PREVENTION   9
Economics of Environmental Quality- - Cost benefit analysis and Cost effectiveness analysis – Principles, methodology and Limitations – Discounting - Profitability of Pollution Prevention - Pay back period – Present value estimation – Internal rate of return – Opportunity costs – Economic analysis of Pollution Prevention Case studies –economically efficient pollution control programmes – Economics of Enforcement - Efficient allocation of pollution from mobile and stationery source – Total Cost Assessment- Life cycle costing-Green Accounting and Economic indicators.

UNIT IV ECONOMIC INSTRUMENTS FOR ENVIIRONMENTAL PROTECTION   9
Point vs. Nonpoint Sources - Stock vs. Fund Pollutants - Nature of Marginal abatement cost and that of Marginal damage cost -Efficient level of pollution, total cost of efficient level of pollution - Polluter pays Principle –Economic Optimum level of Pollution- Marginal Damage Functions – Marginal Abatement Costs - Allocation of Stock and Fund Pollutants - Economic analysis of Environmental Policy -Regulatory versus Economic Instruments – Decentralized Policies: Liability Laws, Property Rights,and Moral Suasion - Command-and-Control Strategies - Pigovian and Pollution Taxes – Incentive-Based Strategies: Emission Charges and Subsidies– Marketable permits – Emission trading -– Non Compliance fees, bonds and deposit refunds –Evaluation of Instruments – Choice of instruments for Environmental policy.

UNIT V NATURAL RESOURCE ECONOMICS   8
Types, scarcity and classification of Natural Resources – Depletable and non renewable resources – Recyclable resources – Replenishable but depletable resources – Storable renewable resources

– Renewable common property Resources– Economic Theory of Depletable Resources- Optimal Use of Exhaustible Resources- – Natural resources accounting - Economics of Forestry and fisheries exploitation –Trade and environment – Income Effects and Environmental Kuznets Curves – Race to the Bottom and Pollution Haven Hypothesis - Porter Hypothesis - Economics of Climate Change.

TOTAL: 45 PERIODS

OUTCOMES :
- A student completing the course is expected to be able to understand concepts of willingness to pay, public goods, property rights, market and nonmarket valuation techniques explain why optimal pollution levels, suggest policies within the cost benefit analysis framework have a good appreciation of the economics of exhaustible resources and renewable resources.

REFERENCES:
1. Barry Field and Martha Field, Environmental Economics: An Introduction, McGraw-Hill
2. Kolstad, Charles, (2011),"Environmental Economics", Oxford University Press, New York 3. John Asafu Adjaye, "Environmental Economics for non-Economists – techniques and policies for Sustainable Development, World Scientific,2005.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							

PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E81B   SIMULATION AND MODELING IN ENVIRONMENTAL
SYSTEMS   **L T P C**
                                                       3 0 0 3

COURSE OBJECTIVES:
- To impart an understanding of systems approach to Environmental Management as per ISO 14001 and skills for environmental performance assessment in terms of legal compliance, pollution prevention and continual improvement.

UNIT I ENVIRONMENTAL MANAGEMENTSTANDARDS   9
Unique Characteristics of Environmental Problems - Classification of Environmental Impact Reduction Efforts - Systems approach to Corporate environmental management - Business Charter for Sustainable Production and Consumption – Tools and Barriers - Evolution of Environmental Stewardship –National policies on abatement of pollution and conservation of resources - Charter on Corporate responsibility for Environmental protection - Environmental quality objectives – Rationale of Environmental standards: Concentration and Mass standards, Effluent and stream standards, Emission and ambient standards, Minimum national standards, environmental performance evaluation: Indicators, benchmarking

UNIT II PREVENTIVE ENVIRONMENTAL MANAGEMENT   9
Pollution control Vs Pollution Prevention - Opportunities and Barriers – Cleaner production and Clean technology, closing the loops, zero discharge technologies – Four Stages and nine approaches of Pollution Prevention - Getting management commitment – Analysis of Process Steps- source reduction, raw material substitution, toxic use reduction and elimination, process modification – Material balance – Technical, economical and environmental feasibility evaluation of Pollution Prevention options in selected industries – Preventive Environmental Management over Product cycle.

UNIT III ENVIRONMENTAL MANAGEMENT SYSTEM   10
ISO 14000 family- EMS as per ISO 14001– benefits and barriers of EMS – Understanding the organisation and its context- Understanding the needs and expectations of interested parties- Determining the scope of the environmental management system- Leadership and commitment- Environmental policy- Organizationalroles, responsibilities and authoritiesActions to address risks and opportunities- Environmental objectives and planning – Resources- Competence-Awareness- Communication-Documented Information –Operational Planning and Control- Emergency preparedness and response- Monitoring, measurement, analysis and evaluation - Management review.

UNIT IV ENVIRONMENTAL AUDIT   8
Environmental management system audits as per ISO 19011-Internal Audits and Certification Audits – Principles of auditing- Roles and qualifications of auditors - Determining auditor competence- Managing an audit programme – Establishing and Implementing audit programme- Selecting audit team members and Assigning responsibility - Conducting an audit- opening meeting, Audit evidence gathering - Collecting and verifying information - Managing and maintaining audit programme records- closing meeting and reporting - Non conformance – Corrective and preventive actions - Continual improvement - compliance audits – waste audits and waste minimization planning – Environmental statement (form V) - Due diligence audit

UNIT V CASE STUDIES   9
Case studies on applications of EMS, Waste Audits and Pollution Prevention in Textile industry , Tanning industry, Electroplating, Pulp & Paper, Dairy, Chemical industries and service organizations.

                                                   TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Explain the various elements of Corporate Environmental Management systems and audits complying to international environmental management system standards.
- Apply the knowledge of science and engineering fundamentals to pollution prevention assessment and environmental performance evaluation.

REFERENCES:

1. ISO 14001/14004:2016 Environmental management systems – Requirements and Guidelines – International Organisation for Standardisation, 2015.
2. ISO 19011: 2018, "Guidelines for auditing Management Systems, International Organisation for Standardisation, 2018.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E81C   MEMBRANE SEPARATION FOR WATER AND WASTE WATER

                                                              L T P C
                                                              3 0 0 3

COURSE OBJECTIVES:

- To introduce the concept and principles of membrane separation and its applications in water and wastewater treatment.

UNIT I MEMBRANE FILTRATION PROCESSES   **10**

Solid Liquid separation systems- Theory of Membrane separation – mass Transport Characteristics - Cross Flow filtration - Membrane Filtration- Flux and Pressure drop -Types and choice of membranes, porous, non porous, symmetric and asymmetric – Plate and Frame, spiral wound and hollow fibre membranes – Liquid Membranes.

UNIT II MEMBRANE SYSTEMS   **10**

Microfiltration principles and applications – Ultra filtration principles and applications - Nano Filtration principles and applications – Reverse Osmosis: Theory and design of modules, assembly, plant process control and applications – Electro dialysis : Ion exchange membranes, process design-Pervaporation – Liquid membrane – Liquid Pertraction – Supported Liquid Membrane and Emulsion Liquid membrane - Membrane manufactures – Membrane Module/Element designs – Membrane System components – Design of Membrane systems - pump types and Pump selection – Plant operations – Economics of Membrane systems.

UNIT III MEMBRANE BIOREACTORS   **9**

Introduction and Historical Perspective of MBRs, Biotreatment Fundamentals, Biomass Separation MBR Principles, Fouling and Fouling Control, MBR Design Principles, Design Assignment, Alternative MBR Configurations, Commercial Technologies, Case Studies.

UNIT IV PRETREATMENT SYSTEMS   **8**

Membrane Fouling – Control of Fouling and Concentration Polarisation-Pretreatment methods and strategies – monitoring of Pretreatment – Langlier Index, Silt Density Index, Chemical cleaning , Biofoulant control.

UNIT V CASE STUDIES   **8**

Case studies on the design of membrane based water and wastewater treatment systems – zero Liquid effluent discharge Plants – Desalination of brackish water.

                                                     TOTAL : 45 PERIODS

OUTCOMES:

- On Completion of the Course the student will be familiar with main membrane processes, principles, separation mechanisms, and applications
- Understand the selection criteria for different membrane processes
- Know the principle of the most common membrane applications and Carry out design of project for a particular membrane technology application.

REFERENCES:

1. Anthony Wachinski, Membrane Processes for water reuse, McGraw-Hill, USA, 2013
2. WEF, Membrane Bioreactors, WEF manual of Practice No.36, Water Environment Federation, USA.2012.
3. Symon Jud, MBR Book – "Principles and application of MBR in water and wastewater treatment", Elservier, 2006.
4. Baker, R.W., "Membrane technology and applications", 2nd., John Wiley 2004 7 Noble, R.D. and Stern, S.A., "Membrane Separations Technology: Principles and Applications", Elservier,Netherlands,1995.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E81D THEORY AND PRACTICE OF INDUSTRIAL WASTEWATER TREATMENT
.   **L T P C**
                                                                                     3 0 0 3
COURSE OBJECTIVES:
- To impart knowledge on the concept and application of Industrial pollution prevention, cleaner technologies, industrial wastewater treatment and residue management.
- Understand principles of various processes applicable to industrial wastewater treatment
- Identify the best applicable technologies for wastewater treatment from the perspective of yield production.

UNIT I INTRODUCTION   8
Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater monitoring and sampling - generation rates, characterization and variables –Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management.

UNIT II INDUSTRIAL POLLUTION PREVENTION & WASTE MINIMISATION   8
Prevention vis a vis Control of Industrial Pollution – Benefits and Barriers – Waste management Hierarchy - Source reduction techniques – Periodic Waste Minimisation Assessments – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay-back period – Implementing & Promoting Pollution Prevention Programs in Industries.

UNIT III INDUSTRIAL WASTEWATER TREATMENT   10
Flow and Load Equalisation – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation – Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis & Evaporation – Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced Oxidation processes – Treatability Studies.

UNIT IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT   9
Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.

UNIT V CASE STUDIES   10
 Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining–Pharmaceuticals–Sugar and Distilleries

                                                                  TOTAL: 45 PERIODS
OUTCOMES:
- After completion of this course, the students is expected to be able to, define the Principles of pollution prevention and mechanism of oxidation processes suggest the suitable technologies for the treatment of wastewater.
- Discuss about the wastewater characteristics.
- Design the treatment systems.

REFERENCES:

1. "Industrial wastewater management, treatment & disposal, Water Environment" Federation Alexandria Virginia, Third Edition, 2008.

2. Lawrance K.Wang, Yung Tse Hung, Howard H.Lo and Constantine Yapijakis "handlook of Industrial and Hazardous waste Treatment", Second Edition, 2004.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E81E   **GEO – ENVIRONMENTAL ENGINEERING   L T P C**

                                                                   3 0 0 3

COURSE OBJECTIVE:
- To provide an understanding of the concept of energy consumption in buildings and design anenergy efficient building.

UNIT I   INTRODUCTION   9
Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – ThermalStorage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent andsensible heat — Psychrometry Chart — Thermal Comfort — Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

UNIT IIPASSIVE SOLAR HEATING AND COOLING   9
General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trom be Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds– Cool Pools Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers –Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

UNIT III   DAYLIGHTING AND ELECTRICAL LIGHTING   9
Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts –Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lightingdesign – Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings –Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – PowerAdjustment Factors.

UNIT IV   HEAT CONTROL AND VENTILATION   9
Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission throughbuilding sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation –Calculation of probable indoor wind speed.

UNIT V   DESIGN FOR CLIMATIC ZONES   9
Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Downdraft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hotand dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis and design - Energy Audit ─ Certification.

                                                        TOTAL: 45 PERIODS

COURSE OUTCOMES :
- Environmental energy supplies on buildings.
- The passives heating, cooling system.
- Predict and design building ventilation and heat control for indoor comfort.
- Design a building for climatic zone and apply simulation programs of buildings to performenergy calculations.

REFERENCES :
- Energy Conservation Building Code, cau of Energy Efficiency, New Delhi, 2018.
- Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 (S and T) 1995.
- Residential Energy: Cost Savings and Comfort for Existing Buildings by John Krigger and ChrisDorsi, Published by Saturn Resource Management, 2013.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E82A   **AIRPORT & WATERWAYS ENGINEERING**

                                                                    LT P C
                                                                    3 0 0 3

COURSE OBJECTIVE:

- The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics. Students become conversant with the definition, purpose, location and materials of coastal structures such as piers, breakwaters, wharves, jetties, quays and spring fenders.
- The students acquire knowledge on site investigation for location and planning of harbours.

UNIT I   AIRPORT PLANNING AND DESIGN   8
Components of airports – Airport planning – Runway design – Orientation – Wind rose diagram – Taxiway design – Separation distances – Design speed – Drainage.

UNIT II   AIRPORT AND LAYOUTS   10
Airport zoning – Clearance over highways and railways – Airport layouts – Apron – Hangars – Terminal buildings – Airports buildings – Passenger flow – Passenger facilities.

UNIT III   AIR TRAFFIC CONTROL   8
Visual aids – Runway and taxiway markings – Wind direction indicators – Runway and taxiway lightings – Air traffic control network – Helipads – Service equipments.

UNIT IV   CONVEYANCE FROM THE SOURCE   10

Water supply — intake structures — Functions; Pipes and conduits for water — Pipe materials — Hydraulics of flow in pipes — Transmission main design — Laying, jointing and testing of pipes — appurtenances — Types and capacity of pumps — Selection of pumps and pipe materials.

UNIT V   COASTAL STRUCTURES   9
Piers – Sliways – Breakwaters – Wharves – Jetties – Quays – Spring fenders – Coastal shipping – Inland water transport – Container transportation – Pipe ways – Rope ways.
                                                          TOTAL: 45 PERIODS

OUTCOMES:

• The students obtain the complete knowledge on hydrologic cycle, hydrometeorology and formation of precipitation.

TEXT BOOKS
1. Khanna, S.K., Arora, M.G. and Jain, S.S., "Airport Planning and Design", Namchand and Brother,1999.
2. Bindra, S.P., "A course in Docks and Harbour Engineering", Dhanpat Rai and Sons, 1993.

REFERENCES
1. Seetha Raman, S., "Docks and Harbour Engineering ", Umesh Publications, 1992.
2. Ranga Wala, S., "Airport Engineering ", Chasotar Publishing House , 1996.
3. Vazirani and Chandolas, S.P., "Transportation Engineering", Khanna Publications, 1991.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E82B   **SURFACE WATER HYDROLOGY**   **L T P C**
                                                                                3 0 0 3

COURSE OBJECTIVE:

- This subject aims at making the students to understand the relevance of various components of hydrologic cycle, which are responsible for spatial and temporal distribution of water availability in any region.

UNIT I HYDROMETEOROLOGY   9
Hydrologic cycle – Global water budget – Practical applications – Hydrometeorology – Constituents of atmosphere – Vertical structure of the atmosphere – general circulation – Transitory system – Air mass – Air front – cyclones – Formation of precipitation – Types and forms of precipitation – Climate and Weather – Meteorological Observations.

UNIT II PRECIPITATION   8
Measurement of rainfall – Rain gauges – Radar Measurement of rainfall - Rainfall Hyetograph – Intensity Duration and Frequency analysis – Consistency – Missing data – Rain gauge network – Average depth of rainfall analysis – Spatial analysis using GIS – Annual rainfall of India and Tamilnadu.

UNIT III ABSTRACTIONS   8
Water losses - Initial losses – Interception and depression storage – Evaporation – Evaporimeters – Estimation of Evaporation - Evapotranspiration – Field Measurement – Empirical Equations - Infiltration – Infiltrometers – Infiltration Equations - Infiltration Indices.

UNIT IV STREAMFLOW MEASUREMENT   8
Stage and Velocity Measurement – Gauges – Current meter and Doppler flow velocity meter - Discharge measurement – Area Velocity method - Area Slope method – Discharge Measuring Structures - Dilution Technique – Stage Discharge relationship – Selection of a Stream Gauging Site.

UNIT V RUNOFF AND WATER CONSERVATION   12
Concept of catchment – Linear, Areal and Relief Aspects – Detailed study of Runoff process – Factors affecting Runoff – Hydrograph – Unit Hydrograph – Synthetic Hydrograph –Runoff estimation - Strange and SCS methods – Water Conservation – Rain water and Runoff Harvesting in Rural and Urban Areas - Reservoir Sedimentation.

                                                                      TOTAL: 45 PERIODS

OUTCOMES:
- The students obtain the complete knowledge on hydrologic cycle, hydrometeorology and formation of precipitation.
- The students are able to apply the various methods of field measurements and empiricalformulas for estimating the various losses of precipitation, stream flow and runoff.
- The students know the various methods of rainwater and runoff harvesting.
- Then apply the knowledge of soil erosion and sedimentation to estimate the life of the reservoir.

REFERENCES:

1. Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology", McGraw Hill Publications, New York, 1995.

2. Subramanya K., "Hydrology,Tata McGraw Hill Co., New Delhi, 1994.

3. Patra.K.C, "Hydrology and Water Resources Engineering", Narosa Publications, 2008.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
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PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E82C   **PREFABRICATED STRUCTURES**   **L T P C**
                                                                                       3 0 0 3

COURSE OBJECTIVE:
- To impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods.

UNIT I   INTRODUCTION   **9**
Need for prefabrication – Principles of prefabrication – Modular coordination – Standarization – Materials – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS   **9**
Behavour and types of structural components – Large panel systems- roof and floor slabs- Walls panels - Beams - Columns - Shear walls.

UNIT III DESIGN PRINCIPLES   **9**
Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems.

UNIT IV JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS   **9**
Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction, contraction, expansion. Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V   DESIGN FOR ABNORMAL LOADS   **9**
Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

                                              TOTAL: 45 PERIODS

OUTCOMES:
- The student will have good knowledge about design principles, layout of factory and stages
- ofloading in precast construction.
- Acquire knowledge about panel systems, slabs, connections used in precast construction and
- theywill be in a position to design the elements.
- Acquire knowledge about types of floor systems, stairs and roofs used in precast construction.
- Acquire knowledge about types of walls used in precast construction, sealants, design of joints. ☐ Acquire knowledge about components in industrial building.

TEXTBOOKS:
1. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers,USA,1991.
2. Lewitt,M. " Precast Concrete- Materials, Manufacture, Properties And Usage", Applied SciencePublishers , London And New Jersey, 1982.
3. Bachmann, H. and Steinle, A. "Precast Concrete Structures", Ernst & Sohn, Berlin, 2011.

REFERENCES:

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
3. "Structural design manual", Precast concrete connection details, Society for the studies in the use ofprecast concrete, Netherland Betor Verlag, 2009.

CO's- PO's & PSO's MAPPING:

PO/PSO		Course Outcome					Overall Correlation of CO s to POs
		CO1	CO2	CO3	CO4	CO5	
PROGRAMOUTCOMES(PO)							
PO1	Knowledge of Engineering Sciences	3	3	3	3	3	3
PO2	Problem analysis	3	3	3	3	3	3
PO3	Design/development of solutions	3	3	3	3	3	3
PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

- 1-low,2-medium,3-high,'-"-no correlation.

20155E82D   **CONTRACTS MANAGEMENT**   **L T P C**
                                                                   3 0 0 3

COURSE OBJECTIVES:
- To study the various types of construction contracts and their legal aspects and provisions.
- To study the of tenders, arbitration, legal requirement, and labour regulations.

UNIT I CONSTRUCTION CONTRACTS   **9**
Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts.

UNIT II TENDERS   **9**
Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

UNIT III ARBITRATION   **9**
Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs.

UNIT IV LEGAL REQUIREMENTS   **9**
Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations.

UNIT V LABOUR REGULATIONS   **9**
Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws.

                                                      TOTAL : 45 PERIODS

OUTCOME:
- On completion of this course the students will know different types of contracts in construction, arbitration and legal aspect and its provisions.

REFERENCES:
1. Gajaria G.T., "Laws Relating to Building and Engineering" Contracts in India,
2. Jimmie Hinze, "Construction Contracts", McGraw Hill, 2001.
3. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", McGraw Hill, 2000.
4. Kwaku, A., Tenah,P.E. Jose M.Guevara, P.E.,"Fundamentals of Construction Management and Organisation", Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.
5. Patil. B.S, "Civil Engineering Contracts and Estimates", Universities Press (India) Private Limited, 2006.

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PO2	Problem analysis	3	3	3	3	3	3
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PO4	Investigation	3	3	3	3	3	3
PO5	Modern Tool Usage	1	1	1	1	1	1
PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
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- 1-low,2-medium,3-high,'-"-no correlation.

20155E82E   **SUSTAINABLE CONSTRUCTION METHODS**   **L T P C**
                                                                     3 0 0 3

COURSE OBJECTIVES:
- To impart knowledge about sustainable construction and to understand.
- The concepts of sustainable materials, energy calculations, green buildings and environmental effects.

UNIT I INTRODUCTION 9
Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO_2 contribution from cement and other construction materials.

UNITII MATERIALS USED IN SUSTAINABLE CONSTRUCTION 9
Construction materials and indoor air quality - No/Low cement concrete - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.

UNITIII ENERGY CALCULATIONS 9
Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditioned building - Life Cycle energy use

UNITIV GREEN BUILDINGS 9
Control of energy use in building - ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling - Performance ratings of green buildings - Zero energy building

UNITV ENVIRONMENTAL EFFECTS 9
Non-renewable sources of energy and Environmental aspects – energy norm, coal, oil, natural gas - Nuclear energy - Global temperature, Green house effects, global warming - Acid rain: Causes, effects and control methods - Regional impacts of temperature change.

                                                                     TOTAL: 45 PERIODS
OUTCOME:
- On completion of the course, the student is expected to be able to
- Summarize the various sustainable materials used in construction.
- Explain the method of estimating the amount of energy required for building.
- Interpret the features of LEED, TERI and GRIHA ratings of buildings.
- Relate the concept and performance of zero energy buildings.
- Select less carbon emission materials for construction.

REFERENCES:
1. Charles J Kibert, Sustainable Construction : Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.
3. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.

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PO6	Engineer and Society	3	3	3	3	3	3
PO7	Environment and Sustainability	1	1	1	1	1	1
PO8	Ethics	1	1	1	1	1	1
PO9	Individual and Teamwork	3	3	3	3	3	3
PO10	Communication	2	2	2		2	2
PO11	Project Management and Finance	1	1	1	1	1	1
PO12	Life Long Learning	2	2	2	2	2	2
PROGRAM SPECIFIC OUTCOMES (PSO)							
PSO1	Knowledge of Civil Engineering discipline	3	3	3	3	3	3
PSO2	Critical analysis of Civil Engineering problems and innovation	3	3	3	3	3	3
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	3	3	3	3	3	3

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