

**KONGU ENGINEERING COLLEGE**  
**PERUNDURAI ERODE – 638 052**  
**(Autonomous)**

**VISION**

To be a centre of excellence for development and dissemination of knowledge in Applied Sciences, Technology, Engineering and Management for the Nation and beyond.

**MISSION**

We are committed to value based Education, Research and Consultancy in Engineering and Management and to bring out technically competent, ethically strong and quality professionals to keep our Nation ahead in the competitive knowledge intensive world.

**QUALITY POLICY**

We are committed to

- Providing value based quality education for the development of students as competent and responsible citizens.
- Contributing to the nation and beyond through research and development
- Continuously improving our services

**DEPARTMENT OF CIVIL ENGINEERING**

**VISION**

To develop the department as a center of excellence to take care of the local and regional needs related to Civil Engineering and to meet acute needs of trained specialists in the diverse field of Civil Engineering.

**MISSION**

Department of Civil Engineering is committed to:

- MS1: Encourage students and faculty to undertake research programmes and projects of multi-disciplinary nature.
- MS2: Conduct summer and winter schools for faculty members and short-term course for technicians.
- MS3: Produce Engineers who can participate in technical advancement and social upliftment of the country and to meet the growing global challenges.
- MS4: Prosper in academic activities by continual improvement in teaching methods, laboratory facilities and research activities.
- MS5: Develop consultancy for various industries

**2014 REGULATIONS**

**PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

Graduates of Civil Engineering will

- PEO1: Implement optimum solution for societal problems using professional knowledge resulting in sustainable development of construction industry
- PEO2: Analyse, solve, design and execute projects with the fundamental knowledge of Civil Engineering.
- PEO3: Exhibit professional and ethical attitude, communication skills and the life-long learning skills needed for the successful professional career.

## MAPPING OF MISSION STATEMENTS (MS) WITH PEOs

MS\PEO	PEO1	PEO2	PEO3
MS1	1	1	2
MS2	2	2	1
MS3	1	2	1
MS4	1	1	2
MS5	1	2	3

1 – Slight, 2 – Moderate, 3 – Substantial

### PROGRAM OUTCOMES (POs)

#### Engineering Graduates will be able to:

- PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4 Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11 Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12 Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO1** Understand the requirement of the industry and perform effectively with professional skills.

**PSO2** Apply advanced and innovative techniques and methodologies in Civil Engineering Practices.

### MAPPING OF PEOs WITH POs AND PSOs

PEO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO1	3	3	1	1		3	3	3	3	1			3	2
PEO2	3	3	3	3	2		1	1	2	1	3	3	3	3
PEO3						3	2	3		3			3	2

1 – Slight, 2 – Moderate, 3 – Substantial

### CURRICULUM BREAKDOWN STRUCTURE UNDER REGULATION 2014

Curriculum Breakdown Structure(CBS)	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total number of credits
Basic Sciences(BS)	13.11	420	24
Engineering Sciences(ES)	14.02	450	26
Humanities and Social Sciences(HS)	10.38	315	19
Program Core(PC)	39.89	1455	73
Program Electives(PE)	09.83	270	18
Open Electives(OE)	04.91	135	9
Project(s)/Internships (PR)	06.01	225	11
Others(OT)	01.63	45	3
<b>Total</b>			<b>183</b>

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**B.E. DEGREE IN CIVIL ENGINEERING**

**CURRICULUM**

(For the candidates admitted from academic year 2014 – 15 onwards)

**SEMESTER – I**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			CBS
		L	T	P		CA	ESE	Total	
	<b>THEORY</b>								
14EGT11	Communicative English I	3	0	0	3	40	60	100	HS
14MAT11	Mathematics I	3	1	0	4	40	60	100	BS
14PHT11	Applied Physics	3	0	0	3	40	60	100	BS
14CYT11	Applied Chemistry	3	0	0	3	40	60	100	BS
14MET11	Basics of Civil and Mechanical Engineering	3	0	0	3	40	60	100	ES
14MEC11	Engineering Drawing	2	0	3	3	40	60	100	ES
14VEC11	Value Education	0	2	1	1	100	0	100	OT
	<b>PRACTICAL</b>								
14PHL11	Physical Sciences Laboratory I	0	0	3	1	100	0	100	BS
14MEL11	Basics of Civil and Mechanical Engineering Laboratory	0	0	3	1	100	0	100	ES
		<b>Total</b>			<b>22</b>				

CA – Continuous Assessment, ESE – End Semester Examination

CBS – Curriculum Breakdown Structure

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(For the candidates admitted from academic year 2014 – 15 onwards)

**SEMESTER – II**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			CBS
		L	T	P		CA	ESE	Total	
	<b>THEORY</b>								
14EGT21	Communicative English II	3	0	0	3	40	60	100	HS
14MAT21	Mathematics II	3	1	0	4	40	60	100	BS
14PHT21	Materials Science	3	0	0	3	40	60	100	ES
14CYT21	Environmental Science	3	0	0	3	40	60	100	HS
14CSC11	Problem Solving and Programming	3	0	3	4	40	60	100	ES
14EET11	Basics of Electrical and Electronics Engineering	3	0	0	3	40	60	100	ES
	<b>PRACTICAL</b>								
14PHL21	Physical Sciences Laboratory II	0	0	3	1	100	0	100	BS
14EEL11	Basics of Electrical and Electronics Engineering Laboratory	0	0	3	1	100	0	100	ES
		<b>Total</b>			<b>22</b>				

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**CURRICULUM**

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**SEMESTER – III**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			CBS
		L	T	P		CA	ESE	Total	
	<b>THEORY</b>								
14MAT31	Mathematics III	3	1	0	4	40	60	100	BS
14CET31	Engineering Geology	3	0	0	3	40	60	100	PC
14CET32	Rigid Body Statics and Dynamics	3	1	0	4	40	60	100	ES
14CET33	Mechanics of Fluids	3	1	0	4	40	60	100	PC
14CET34	Concrete Technology	3	0	0	3	40	60	100	PC
14CET35	Surveying	3	0	0	3	40	60	100	PC
	<b>PRACTICAL</b>								
14CEL31	Survey Practical	0	0	3	1	100	0	100	PC
14CEL32	Computer Aided Building Drawing	0	0	3	1	100	0	100	PC
14CEL33	Concrete Laboratory	0	0	3	1	100	0	100	PC
		<b>Total</b>			<b>24</b>				

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**CURRICULUM**

(For the candidates admitted from academic year 2014 – 15 onwards)

**SEMESTER – IV**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			CBS
		L	T	P		CA	ESE	Total	
	<b>THEORY</b>								
14MAT41	Numerical Methods	3	1	0	4	40	60	100	BS
14CET41	Mechanics of Deformable Bodies	3	1	0	4	40	60	100	ES
14CET42	Applied Hydraulic Engineering	3	1	0	4	40	60	100	PC
14CET43	Water Supply Engineering	3	0	0	3	40	60	100	PC
14CET44	Soil Mechanics	3	0	0	3	40	60	100	PC
14CET45	Building Planning and Practices	3	0	0	3	40	60	100	PC
	<b>PRACTICAL</b>								
14CEL41	Hydraulic Engineering Laboratory	0	0	3	1	100	0	100	PC
14CEL42	Advanced Survey Practical	0	0	3	1	100	0	100	PC
14CEL43	Soil Mechanics Laboratory	0	0	3	1	100	0	100	PC
					<b>Total</b>				
					<b>24</b>				

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**CURRICULUM**

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**SEMESTER – V**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			CBS
		L	T	P		CA	ESE	Total	
	<b>THEORY</b>								
14CET51	Foundation Engineering	3	0	0	3	40	60	100	PC
14CET52	Highway Engineering	3	0	0	3	40	60	100	PC
14CET53	Classical Methods of Structural Analysis	3	1	0	4	40	60	100	PC
14CET54	Waste Water Engineering	3	0	0	3	40	60	100	PC
14CET55	Design of RC Elements	3	1	0	4	40	60	100	PC
	Elective-I (Professional)	3	0	0	3	40	60	100	PE
	<b>PRACTICAL</b>								
14CEL51	Strength of Materials Laboratory	0	0	3	1	100	0	100	PC
14CEL52	Environmental Engineering Laboratory	0	0	3	1	100	0	100	PC
14EGL41	Communication Skills Laboratory	0	0	3	1	100	0	100	HS
	<b>Total</b>				<b>23</b>				

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**CURRICULUM**

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**SEMESTER – VI**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			CBS
		L	T	P		CA	ESE	Total	
	<b>THEORY</b>								
14GET61	Economics and Management for Engineers	3	0	0	3	40	60	100	HS
14CET61	Modern Methods of Structural Analysis	3	1	0	4	40	60	100	PC
14CET62	Advanced RC Design	3	1	0	4	40	60	100	PC
14CET63	Design of Steel Structures	3	1	0	4	40	60	100	PC
	Elective-II (Professional)	3	0	0	3	40	60	100	PE
	Elective – III (Open)	3	0	0	3	40	60	100	OE
	<b>PRACTICAL</b>								
14CEL61	Computer Applications Laboratory	0	0	3	1	100	0	100	PC
14CEL62	Transportation Engineering Laboratory	0	0	3	1	100	0	100	PC
14CEL63	Survey Camp	0	0	3	1	100	0	100	PC
	<b>Total</b>				<b>24</b>				

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**CURRICULUM**

(For the candidates admitted from academic year 2014 – 15 onwards)

**SEMESTER – VII**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			CBS
		L	T	P		CA	ESE	Total	
	<b>THEORY</b>								
14GET71	Total Quality Management	3	0	0	3	40	60	100	HS
14CET71	Estimation and Quantity Surveying	3	0	0	3	40	60	100	PC
14CET72	Pre-stressed Concrete Structures	3	0	0	3	40	60	100	PC
	Elective-IV (Professional)	3	0	0	3	40	60	100	PE
	Elective –V (Open)	3	0	0	3	40	60	100	OE
	Elective – VI (Open)	3	0	0	3	40	60	100	OE
	<b>PRACTICAL</b>								
14CEL71	Structural Drawing	0	0	3	1	100	0	100	PC
14CEI71	Inplant Training	0	0	0	1	0	100	100	PR
14CEP71	Design Project	0	0	6	3	50	50	100	PR
					<b>Total</b>				
					<b>23</b>				

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**CURRICULUM**

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**SEMESTER – VIII**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			CBS
		L	T	P		CA	ESE	Total	
	<b>THEORY</b>								
14GET81	Professional Ethics and Human Values	3	0	0	3	40	60	100	HS
	Elective – VII (Professional)	3	0	0	3	40	60	100	PE
	Elective – VIII (Professional)	3	0	0	3	40	60	100	PE
	Elective – IX (Professional)	3	0	0	3	40	60	100	PE
	<b>PRACTICAL</b>								
14CEP81	Project Work	0	0	18	9	100	100	200	PR
		<b>Total</b>			<b>21</b>				

CA – Continuous Assessment, ESE – End Semester Examination

CBS – Curriculum Breakdown Structure

**Total Credits: 183**

<b>LIST OF PROFESSIONAL ELECTIVES</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Hours/Week</b>			<b>Credit</b>	<b>CBS</b>
		<b>L</b>	<b>T</b>	<b>P</b>		
<b>SEMESTER V</b>						
14CEE01	Advanced Strength of Materials	3	0	0	3	PE
14CEE02	Railways, Airport and Harbour Engineering	3	0	0	3	PE
14CEE03	Water Resources Engineering	3	0	0	3	PE
14CEE04	Urban and Regional Planning	3	0	0	3	PE
<b>SEMESTER VI</b>						
14CEE05	Structural Dynamics and Earth Quake Engineering	3	0	0	3	PE
14CEE06	Pavement Design	3	0	0	3	PE
14CEE07	Hydrology	3	0	0	3	PE
14CEE08	Solid Waste Management	3	0	0	3	PE
<b>SEMESTER VII</b>						
14CEE09	Advanced Design of Steel Structures	3	0	0	3	PE
14CEE10	Traffic Engineering and Transportation Planning	3	0	0	3	PE
14CEE11	Finite Element Method	3	0	0	3	PE
<b>SEMESTER VIII</b>						
14CEE12	Industrial Structures	3	0	0	3	PE
14CEE13	Rehabilitation of Structures	3	0	0	3	PE
14CEE14	Ground Improvement Techniques	3	0	0	3	PE
14CEE15	Design of Composite structures	3	0	0	3	PE
14CEE16	Design of Bridges	3	0	0	3	PE
14CEE17	Water Power Engineering	3	0	0	3	PE
14CEE18	Industrial Waste Management	3	0	0	3	PE
14CEE19	Prefabricated structures	3	0	0	3	PE
14CEE20	Construction Management	3	0	0	3	PE

**LIST OF OPEN ELECTIVES**

Course Code	Course Title	Hours/Week			Credit	CBS
		L	T	P		
<b>SEMESTER VI</b>						
14CEO01	Disaster Management	3	0	0	3	OE
14CEO02	Remote Sensing and Geographic Information System	3	0	0	3	OE
14CEO03	Road Safety Management	3	0	0	3	OE
<b>SEMESTER VII</b>						
14CEO04	Building Sciences	3	0	0	3	OE
14CEO05	Air Pollution Management	3	0	0	3	OE
14CEO06	Green Buildings	3	0	0	3	OE
14CEO07	Environmental Impact Assessment	3	0	0	3	OE
14CEO08	Architecture and Town planning	3	0	0	3	OE

**14EGT11 COMMUNICATIVE ENGLISH I**  
(Common to all Engineering and Technology branches)

3    0    0    3    9

**UNIT – I**

**Functional Grammar:** Basics of Vocabulary - Parts of speech or Word Classes including Determiners - Prefixes and Suffixes - Homonyms and Homophones - Connectives - Compound Nouns. **Listening:** Introduction to Listening / Types of Listening – Extensive / Intensive Listening - Listening Activities. **Speaking:** Verbal and non verbal communication – An introduction to speech sounds, syllables & word stress – Speaking Activities. **Reading:** Introduction to Skimming and scanning as reading techniques - understanding discourse coherence – sequencing of sentences – Reading activities. **Writing:** Introduction to aspects of technical writing – writing definitions and descriptions- Letter Writing – Informal letters-Punctuation in Letter Writing

**UNIT – II**

**Functional Grammar:** Concord - Tenses - Voice - Use of Articles and prepositions. **Listening:** Listening Comprehension – Cloze Test - Extensive listening – listening for general information. **Speaking:** Role Play – Situational Conversations. **Reading:** Reading newspaper articles – global understanding skills and ability to infer, extract gist and understand main ideas. **Writing:** Letter Writing - Formal letters, Writing a Profile about an organization—Punctuation (General).

**UNIT – III**

**Functional Grammar:** Phrasal verbs - Clauses - Simple, Compound and Complex Sentences - Synonyms and Antonyms. **Listening:** Listening Comprehension – Cloze Text - Intensive listening – listening for specific information. **Speaking:** Describing Places, People, Technical Processes. **Reading:** Reading different types of texts – Understanding general and specific information. **Writing:** Paragraph Writing – Writing reviews on short films and videos - Offering suggestions and recommendations

**UNIT – IV**

**Functional Grammar:** Conditional clauses (If clause) - Adjectives, Compound Adjectives and Degrees of Comparison. **Listening:** Listening to different accents, listening to speeches / presentations. **Speaking:** Describing Technical Processes and Machines and Gadgets - Telephone Skills. **Reading:** Reading Texts with focus on use of verbs and verb phrases. **Writing:** Writing e-mails –Transcoding - Using Charts, pictures and tables for interpretations.

**UNIT – V**

**Functional Grammar:** Modals – Types of Sentences – Idioms and Phrases and proverbs - identifying odd words. **Listening:** Retrieval of factual information – listening to identify topic, context, function, speaker’s opinion, attitude, etc. **Speaking:** Interviews - Personal and Telephonic - Giving impromptu talks, making presentations on given topics. **Reading:** Reading for structure and detail – finding key information in a given text and finding topic sentences. **Writing:** Designing and Making Posters – Writing Advertisements-Free writing on any given topic ( Technical and topics on current affairs )

**TOTAL : 45**

**TEXT BOOKS :**

1. “Learn English – A Fun Book of Functional Language, Grammar and Vocabulary”, McGraw Hill Education [India] Pvt. Ltd., Santanu Sinha Chaudhuri, 2013.

**REFERENCE BOOKS :**

1. Raman, Meenakshi and Sangeetha Sharma, “Technical Communication: Principles and Practice”, Oxford University Press, New Delhi, 2011.
2. Regional Institute of English, “English for Engineers”, Cambridge University Press, New Delhi, 2006.
3. Rizvi, Ashraf M., “Effective Technical Communication”, Tata McGrawHill, New Delhi. 2009.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: speak clearly, confidently, comprehensibly, and communicate with others using appropriate communicative strategies
- CO2: write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide range of vocabulary, organizing their ideas logically on a topic
- CO3: read different genres of texts adopting various reading strategies
- CO4: listen/view and comprehend different spoken discourses / excerpts in different accents
- CO5: use language effectively and accurately acquiring vocabulary from real-life context

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						1			2	3		2		
CO2						1			1	3		1		
CO3						1			1	3		2		
CO4						1			2	3		2		
CO5						2			2	3		2		

1 – Slight, 2 – Moderate, 3 – Substantial

**14MAT11 MATHEMATICS I**  
(Common to all Engineering and Technology branches)

**3 1 0 4**

**Pre-requisites:** Basics concepts of matrices, Basic idea of differentiation, Knowledge of differential equations

**UNIT – I** **9**

**Matrices:** Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors (without proof) – Cayley-Hamilton Theorem (Statement and Applications) - Similarity transformation (concept only) – Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Nature of quadratic forms – Reduction of a quadratic form to canonical form by orthogonal transformation.

**UNIT – II** **9**

**Functions of Several Variables:** Functions of two variables – Partial derivatives – Total differential – Taylor’s Series expansion –Maxima and Minima – Constrained maxima and minima – Lagrange’s multiplier method – Jacobians – Properties.

**UNIT – III** **9**

**Ordinary Differential Equations of First Order:** Solutions of equations in separable form – Exact differential equations – Integrating factors – Linear first order differential equations – Bernoulli’s equation – Clairaut’s equation.

**UNIT – IV** **9**

**Ordinary Differential Equations of Higher Order:** Linear differential equations of second and higher order with constant coefficients – Particular Integrals for the types:  $e^{ax} - \cos(ax) / \sin(ax) - x^n - e^{ax}x^n, e^{ax}\sin(bx)$  and  $e^{ax}\cos(bx) - x^n\sin(ax)$  and  $x^n\cos(ax)$  – Linear differential equations with variable coefficients: Euler-Cauchy’s equation – Legendre’s equation.

**UNIT – V** **9**

**Applications of Ordinary Differential Equations:** Method of variation of parameters – Simultaneous first order linear equations with constant coefficients – Simple harmonic motion – Deflection of beams – Electric circuits (Differential equations and associated conditions need to be given).

**Lecture: 45, Tutorial: 15, TOTAL: 60**

**TEXT BOOKS:**

1. Kandasamy P., Thilagavathy K. and Gunavathy K., “Engineering Mathematics For First Year B.E/B.Tech”, Reprint Edition 2014, S.Chand and Co., New Delhi.
2. Veerarajan T., “Engineering Mathematics, (for first year)”, Reprint Edition 2013, Tata McGraw-Hill, New Delhi.

**REFERENCE BOOKS:**

1. Grewal B.S., “Higher Engineering Mathematics”, 42<sup>nd</sup> Edition, Khanna Publications, New Delhi, 2011.
2. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, 4<sup>th</sup> Edition, Narosa Publishing House, New Delhi, Reprint 2014.
3. Bali N.P. and Manish Goyal, “Text Book of Engineering Mathematics”, 8<sup>th</sup> Edition, Laxmi Publications, New Delhi, 2011.
4. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, 2011.
5. Kreyszig E., “Advanced Engineering Mathematics”, 10<sup>th</sup> Edition, John Wiley Sons, 2010.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: solve engineering problems which needs matrix computations.  
 CO2: solve extremal problems which arise in function of several variables.  
 CO3: identify the appropriate method for solving first order ordinary differential equations.  
 CO4: classify and find the solution of ordinary differential equations of higher order.  
 CO5: apply the concept of ordinary differential equations for modeling and finding solutions to engineering problems.

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1								1		
CO2	3											1		
CO3	3	3	1	1								1		
CO4	3	3	1	1								1		
CO5	3	3	2	1								1		

1 – Slight, 2 – Moderate, 3 – Substantial

**14PHT11 APPLIED PHYSICS**  
(Common to all Engineering and Technology branches)

**3   0   0   3   9**

**UNIT – I**

**Properties of Matter:** Elasticity – Hooke’s law – Modulus of elasticity (qualitative) – Stress-strain diagram – Poisson’s ratio – Bending moment – Depression of a cantilever (theory) – Derivation of Young’s modulus of the material of the beam – Uniform and non-uniform bending – I-shaped girders. **Thermal Physics:** Modes of heat transfer – Thermal conductivity – Derivation of rectilinear flow of heat along a bar – Radial and cylindrical heat flow – Conduction through compound media (series and parallel).

**UNIT – II**

**Acoustics:** Classification of sound – 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. **Ultrasonics:** Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Cavitation – Industrial applications – Drilling, welding, soldering and cleaning – Non destructive testing – Ultrasonic pulse echo system.

**UNIT – III**

**Laser and Applications:** Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Derivation of Einstein’s coefficients (A&B) – Types of lasers – Nd:YAG laser, CO<sub>2</sub> laser, Semiconductor lasers: homojunction and heterojunction – Laser Applications – Industrial applications: laser welding, laser cutting, laser drilling – Holography – Construction and reconstruction of images.

**UNIT – IV**

**Fiber Optics and Applications:** Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) – Crucible-crucible technique for fiber fabrication – Sources (LED and LASER) and detectors (p-i-n photodiode and avalanche photodiode) for fiber optics - Fiber optical communication links – Losses in optical fibers – Fiber optic sensors – Temperature and displacement sensors.

**UNIT – V**

**Quantum Physics and Applications:** Black body radiation – Planck’s theory (derivation) – Compton effect (theory) – Matter waves – Uncertainty principle (qualitative) – Schroedinger’s wave equations – Time independent and time dependent wave equations – Physical significance of wave function – Particle in a box (One dimensional) – Electron microscopes – Scanning electron microscope – Transmission electron microscope.

**TOTAL : 45**

**TEXT BOOKS:**

1. Tamarasan K and Prabu K, “Engineering Physics-I”, Tata McGraw Hill Education Private Limited, New Delhi, 2014.

**REFERENCE BOOKS:**

1. Gaur R.K. and Gupta S.L., “Engineering Physics”, Dhanpat Rai and Sons, New Delhi, 2009.
2. Uma Mukherji, “Engineering Physics”, Narosa Publishing House, New Delhi, 2011.
3. Laud B.B., “Lasers and non- linear optics”, New Age International (p) Limited Publishers, New Delhi, 1996.
4. Ajoy Ghatak and Thyagarajan K., “Introduction to Fiber Optics”, Cambridge University Press, New York, USA, 2000
5. Mehta and Neeraj, “Applied Physics for Engineers”, Prentice-Hall of India Private Limited, New Delhi, 2011.
6. Douglas Brandt and Douglas C. Giancoli, “Physics for Scientists and Engineers”, Prentice-Hall of India Private Limited, New Delhi, 2000.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: Infer the extensive properties of matter and heat conduction in metal.
- CO2: Demonstrate acoustically good buildings and non-destructive testing using ultrasonic waves.
- CO3: Employ the laser in engineering and technology.
- CO4: Sketch the principle of fiber optics and fiber optic communication link.
- CO5: Interpret the concepts of quantum physics to optical phenomena and electrons in a metal.

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			2	2		2		1					
CO2	3			2	2		2		1					
CO3	3			2	2		2		1					
CO4	3			2	2		2		1					
CO5	3			2	2		2		1					

1 – Slight, 2 – Moderate, 3 – Substantial



**14CYT11 APPLIED CHEMISTRY**  
(Common to all Engineering and Technology branches)

**3 0 0 3**

**UNIT – I**

**9**

**Water:** Introduction - Sources of water - Impurities in water - Types of water - Water quality standards - Water quality parameters (Brief discussion only) - Hardness of water- Expression of hardness - Units of hardness –Estimation of Hardness of water by EDTA method – Determination of alkalinity - Disadvantages of using hard water - Boiler troubles due to hard water - scale and sludge formation – boiler corrosion – caustic embrittlement- priming and foaming- Softening of water- External treatment methods - zeolite and demineralization process (principle, process, advantages and disadvantages only) - Internal treatment process - colloidal, carbonate, calgon and phosphate conditioning (brief discussion only) - desalination by reverse osmosis method

**UNIT – II**

**9**

**Electrochemistry:** Introduction – Electrolytic and Electrochemical Cells – Representation of a galvanic cell - Reversible and Irreversible cells - EMF and its determinations – Electrode potential - Nernst Equation – Reference electrodes (hydrogen and calomel electrodes) – Electrochemical series and its applications – Conductometric titrations (strong acid vs strong base only) - Batteries (Lead Acid battery, NICAD, Lithium battery, Lithium Sulphur battery) – Proton exchange membrane cells.

**UNIT – III**

**9**

**Corrosion and Its Control:** Introduction – Mechanism of chemical and electrochemical corrosion – galvanic corrosion - concentration cell corrosion – Galvanic series - Factors influencing rate of corrosion – corrosion control methods - Sacrificial anode and impressed current cathodic protection methods – Corrosion inhibitors - Protective coatings - classifications - Pretreatment of metal surface - Metallic coating -electroplating and electrolessplating (General discussion) - Hot dipping (Tinning and galvanising) - Non-metallic coating - surface conversion coating (phosphate coating and anodized coating) - Organic coating - paints – constituents and their function – Special paints (Fire retardant, temperature indicating, water repellent and luminescent paints)

**UNIT – IV**

**9**

**Fuels:** Coal and its varieties – proximate and ultimate analysis – their significance – metallurgical coke - Otto-Hoffman byproduct method - Liquid fuel - refining of petroleum – Manufacture of synthetic petrol – Cracking - Polymerization - Hydrogenation of coal (Fisher Tropsch and Bergius methods) - knocking - octane number – improving octane number by additives – Diesel – cetane number – Gaseous fuels (Water gas and LPG).

**Combustion:** Introduction – Calorific Values – Gross and Net Calorific Values – Dulong’s formula (simple problems)- Flue gas analysis by Orsat’s method - Explosive range and Spontaneous Ignition Temperature

**UNIT – V**

**9**

**Polymers:** Introduction – Nomenclature of polymers – functionality – polymerization - types – addition, condensation and co-polymerization with examples – Effect of polymer structure on properties (strength, plastic deformation, glass transition temperature and melting point of polymers (T<sub>g</sub> and T<sub>m</sub>), crystallinity and chemical resistance) - plastics – types (thermo and thermosetting plastics) - individual polymers - Polyethylene, Polypropylene, PVC, Teflon and Bakelite (preparation, properties and uses only) - Compounding of plastics- Fabrication of plastics (compression, injection and extrusion moulding methods) – conducting polymers

**TOTAL : 45**

**TEXT BOOKS:**

- Palanisamy P.N, Geetha A, Manjula Rani K, “Applied Chemistry”, 2<sup>nd</sup> Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2013.
- Jain P C and Monica Jain, “Engineering Chemistry”, 15<sup>th</sup> Edition, Dhanpat Rai Publication Co., New Delhi, 2008.

**REFERENCE BOOKS:**

- Sharma B.K., “Engineering Chemistry”, Krishna Prakasan Media (P) Ltd., Meerut, 2001.
- Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill, New Delhi, 2008.
- Krishnamurthy N., “Engineering Chemistry”, 2<sup>nd</sup> Edition, PHI Learning Private Limited, New Delhi, 2008.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: Get the basic knowledge of water quality parameters and treatment methods
- CO2: Obtain the principles of electrochemical cells, EMF series and energy storing devices
- CO3: Acquire the knowledge of the types and prevention methods of corrosion
- CO4: Know the concepts and developments in combustion and various types of fuels.
- CO5: Understand the knowledge about the types of polymers, plastics and moulding methods

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2		2	2		2	3	3	1	1		
CO2	3	2		2	2		2	3	3	1	1		
CO3	3	2		2	2		2	3	3	1	1		
CO4	3	2		2	2		2	3	3	1	1		
CO5	3	2		2	2		2	3	3	1	1		

1 – Slight, 2 – Moderate, 3 – Substantial

## 14MET11 BASICS OF CIVIL AND MECHANICAL ENGINEERING

(Common to all Engineering and Technology branches)

3    0    0    3

### PART-A: CIVIL ENGINEERING

<b>UNIT – I</b>	<b>5</b>
<b>Introduction:</b> History of civil engineering - Role and Functions of civil engineer - Fields of civil engineering	
<b>UNIT– II</b>	<b>5</b>
<b>Building Materials:</b> Introduction – Properties and applications of Construction Materials – bricks – stones – sand – cement – mortar- concrete – steel – glass-wood –plastics- ceramics -rubber- FRP – Non ferrous materials - Geosynthetics – Smart materials.	
<b>UNIT – III</b>	<b>4</b>
<b>Sub Structure:</b> Soil – classification- bearing capacity- foundation -function- requirements- types-failures -remedial measures- machine foundation	
<b>UNIT – IV</b>	<b>4</b>
<b>Super Structures:</b> Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering- damp proofing- weathering course	
<b>UNIT – V</b>	<b>4</b>
<b>Interior design and Landscaping:</b> History of Interior design-Importance of Interior design- Basic elements of Interior design. Landscape Architecture-Elements of Landscaping- Green Engineering	

### PART-B: MECHANICAL ENGINEERING

<b>UNIT – I</b>	<b>5</b>
<b>Thermal Science:</b> Laws of thermodynamics and their applications – Principle of operation of Steam, Diesel, Hydro-electric and Nuclear power plants - Classification of internal combustion engines and their working principles – Components of basic Vapour Compression Refrigeration system.	
<b>UNIT – II</b>	<b>4</b>
<b>Fluid Science:</b> Properties of fluids – Classification of hydraulic turbines, working principle of Pelton turbine – Applications of steam and gas turbines. Classification of pumps, working principle of centrifugal and reciprocating pump	
<b>UNIT – III</b>	<b>4</b>
<b>Mechanics and Materials:</b> Classification of engineering materials - Mechanical properties of engineering materials- Definition and importance of stress and strain - Definition and importance of centre of gravity and moment of inertia.	
<b>UNIT – IV</b>	<b>5</b>
<b>Mechanical Components And Their Applications:</b> Basic principles and applications of power transmission systems such as belt, rope, chain and gear drives – Function and principles of coupling, clutch, brake, flywheel and governor	
<b>UNIT – V</b>	<b>5</b>
<b>Manufacturing Technology:</b> Principle and applications of Metal forming process – Foundry, Forging. Principle and applications of Metal Joining process – Welding, Soldering and Brazing, Basics of CAD/CAM/CIM.	

**TOTAL : 45**

#### TEXT BOOKS:

1. Palanichamy M.S., “Basic Civil Engineering”, Tata McGraw-Hill, New Delhi, 2006.
2. Pravin Kumar, “Basic Mechanical Engineering”, Pearson Publishers, New Delhi, 2013.

#### REFERENCE BOOKS:

1. Rangawala S.C., “Engineering Materials” Charotar Publishing House(P) Ltd., Anand, 2013.
2. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, “Building Construction,” Laximi Publications (P) Ltd., NewDelhi, 2005.
3. Shanmugam G., “Basic Mechanical Engineering”, Tata McGraw-Hill, New Delhi, 2005.
4. Venugopal K. and Prabhu Raja V., “Basic Mechanical Engineering”, 6<sup>th</sup> Edition, Anuradha Publishers, Kumbakonam, 2005.

#### COURSE OUTCOMES

On completion of the course the students will be able to

CO1:	understand the functions and various roles of civil engineer
CO2:	identify the suitable construction materials required for a building
CO3:	explain the various components of sub-structure
CO4:	demonstrate the various elements of super-structure
CO5:	apply the elementsof interior design and landscaping in civil engineering
CO6:	demonstrate an understanding of basic concepts in thermal engineering
CO7:	demonstrate an understanding of basic concepts in fluid mechanics and fluid machines
CO8:	demonstrate an understanding of basic concepts in engineering mechanics and materials
CO9:	demonstrate an understanding of principles and applications of different mechanical components.
CO10:	demonstrate an understanding of principles and applications of various manufacturing process

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2		2	1	2			2		2
CO2	3	2	2		2	1	2			2		2
CO3	3	2	2		2	1	2			2		2

CO4	3	2	2		2	1	2			2		2
CO5	3	2	2		2	1	2			2		2
CO6	3	2	2		2	1	2			2		2
CO7	3	2	2		2	1	2			2		2
CO8	3	2	2		2	1	2			2		2
CO9	3	2	2		2	1	2			2		2
CO10	3	2	2		2	1	2			2		2

1 – Slight, 2 – Moderate, 3 – Substantial

**14MEC11 ENGINEERING DRAWING**  
(Common to all Engineering and Technology branches)

2    0    3    3

**Pre-requisites:** Basic knowledge in practical geometry construction and mathematics

- UNIT – I** **9**  
**General Principles of Orthographic Projection:** Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Projections of Points, Lines and Planes. General principles of orthographic projection – First angle projection – Layout of views – Projection of points, located in all quadrant and straight lines located in the first quadrant – Determination of true lengths and true inclinations and location of traces – Projection of polygonal surface and circular lamina inclined to both reference planes.
- UNIT – II** **9**  
**Projections of Solids:** Projections of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.
- UNIT – III** **9**  
**Sectioning of Solids:** Sectioning of solids- prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.
- UNIT – IV** **9**  
**Development of Surfaces:** Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cone with cutout, perpendicular and inclined to the horizontal axis.
- UNIT – V** **9**  
**Isometric and Perspective Projection:** Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones Conversion of isometric projection into orthographic projection. Perspective projection of prisms, pyramids and cylinders by visual ray method.

**TOTAL : 45**

**TEXT BOOKS:**

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw-Hill, New Delhi, 2008.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, New Delhi, 2008.

**REFERENCE BOOKS:**

1. Bhatt N.D., “Engineering Drawing”, 46<sup>th</sup> Edition, Charotar Publishing House, Anand, 2003.
2. Gopalakrishnana K.R., “Engineering Drawing”, Volume. I & II, Subhas Publications, Bangalore, 2006.
3. Dhananjay A. Jolhe, “Engineering Drawing with an introduction to AutoCAD”, Tata McGraw Hill, New Delhi, 2008.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: gain knowledge on international standards of drawings and to draw the different types of projections for points, lines and planes
- CO2: draw the different positions of 3D primitive objects like cube, cone, cylinder, etc.
- CO3: draw sections of solids including prisms, pyramids, cylinders and cones
- CO4: understand the concepts of development of surfaces of simple and truncated solids
- CO5: draw the isometric and perspective projections for the given object

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3		2	1				2		2
CO2	3	2	3		2	1				2		2
CO3	3	2	3		2	1				2		2
CO4	3	2	3		2	1				2		2
CO5	3	2	3		2	1				2		2

1 – Slight, 2 – Moderate, 3 – Substantial

**14VEC11 VALUE EDUCATION**  
(Common to all Engineering and Technology branches)

0    2    1    1  
**6**

**UNIT – I**

**Philosophy of Life Science:**Life – Purpose of life (four stages of life) – Philosophy of life (who am ‘I’) – Law of nature (cause of the life and body) – Content of the Life (five sheaths) – Goal of life. Five duties in life.

**Methodology:** Life and messages of spiritual and national leaders– The forgotten hero, etc.

**Project report:** Complementing with happiness - Every soul is potentially divine

**UNIT – II**

**Human Values-Moral foundation:**Truth, forgiveness, compassion, endurance, humility, non violence, moderate diet, non stealing, self purification, self discipline, self study, content, cleanliness, honesty, and totality in faith– Good habits – Attitude forming for Individual peace.

**Practical Methods:** Personal experience with above characters, Puranic Stories - Self resolve diary maintenance

**UNIT – III**

**Social Values:**Family – Family System - Greatness of women – World brotherhood (vasudeiva kudumbagam) – Glorious Bharath - Bharathian systems - Past –Present – Future - Team spirit - Goal setting – Economics – Education – Politics – Responsibilities of people – Preserving natural resources.

**Methodology:** Preparing an album on glorious Bharath Past, Present and Future Plans. Goal setting - Management Games. Team Spirit - Yogic Games.

**UNIT – IV**

**Development of Mental Prosperity:**Prosperity of mind – Functions of mind - Obstacles of mind - Practical method to perfect mind is yoga – Types – Uses – Precaution – Contradiction – Kriyas - Asanas – Pranayamas – Meditative techniques.

**Methodology:** Asana - Pranayama – Cyclic meditation – Nada anu sandhana – Meditation – Yogic games for memory. Album on asanas , pranayama and mantra.

**UNIT – V**

**Maintenance of Physical Health:**Human body – Structure - Ten Systems of the body as per modern science. Five elements - Harmonious relationship – Life force – Conserving vitality & health through natural life – Pranic food and its importance – Uses of herbs - Right way of cooking to preserve nutrients - Cause of the disease – Acute and chronic - Disease - Life and death.

**Methodology:** Natural food making, traditional millet dishes. Asanas, pranayamas, cleansing procedures, Quiz on healthy living, Uses of herbs or kitchen garden.

**TOTAL : 30**

**TEXT BOOK:**

- “Value Education”, compiled by Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, Pollachi, for Kongu Engineering College.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: understand the purpose and value of life
- CO2: exhibit positive human values
- CO3: understand social values
- CO4: take steps to develop mental and physical health

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3		3				3		
CO2						3		3				3		
CO3						3		3				3		
CO4						3		3				3		

1 – Slight, 2 – Moderate, 3 – Substantial

**14PHL11 PHYSICAL SCIENCES LABORATORY I**  
(Common to all Engineering and Technology branches)

0 0 3 1

**PART-A: APPLIED PHYSICS LABORATORY**  
(Any five experiments)

**LIST OF EXPERIMENTS:**

1. Determination of Young's modulus of a given material using uniform bending.
2. Determination of thermal conductivity of bad conductor using Lee's disc arrangement.
3. Determination of velocity of ultrasonic waves in liquid and compressibility of liquid using ultrasonic interferometer.
4. (a) Particle size determination using diode laser.  
(b) Determination of wavelength of laser
5. Determination of specific resistance of a given coil of wire using Carey Foster bridge.
6. Determination of wavelength of Hg spectrum using spectrometer and grating.

**Demonstration**

1. Measurement of efficiency of a solar cell
2. Non destructive testing
3. Tyndall effect

**PART-B: APPLIED CHEMISTRY LABORATORY**  
(Any five experiments)

**LIST OF EXPERIMENTS:**

1. Estimation of Total, Temporary and Permanent hardness of water by EDTA method.
2. Estimation of  $Ca^{2+}$  and  $Mg^{2+}$  hardness separately by EDTA method.
3. Estimation of Alkalinity of the given water sample.
4. Conductometric titration - Mixture of acids.
5. Estimation of Hydrochloric acid using pH meter.
6. Estimation of Ferrous ion by potentiometric titration.

**Demonstration**

1. Distillation system
2. RO water treatment system
3. UV Spectrophotometer

**REFERENCES / MANUALS / SOFTWARE:**

1. Physics Laboratory Manual –Dr.K.Tamilarasan and Dr.K.Prabu
2. Chemistry Laboratory Manual- Dr.P.N.Palanisamy, P.Manikandan, A.Geetha and K.Manjularani

**TOTAL : 45**

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: Describe the basics of modulus of elasticity, thermal conductivity, ultrasonics and compressibility of water, laser parameters, specific resistance of electrical conductors, and interference and diffraction of light waves.
- CO2: Operate the basic measuring devices, travelling microscope, Lee's disc arrangement, ultrasonic interferometer, Carey Foster bridge and spectrometer, and to measure the related physical parameters.
- CO3: Analyze the hardness, amount of  $Ca^{2+}$  and  $Mg^{2+}$  ions, and presence of alkalinity in water.
- CO4: Employ the instruments like pH meter, conductivity meter and potentiometer for the estimation of unknown concentration of acids and ferrous ion.

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		2	1		2		2				
CO2	3	3		2	1		2		2				
CO3	3	3		2	1		2		2				
CO4	3	3		2	1		2		2				

1 – Slight, 2 – Moderate, 3 – Substantial

# 14MEL11BASICS OF CIVIL AND MECHANICAL ENGINEERING LABORATORY

(Common to all Engineering and Technology branches)

0 0 3 1

## LIST OF EXPERIMENTS:

1. To prepare a square or rectangular shaped two identical MS plates by cutting and filing operations
2. To prepare a square/rectangular/circular/trapezoidal/Vshaped projection and its counterpart forming from the given square or rectangular MS plates.
3. To carryout drilling, tapping and assembly on the given MS plates.
4. To carryout thread forming on a GI and PVC pipes and cut to the required length.
5. To use various pipe fitting accessories and prepare water leak proof water line from overhead tank.
6. To prepare a T/L/Lap joint from the given wooden work pieces.
7. To prepare a plywood box/tray to the given dimensions.
8. To prepare a leak proof sheet metal tray/box/funnel to the given dimensions.
9. Cutting of MS plates by gas cutting method and arc weld joining by Lap/Butt/T joint method
10. Preparing a simple PVC window/door frame assembly.
11. Preparing a simple memento or similar articles using wood/sheet metal
12. Preparing innovative articles involving waste metals.

**TOTAL : 45**

## REFERENCES / MANUALS / SOFTWARE:

1. Introduction to basic manufacturing processes and workshop technology by Rajender Singh, New Age International (P) Limited, 2006.
2. Elements of Workshop Technology by S.K.Hajra Choudhury, Media Promoters, 2009.

## COURSE OUTCOMES:

On completion of the course the students will be able to

- CO1: demonstrate knowledge on safety and adhere to safety features
- CO2: mark the given dimensions accurately and execute cutting and joining operations
- CO3: select methods and tools and execute the given experiments
- CO4: finish the job to the requirements and quantify the accuracy
- CO5: plan and complete simple and innovative articles

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2		2	2	1		2	2		2
CO2	3	1	2		2	2	1		2	2		2
CO3	3	1	2		2	2	1		2	2		2
CO4	3	1	2		2	2	1		2	2		2
CO5	3	1	2		2	2	1		2	2		2

1 – Slight, 2 – Moderate, 3 – Substantial 1

**14EGT21 COMMUNICATIVE ENGLISH II**  
( Common to all Engineering and Technology branches )

**3 0 0 3 9**

**UNIT – I**

**Functional Grammar:** Sentences – Affirmative / Negative – Asking questions in the simple present – Using reference words - Cause and Effect expressions. **Listening:** Listening practice - listening to different types of conversation and answering questions - listening to Audio texts and completing cloze exercises. **Speaking:** Opening a conversation and getting acquainted with people. **Reading:** Reading excerpts from a novel, itinerary, magazine and news paper articles. **Writing:** Formal Letter writing – Job Application Letter – CV and Resume – Writing Instructions

**UNIT – II**

**Functional Grammar:** Sentences – Interrogative & WH questions - SI units – Numerical Adjectives  
**Listening:** Listening to situation based dialogues – listening to short and long conversations in different domains of activity. **Speaking :** Conversation practice in real life situations, describing places, narration, introducing ideas. **Reading:** Reading historic writing – biographical writing – Non fictional book extracts and news feeds. **Writing:** Filling Forms – Academic Writing - Basics of Business Writing – Calling for Quotation, Placing Orders, Letter of Complaint

**UNIT – III**

**Functional Grammar:** Sentences – Imperative – Gerunds & Infinitives - Commonly confused words. **Listening:** Understanding the structure of conversations - Listening to academic lectures and live speech – advertisements and announcements. **Speaking:** Giving and Justifying opinions – apologizing – extempore. **Reading:** Reading Blogs - Website articles – e-mails. **Writing:** e-mails – Tweets – Texting and SMS language

**UNIT – IV**

**Functional Grammar:** Transformation of Sentences – Simple, Compound and Complex - Vocabulary ( single word substitute ) – conjunctions - reporting verbs – Direct and Indirect speech. **Listening:** Listening to a telephone conversation, viewing of model interviews ( face-to-face, telephonic and video conferencing). **Speaking:** Giving instructions – Role play – Interviews. **Reading:** Reading job advertisements and profile of the company concerned  
**Writing:** Writing Reports - Preparing a Check list

**UNIT – V**

**Grammar:** Analyzing sentence structures in a given short passage - Identifying parts of speech in a given short passage. **Listening:** Viewing a model group discussion and reviewing the performance of each participant – identifying the characteristics of a good listener – casual conversation. **Speaking:** Group discussion skills – initiating, turn taking and concluding the discussion. **Reading:** Making notes from long passages or any form of written materials – providing a suitable title – identifying main points, supporting points. **Writing:** Email writing – Effective use of email.

**TOTAL: 45**

**TEXT BOOKS :**

1. Dr. Elango et al. “Resonance: English for Engineers and Technologists”, Foundation, Chennai, 2013.

**REFERENCE BOOKS:**

1. Anderson, Paul V., “ Technical Communication : A Reader–Centered Approach”, Cengage.
2. Muralikrishna and Sunita Mishra, “Communication Skills for Engineers”, Pearson, New Delhi, 2011.
3. Sharma, Sangeetha and Binod Mishra, “Communication Skills for Engineers and Scientists”, PHI Learning, New Delhi, 2009.

**COURSE OUTCOMES**

**On completion of the course the students will be able to**

- CO1: speak effectively, express their opinions clearly, initiate and sustain a discussion and also negotiate using appropriate communicative strategies
- CO2: write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing
- CO3: read different genres of texts, infer implied meanings and critically analyze and evaluate them for ideas as well as for method of presentation
- CO4: listen and comprehend different spoken excerpts critically and infer unspoken and implied meanings
- CO5: use functional grammar for improving employment oriented skills

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2			2	3		2		
CO2						1			1	3		1		
CO3						2			1	3		2		
CO4						1			2	3		2		
CO5						1			1	3		1		

1 – Slight, 2 – Moderate, 3 – Substantial



## 14MAT21 MATHEMATICS II

(Common to all Engineering and Technology branches)

3 1 0 4

**Pre-requisites:** Basic ideas of integration, Basic ideas of vectors and complex numbers

**UNIT – I** 9

**Multiple Integrals:** Double integration in Cartesian coordinates – Change of order of integration – Area between two curves – Triple integration in Cartesian coordinates – Volume as Triple integrals (Simple problems only).

**UNIT – II** 9

**Vector Calculus:** Gradient of a scalar point function – Directional derivative – Divergence of a vector point function – Curl of a vector – Irrotational and Solenoidal vectors – Line Integral, Surface integral and Volume integral (Concept only) – Green’s, Stoke’s and Gauss divergence theorems (Statement only) – Verification of the above theorems and evaluation of integrals using them (Simple problems only).

**UNIT – III** 9

**Analytic Functions:** Functions of a complex variable – Analytic functions – Necessary conditions and Sufficient conditions (excluding proofs) – Cauchy– Riemann equations (Statement only) – Properties of analytic function (Statement only) – Harmonic functions – Construction of Analytic functions – Conformal mapping:  $w = z + a$ ,  $az$ ,  $1/z$  – Bilinear transformation.

**UNIT – IV** 9

**Complex Integration:** Cauchy’s theorem and Cauchy’s integral formula (Statement and applications) – Taylor’s and Laurent series – Singularities – Classification – Cauchy’s Residue theorem (Statement only) – Contour integration – circular and semi-circular contours (excluding poles on real axis).

**UNIT – V** 9

**Laplace Transform:** Conditions for existence – Transform of elementary functions – Basic properties – Derivatives and integrals of transforms – Transforms of derivatives and integrals – Initial and final value theorems – Transform of unit step function – Transform of periodic functions - Inverse Laplace transform of elementary functions – Partial fraction method – Convolution theorem (Statement only) – Solution of linear ODE of second order with constant coefficients.

**Lecture: 45, Tutorial: 15, TOTAL: 60**

### TEXT BOOKS:

- Kandasamy P., Thilagavathy K. and Gunavathy K., “Engineering Mathematics For First Year B.E/B.Tech”, Reprint Edition 2014, S.Chand and Co., New Delhi.
- Veerarajan T., “Engineering Mathematics”, (for first year), Reprint Edition 2013, Tata McGraw-Hill, New Delhi.

### REFERENCE BOOKS:

- Grewal B.S., “Higher Engineering Mathematics”, 42<sup>nd</sup> Edition, Khanna Publications, New Delhi, 2011.
- Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, 4<sup>th</sup> Edition, Narosa Publishing House, New Delhi, Reprint 2014.
- Bali N.P. and Manish Goyal, “Text Book of Engineering Mathematics”, 8<sup>th</sup> Edition, Laxmi Publications, New Delhi, 2011.
- Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, 2011.
- Kreyszig E., “Advanced Engineering Mathematics”, 10<sup>th</sup> Edition, John Wiley Sons, 2010.

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: Solve problems involving double and triple integrals.
- CO2: Apply the concept of vectors in engineering problems.
- CO3: Have a clear idea about functions of complex variables and analytic function which are widely used in study of fluid and heat flow problems.
- CO4: Evaluate complex integrals which is extensively applied in engineering.
- CO5: Handle Laplace transforms to solve practical problems.

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1								1		
CO2	3	3	1	1								1		
CO3	3	3										1		
CO4	3	3	1	1								1		
CO5	3	3	1	1								1		

1 – Slight, 2 – Moderate, 3 – Substantial

**14PHT21 MATERIALS SCIENCE**  
(Common to all Engineering and Technology branches)

**3 0 0 3**

**UNIT – I**

**Crystal Physics:** Crystalline and amorphous solids – Lattice – Unit cell – Crystal systems – Bravais lattice – Lattice planes – Miller indices – Derivation of ‘d’ spacing in cubic lattice – Atomic radius – Coordination number– Packing factor for SC, BCC, FCC and HCP structures – Crystal imperfections: Point and line imperfections.

**UNIT – II**

**Conducting Materials:** Conductors – Classical free electron theory of metals – Electrical and thermal conductivities – Wiedemann–Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.

**UNIT – III**

**Semiconducting Materials:** Intrinsic semiconductor – Carrier concentration derivation – Electrical conductivity and band gap (theory) – Extrinsic semiconductors – Carrier concentration derivation in n-type and p-type semiconductors – Hall effect – Determination of Hall coefficient – Applications –Solar cell – LDR.

**UNIT – IV**

**Magnetic and Superconducting Materials:** Magnetic materials - Types of magnetic materials (qualitative) – Domain theory – Hysteresis – Soft and hard magnetic materials – Applications - Transformer core – Magneto optical recording – Superconductors – Properties – Types of superconductors – BCS theory of superconductivity (qualitative) – Josephson effect - Applications of superconductors – SQUID – Cryotron – Magnetic levitation. **Dielectric Materials:** Dielectric constant – Qualitative study of polarization – Frequency and temperature dependence of polarization – Dielectric loss – Dielectric breakdown – Uses of dielectric materials (capacitor) – Ferro electric materials (qualitative).

**UNIT – V**

**Smart Materials:** Metallic glasses: Preparation (Melt spinning method only), properties and applications – Shape memory alloys (SMA): Characteristics and applications. **Nano Materials:** Low dimensional structures (quantum dot, wire and well) – Features of nano materials – Synthesis: top down and bottom up approaches – Ball milling and lithographic methods – Physical and chemical vapor phase depositions – Sol gel method – Carbon nanotubes: Structures – Properties – Fabrication by laser ablation – Applications.

**TOTAL : 45**

**TEXT BOOKS:**

1. Tamilarasan K. and Prabu K., “Engineering Physics-II”, Tata McGraw Hill Education Private Limited, New Delhi, 2014.

**REFERENCE BOOKS:**

1. Mehta and Neeraj, “Applied Physics for Engineers”, Prentice-Hall of India Private Limited, New Delhi, 2011.
2. Raghavan V., “Materials Science and Engineering: A first course”, 5<sup>th</sup> Edition, Prentice-Hall of India, New Delhi, 2009.
3. Poole Charles P. and Ownen Frank J., “Introduction to Nanotechnology”, Wiley India, 2007.
4. William Fortune Smith and Javad Hashemi, “Foundations of Materials Science and Engineering”, McGraw-Hill Education, 2006, New Delhi.
5. Pillai S.O., “Solid State Physics”, 5<sup>th</sup> Edition, New Age International, New Delhi, 2003.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: Explain the various crystal systems and crystal defects.  
 CO2: Comprehend the theory of conducting materials.  
 CO3: Classify the types of semiconducting materials and to illustrate the device applications.  
 CO4: Summarize the theory and applications of magnetic, superconducting and dielectric materials.  
 CO5: Outline the properties and applications of smart materials and nano materials.

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			2	2		2		1					
CO2	3			2	2		2		1					
CO3	3			2	2		2		1					
CO4	3			2	2		2		1					
CO5	3			2	2		2		1					

1 – Slight, 2 – Moderate, 3 – Substantial

**14CYT21 ENVIRONMENTAL SCIENCE**  
(Common to all Engineering and Technology branches)

3 0 0 3

**UNIT – I**

9

**Introduction to Environmental Studies and Natural Resources:** Introduction to Environmental Science – Forest resources: Use and over-exploitation, deforestation, case studies. – Water resources: Use and over-utilization of surface and ground 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 - effects of modern agriculture, fertilizer and 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 – Conservation Practices - Role of an individual in conservation of natural resources.

**UNIT – II**

9

**Ecosystems:** Concept of an ecosystem – Components of an ecosystem - Structural and functional features – Functional attributes (Food chain and Food web only) – Ecological Succession- Introduction, types, characteristic features, structure and functions of the (a) Forest ecosystem (b) Aquatic ecosystems (ponds, rivers and oceans). **Biodiversity:** Introduction – Classification: genetic, species and ecosystem diversity – Bio geographical classification of India- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic, option values and ecosystem service value – Biodiversity at global, national and local level- Hotspots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – In-situ and Ex-situ conservation of biodiversity.

**UNIT – III**

9

**Environmental Pollution:** Definition – Causes, effects and control measures of: (a) Air pollution - Climate change, global warming, acid rain, ozone layer depletion (b) Water pollution (c) Soil pollution - Solid waste Management - Disaster management: floods, earthquake, cyclones and landslides - Role of an individual in prevention of pollution - Case studies. **Water Treatment methods:** Treatment of Water for Domestic Supply (Screening, Aeration, Sedimentation with Coagulation, Filtration and Disinfection methods) - Break point chlorination- Estimation of dissolved oxygen, BOD and COD - Sewage treatment (Primary, Secondary & Tertiary methods) – Introduction to industrial wastewater treatment using Reverse Osmosis Technology- Membrane Technology for wastewater treatment - Activated carbon in pollution abatement of wastewater.

**UNIT – IV**

9

**Social Issues and the Environment:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation – Environmental ethics - Wasteland reclamation – Environment Protection Act – Air (Prevention and control of pollution) Act – Water (Prevention and control of pollution) Act – Wildlife protection Act – Forest conservation Act – Issues involved in enforcement of environmental legislation – Public awareness. **Human Population and the Environment:** Introduction - Population growth - Variation of population based on age structure - Variation among nations – Population explosion – Family welfare programme – Value Education – HIV / AIDS – Women and Child welfare – Role of Information Technology in Environment and human health – Case studies.

**UNIT – V**

9

**Green Chemistry for Sustainable Future:** Water the greenest solvent – Role of catalyst – Biopolymers – Biofertilizers – Principle and applications of green chemistry. **Food and Human Health:** Introduction – Classification and applications of carbohydrates, amino acids, proteins, lipids and vitamins – Food additives – Balanced food – Minerals rich, carbohydrates rich and proteins rich – Chemistry of soft drinks – Oils and fats – Simple tests for identification of adulterants in food stuffs – Impacts of fluoride and arsenic on human health – Fluoride and arsenic removal methods – Significance of iodine, iron and calcium content in human health.

**TOTAL : 45**

**TEXT BOOKS:**

1. Palanisamy P.N., Manikandan P., Geetha A., Manjula Rani K., “Environmental Science”, Pearson Education, New Delhi, Revised Edition 2014.
2. Anubha Kaushik, and Kaushik C.P., “Environmental Science and Engineering”, 4<sup>th</sup> multicolour Edition, New Age International (P) Ltd., New Delhi, 2014.

**REFERENCE BOOKS:**

1. Erach Bharucha, “Textbook of Environmental Studies for Undergraduate Courses”, 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad.
2. Uppal M.M. revised by Bhatia S.C., “Environmental Chemistry”, 6<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2002.
3. Bahl B.S. and Arun Bahl, “Advanced Organic Chemistry”, 3<sup>rd</sup> Edition, S. Chand & Co., New Delhi, 2005.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: Know the types of natural resources and the individual role in conserving the resources
- CO2: Understand the ecological balance and the preservation of biodiversity
- CO3: Gain the knowledge of the various types of pollution and the waste water treatment methods
- CO4: Attain the knowledge of various social issues and impact of population explosion on environment
- CO5: Know about the green chemistry for sustainable future, food and human health

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2			3	2	3	2	1	1			
CO2	3	2			3	2	3	2	1	1			
CO3	3	2			3	2	3	2	1	1			
CO4	3	2			3	2	3	2	1	1			
CO5	3	2			3	2	3	2	1	1			

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CSC11 PROBLEM SOLVING AND PROGRAMMING

(Common to all Engineering and Technology branches)

3 0 3 4

### UNIT – I

9

**Introduction to Computer and Problem Solving:** Overview of computers – Applications of computers-Characteristics of computer - Basic computer Organization – Number System - Problem solving: Planning the computer program – Algorithms - Flowcharts – Pseudo codes – Structuring the logic - Top-Down design.

### UNIT – II

9

**Case Study on Problem Solving:** Algorithm, Flowchart and Pseudo code for the problems: Exchanging the values of two variables – Finding the biggest number - Counting – Summation of numbers – Factorial computation – Generation of Fibonacci Sequence - Summation of series – Base Conversion - Reversing the digits of an Integer.

### UNIT – III

9

**Introduction to C and Control Statements:** Overview of C – Basic structure of a C Program – Executing a C Program – C Character set – Tokens – Keywords and Identifiers – Constants – Variables – Data types - Storage classes - Managing Input and Output operations – Operators and Expressions - Decision making and Branching - Looping – break and continue statements.

### UNIT – IV

9

**Arrays, Strings and Functions:**Arrays – One dimensional and Two dimensional arrays - Handling of character strings: Declaring and initializing string variables – String handling functions - Library functions – User defined functions: Elements of User defined Functions – nesting of functions – passing arrays to function – passing strings to functions - recursion.

### UNIT – V

9

**Structures, Unions and Pointers:** Structure definition – Structure declaration – Accessing a structure member- Structure initialization – Array of Structures - Arrays within structures –Structures within Structures – Structures and Functions , Unions. Understanding pointers – Accessing address of a variable – Declaring pointer variables – Initialization of pointer variables – accessing a variable through its pointer – Pass by value vs. Pass by pointers.

**Lecture: 45, Practical: 45, TOTAL: 90**

### REFERENCE BOOKS:

1. Dromey R.G., “How to Solve it by Computer”, Pearson Education, 2009.
2. Balagurusamy E., “Fundamentals of Computing and Programming“, Tata McGraw-Hill Education Pvt. Ltd, 2010.
3. Stephen G. Kochan, “Programming in C”, 3<sup>rd</sup> Edition, Pearson Education, 2005.
4. Yashavant P. Kanetkar, “Let Us C”, BPB Publications, 2011.

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: apply fundamental principles of problem solving techniques
- CO2: develop algorithm, flowchart and pseudo code to provide solutions to problems
- CO3: develop programs using basic programming principles of C language
- CO4: implement modular programming concepts using functions
- CO5: design simple applications using arrays, structures and pointers

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3		2							2		
CO2	3	3	1		2							2		
CO3	3	3	2	1	2							2		
CO4	3	3	3	2								2		
CO5	3	3	3	2	2							2		

1 – Slight, 2 – Moderate, 3 – Substantial

## 14EET11 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to all Engineering and Technology branches)

3      0      0      3

### UNIT - I

9

**Introduction to Power Systems:** Introduction: Electric Potential, Current, Power and Energy. Generation of Electrical Energy: Sources of Energy - Renewable and Non Renewable - Power Generation: Thermal, Hydro and Nuclear Power plants - Solar and Wind (schematic arrangement and operation) Power plants - Structure of Electric Power System - Transmission and Distribution Voltages. Electrical Safety Aspects - Phase-Neutral - Earthing: Need for Earthing and Types - Domestic Wiring (Simple and staircase) - Energy Conservation and Sustainability.

### UNIT - II

9

**DC Circuits and AC Circuits:** Resistance: Resistors in Series and Parallel - Network Reduction - Voltage and Current Division Rule - Ohm's Law- Kirchhoff's Laws - Mesh Analysis of Simple Resistive Networks.

**Single phase systems:** Alternating (Sinusoidal) Voltage and Current, R.M.S and Average Value, Power Factor, Form Factor and Peak Factor - AC Series Circuits (RL, RC & RLC). Three phase Systems (Qualitative only): Star and Delta Connected Systems - Line and Phase Voltage/Current - Three Phase Power Measurement by Two Wattmeter Method.

### UNIT - III

9

**Electrical Machines:** DC Machines: Construction, Principle of Operation of DC Motor-Torque Equation, Types and Applications. AC Machines: Construction and Working Principle of AC Generator , Single Phase Transformer, Three Phase Induction Motor and Single Phase Induction Motor (Split Phase and Capacitor Start Induction Motor) - Applications.

### UNIT - IV

9

**Basic Electronics:** PN Junction Diode - Operation of Rectifiers (Half wave, Full wave - Bridge Rectifiers with waveforms) and Filters - Zener Diodes - Zener Diode as Voltage Regulator - IC Voltage Regulators (78XX & 79XX) - Transistors: Types - Operation of NPN Transistor - Transistor as an Amplifier - Operation and Characteristics of SCR - UPS and SMPS (Block Diagram approach).

### UNIT - V

9

**Digital Electronics:** Introduction – Binary Number Systems and Conversions - Binary Addition and Subtraction - Logic Gates and Truth tables - Boolean Algebra - Basic Laws and Demorgan's theorem - Simplification of Boolean Functions - Full Adder and Full Subtractor - Flip Flops - Counters: Asynchronous Binary Ripple Counter .

**TOTAL: 45**

### TEXT BOOKS:

- Prasad P.V., Sivanagaraju S. and Prasad R., "Basics of Electrical and Electronics Engineering", 1<sup>st</sup> Edition, Cengage Learning, 2013.
- Muthusubramanian R. and Salivahanan S., "Basics of Electrical and Electronics Engineering", 1<sup>st</sup> Edition ,Tata McGraw Hill, 2009.

### REFERENCE BOOKS:

- Jegathesan V., Vinoth Kumar K. and Saravanakumar R., "Basic Electrical and Electronics Engineering", 1<sup>st</sup> Edition, Wiley India, 2011.
- Sukhija M.S. and Nagsarkar T.K., "Basics of Electrical and Electronics Engineering", 1<sup>st</sup> Edition ,Oxford University Press, 2012.
- Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2<sup>nd</sup> Edition, PHI Learning, 2007.
- Edward Hughes, Ian McKenzie Smith, Dr. John Hiley and Keith Brown, "Electrical and Electronics Technology", 8<sup>th</sup> Edition, Pearson Education, 2012.

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: develop a basic understanding of the concept of electrical systems  
 CO2: analyze the DC and AC circuits  
 CO3: interpret the construction and working of different types of electric machines  
 CO4: discuss the basic electronic components  
 CO5: distinguish analog and digital electronics

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3									1		
CO2	3	3	3									1		
CO3	3	3	3									1		
CO4	3	3	3									1		
CO5	3	3	3									1		

1 – Slight, 2 – Moderate, 3 – Substantial

**14PHL21 PHYSICAL SCIENCES LABORATORY II**  
(Common to all Engineering and Technology branches)

0 0 3 1

**PART-A: APPLIED PHYSICS LABORATORY**  
(Any five experiments)

**LIST OF EXPERIMENTS:**

1. Determination of band gap of a semiconductor material using post office box.
2. Determination of dispersive power of a prism using spectrometer.
3. Determination of viscosity of liquid - Poiseuille's method.
4. Determination of thickness of a thin wire – air wedge method.
5. Determination of AC frequency using Melde's string experiment.
6. Determination of hysteresis loss in a ferromagnetic material.

**Demonstration**

1. Thin film deposition using RF magnetron sputtering technique
2. Synthesis of nano-particles
3. Phase change memory materials - RW CD / DVD

**PART - B: APPLIED CHEMISTRY LABORATORY**  
(Any five experiments)

**LIST OF EXPERIMENTS:**

1. Estimation of Chloride in the given water sample.
2. Determination of Dissolved Oxygen in the given wastewater sample.
3. Estimation of Ferrous ion in the given solution.
4. Estimation of Copper in the given solution by Iodometric method.
5. Estimation of Chromium (Cr<sup>6+</sup>) in the wastewater.
6. Estimation of copper content of the given solution by EDTA method.

**Demonstration**

1. Turbidity measurement using Nephelometer
2. COD analyzer
3. Dissolved Oxygen measurement using DO analyzer

**TOTAL : 45**

**REFERENCES / MANUALS / SOFTWARE:**

1. Physics Laboratory Manual –Dr.K.Tamilarasan and Dr.K.Prabu
2. Chemistry Laboratory Manual- Dr.P.N.Palanisamy, P.Manikandan, A.Geetha and K.Manjularani

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: Describe the basics of band gap of semiconductors, dispersive power of a prism, viscosity of liquids, interference of light, AC frequency and hysteresis of ferromagnetic materials.
- CO2: Operate the instruments like post office box, air wedge arrangement, Melde's string apparatus and hysteresis arrangement, and to measure the related parameters
- CO3: Estimate the amount of DO and chloride in a given water sample
- CO4: Determine the amount of chromium, ferrous ion and copper in waste water

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		2	1		2		2				
CO2	3	3		2	1		2		2				
CO3	3	3		2	1		2		2				
CO4	3	3		2	1		2		2				

1 – Slight, 2 – Moderate, 3 – Substantial

**14EEL11 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY**

(Common to all Engineering and Technology branches)

**0 0 3 1****LIST OF EXPERIMENTS:**

1. Control of incandescent and fluorescent lamp by simple and stair-case wiring
2. Resistor color coding and verification of Ohm's Law and Kirchhoff's Laws
3. Measurement of real power, reactive power, power factor and impedance of RC, RL and RLC circuits.
4. Measurement of Earth's resistance
5. Load test on DC shunt motor
6. Performance characteristics of single phase Transformer
7. Load test on single phase induction motor.
8. Verification of basic logic gates and their truth tables.
9. Implementation of Half wave and Full wave Rectifier with simple Capacitor Filter
10. Study of Mixie, Ceiling Fan and Vacuum Cleaner

**TOTAL : 45****REFERENCES / MANUALS / SOFTWARE:**

1. Lab Manuals

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: create a basic electrical connections for domestic applications  
 CO2: test basic electrical machines like transformer and DC motors  
 CO3: construct and analyze basic electronic circuits  
 CO4: measure the various electrical parameters of the circuit  
 CO5: explain the working of various domestic appliances

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3									2		
CO2	3	3	3									2		
CO3	3	3	3						2			2		
CO4	3	3	3									2		
CO5	3	3	3					1				2		

1 – Slight, 2 – Moderate, 3 – Substantial

### 14MAT31 MATHEMATICS III

(Common to all Engineering and Technology Branches)

3    1    0    4

**UNIT – I**

**Fourier Series:** Dirichlet’s conditions – General Fourier series – Change of interval - Odd and even functions – Half range Sine series – Half range Cosine series – Harmonic analysis. 9

**UNIT – II**

**Partial Differential Equations:** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Lagrange’s linear equation – Homogeneous linear partial differential equations of higher order with constant coefficients. 9

**UNIT – III**

**Applications of Partial Differential Equations:** Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two dimensional heat equation (excluding insulated edges). 9

**UNIT – IV**

**Fourier Transform:** Fourier Integral theorem (without proof) –Fourier transform pair – Properties – Transforms of simple functions – Fourier Sine and Cosine transforms – Convolution theorem and Parseval’s identity (Statement and applications only). 9

**UNIT – V**

**Z - Transform:** Definition – Elementary properties – Z-transform of some basic functions – Inverse Z-transform – Partial fraction method – Residue method – Convolution theorem – Applications of Z-transforms – Solution of difference equations. 9

**Lecture: 45, Tutorial: 15, TOTAL: 60**

**TEXT BOOKS:**

1. Kandasamy P., Thilagavathy K. and Gunavathy K., “Engineering Mathematics, Volume - III”, Reprint Edition, S.Chand& Co., New Delhi, 2014.
2. Veerarajan T., "Transforms and Partial Differential Equations", 3<sup>rd</sup> Reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2013.

**REFERENCE BOOKS:**

1. Grewal B.S., "Higher Engineering Mathematics", 43<sup>rd</sup> Edition, Khanna Publishers, Delhi, 2014.
2. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Reprint Edition, Narosa Publishing House, New Delhi, 2014.
3. Bali N.P. and Manish Goyal, “A Text Book of Engineering Mathematics”, 9<sup>th</sup> Edition, Laxmi Publications, New Delhi, 2014.
4. Ramana B.V., “Higher Engineering Mathematics”, 11<sup>th</sup> Reprint, Tata McGraw Hill Publishing Company, New Delhi, 2010.
5. Erwin Kreyzig, “Advanced Engineering Mathematics”, 10<sup>th</sup> Edition, Wiley & Co, 2011.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: Expand a function in terms of Fourier series and apply it for solving engineering problems
- CO2: Model and solve higher order partial differential equations
- CO3: Apply the methods of solving PDE in practical problems
- CO4: Gain knowledge on Fourier transforms
- CO5: Handle problems in Z transforms and apply it to solve difference equations

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial



## 14CET31 ENGINEERING GEOLOGY

3    0    0    3

### UNIT – I

**General Geology:** Importance of Geology in Civil Engineering – Branches of geology – Earth structures and composition - Earth processes – Weathering – work of rivers, wind and their Engineering importance. Groundwater: Mode of occurrence - Importance in Civil Engineering– Earthquake – causes - zones in India.

### UNIT – II

**Mineralogy:** Elementary knowledge on symmetry elements of crystallographic systems (normal class) – Physical properties of minerals – Study of the rock forming minerals – Quartz family - Feldspar family – Pyroxene family minerals - Mica – Fundamentals of ore mineral formation.

### UNIT – III

**Petrology:** Rocks - Rock cycle – Classification and Distinction of rocks - Igneous rocks: Granite, Syenite, Basalt and Dolerite - Sedimentary rocks: Conglomerate, Breccia, Sandstone, Shale and Limestone - Metamorphic rocks: Gneiss, Schist, Quartzite and Marble.

### UNIT – IV

**Structural Geology and Geophysical Investigations:** Dip and Strike – Outcrops – Folds - Faults and joints: causes and types – bearing on engineering construction - Electrical survey for civil engineering investigations

### UNIT – V

**Geological Investigations in Civil Engineering:** Applications of remote sensing technique – Interpretation for civil engineering projects – Geological considerations for construction of dam, reservoir and Tunnels – Landslides – causes and preventions.

**TOTAL: 45**

### TEXT BOOKS:

- Duggal S.K. Pandey and Rawal, “Engineering Geology”, Tata McGraw Hill Publishing Company, New Delhi, 2014.
- Venkat Reddy D., “Applied Geology”, 1<sup>st</sup> Edition, Vikas Publishing House Pvt. Ltd., Noida, 2013.

### REFERENCE BOOKS:

- Legeet, “Geology and Engineering”, McGraw Hill Book Company, 1998.
- Parbin Singh, “Engineering and General Geology”, Katson Publication House, 2013.
- Garg S.K. “Physical and Engineering Geology”, Khanna Publishers, New Delhi, 2009.
- <http://nptel.ac.in/courses/105104147/>
- <http://nptel.ac.in/courses/105105106/>
- <http://nptel.ac.in/courses/105104152/>
- <http://nptel.ac.in/courses/105104156/>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: distinguish the earth process with reference to earth surface
- CO2: identify the different minerals in the field
- CO3: examine the different type of rocks and its properties
- CO4: analyze structural geology in the field
- CO5: select suitable site for the construction of civil engineering projects

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3	1					1	3	2
CO2	1					2							2	1
CO3	3	3	2			3	1					1	3	3
CO4	3	3	2			3	2					2	3	3
CO5	2	1				3	1					1	3	2

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CET32 RIGID BODY STATICS AND DYNAMICS

3    1    0    4

### UNIT – I

**Rigid Body Statics:** Introduction - Units and Dimensions - Laws of Mechanics –types of force systems - Principle of transmissibility - Lamé’s theorem, Parallelogram and triangular Laws of forces – Vectorial representation of forces, Coplanar Forces – Resultant and Equivalent systems of forces- Forces in space – Equilibrium of a particle in space.

### UNIT – II

**Equilibrium of Rigid Bodies:** Free body diagram – Types of supports and their reactions – Moments and couples – Varignon’s theorem – Moment of a force about a point and about an axis - Resolution of forces – Reduction of system of forces - Equilibrium of rigid bodies in two dimensions.

### UNIT – III

**Properties of Surfaces and Solids:** Determination of Areas - Composite Areas (Pappu’s and Guldinus theorem) – Centroid and centre of gravity - Determination of Moment of Inertia of an area - Parallel axis theorem - Perpendicular axis theorem - Polar moment of inertia - Radius of gyration - Mass moment of inertia of simple solids.

### UNIT – IV

**Friction:** Frictional force – Laws of friction – Coefficient of friction - Angle of friction – Simple contact friction- Ladder friction - Wedge friction.

### UNIT – V

**Rigid Body Dynamics: Kinematics:** Rectilinear and Curvilinear motion of particles - Displacements, Velocity and acceleration – relationship. **Kinetics:** Newton’s laws of motion – Principle of Work and Energy– Principle of Impulse and Momentum.

**Lecture:45, Tutorial:15, TOTAL: 60**

### TEXT BOOKS:

1. Sankarasubramanian G., and Rajasekaran S., “Engineering Mechanics Statics and Dynamics”, Vikas Publishing House, New Delhi, 2010.
2. Bhavikatti S.S., “A Text Book of Engineering Mechanics”, New Age International Pvt. Ltd., Publishers, New Delhi, 2008.

### REFERENCE BOOKS:

1. Shames, Irving H., “Engineering Mechanics: Statics and Dynamics”, 4<sup>th</sup> Edition, Pearson Education Asia, Singapore, 2003.
2. Hibbeler, R. C., “Engineering Mechanics”, Volume – I: Statics, Volume – II: Dynamics, Pearson Education Asia, Singapore, 2006.
3. Kumar K.L., “Engineering Mechanics”, Tata McGraw Hill Publishing Company, New Delhi, 2008.
4. Beer F.P. and Johnston E.R., “Vector Mechanics for Engineers- Statics and Dynamics”, 8<sup>th</sup> Edition, Tata McGraw Hill Publishing Company, New Delhi, 2008.
5. <http://nptel.ac.in/courses/112106180/>
6. <http://nptel.ac.in/courses/122104014/>
7. <http://nptel.ac.in/courses/115104094/>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: evaluate the forces and their equilibrium conditions using the general principles
- CO2: compute the moment and reactions on a body
- CO3: calculate the moment of Inertia of various sections
- CO4: evaluate the friction forces of the elements
- CO5: analyse the rigid body subjected to dynamic forces

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	3	2			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CET33 MECHANICS OF FLUIDS**

**3    1    0    4**  
**9**

**UNIT – I**

**Fluid Properties and Statics:** Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Continuum Concept of system and control volume – Pascal’s Law and Hydrostatic equation – Forces on plane and curved surfaces – Buoyancy – Meta centre – Pressure measurement – Fluid mass under relative equilibrium.

**UNIT – II**

**Fluid Kinematics:** Fluid Kinematics - Stream, streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – flow nets – Velocity measurement.

**UNIT – III**

**Fluid Kinetics:** Euler and Bernoullis equations – Application of Bernoullis equation – Discharge measurement – Laminar flows through pipes and between plates – Hagen Poisuille equation – Turbulent flow – Darcy-Weisbach formula – Moody diagram – Momentum Principle.

**UNIT – IV**

**Boundary Layer and Flow Through Pipes:** Definition of boundary layer – Thickness and classification – Displacement and momentum thickness – Development of laminar and turbulent flows in circular pipes – Major and minor losses of flow in pipes – Pipes in series and in parallel.

**UNIT – V**

**Similitude and Model Study:** Dimensional Analysis – Rayleigh’s method, Buckingham’s Pi theorem – Similitude and models – Scale effect and distorted models.

**Lecture:45, Tutorial:15, TOTAL: 60**

**TEXT BOOKS:**

1. Bansal, R.K., “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications Pvt. Ltd., New Delhi, 2008.
2. Rajput, R.K., “A Text Book Fluid Mechanics”, S Chand & Co., New Delhi, 2013.

**REFERENCE BOOKS:**

1. Modi, P.M. and Seth, S.M., “Hydraulics, Fluid Mechanics and Hydraulic Machinery”, Standard Book House, New Delhi, 2005.
2. Streeter, Victor L and Wylie, Benjamin E., “Fluid Mechanics”, McGraw-Hill, New York, 1998.
3. Kumar K.L., “Engineering Fluid Mechanics”, Eurasia Publishing House Pvt. Ltd., New Delhi, 1995.
4. <http://engineeringstudymaterial.net/ebook/fluid-mechanics-and-machinery/>
5. <https://themech.in/mechanical/mechanical-engineering-complete-ebooks-free-download/>
6. <https://www.goodreads.com/search?q=mechanics+of+fluid>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: categorize the types of flow with different flow conditions
- CO2: calculate hydrostatic forces on plane and curved surfaces
- CO3: compute discharge in pipes
- CO4: determine pipe characteristics with the help of Moody diagram
- CO5: calculate major and minor losses in pipes
- CO6: execute dimensional and model analysis to solve complex fluid problems

**Mapping of COs with POs and PSOs**

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	2	3
CO2	3	2	1			3						1	2	3
CO3	3	2	1			3						1	2	3
CO4	3	2	1			3						1	2	3
CO5	3	2	1			3						1	2	3
CO6	3	2	1			3						1	2	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CET34 CONCRETE TECHNOLOGY

3    0    0    3

### UNIT – I

**Ingredients of Concrete:** Cement - Raw materials - Chemical composition – Tests on Cement – Hydration of cement – Structure of hydrated cement paste. Aggregates - Types – Grading of aggregates – tests on aggregates – combining of aggregates – Water – Admixtures. 9

### UNIT – II

**Fresh Concrete Properties and Mix Design:** Water cement ratio – Workability – tests on workability – Factors affecting workability - Mix proportioning – IS code method – ACI method – Methods of concreting and curing . 9

### UNIT – III

**Strength of Concrete:** Mechanical Properties of hardened concrete – tests – Elastic modulus – Creep and shrinkage – Non destructive testing of concrete (Rebound hammer and UPV Test). 9

### UNIT – IV

**Durability of concrete:** Durability properties of concrete - tests - Cracks – Alkali aggregate reaction – Freezing and thawing – Chemical attack – Carbonation – Corrosion – mechanism and tests – Methods of improving durability of concrete. 9

### UNIT – V

**Special Concretes:** High strength concrete - High performance Concrete – Self compacting concrete - Light weight concrete – No fines concrete – Fiber reinforced concrete – Polymer concrete – Vacuum concrete – Ferrocement – High volume fly ash concrete – Roller compacted concrete – Geopolymer concrete – Bacterial concrete - Basalt fibre concrete. 9

**TOTAL: 45**

### TEXT BOOKS:

- Shetty, M.S. “Concrete Technology Theory and Practice” S.Chand & Co. Ltd., New Delhi, Revised Edition, 2008.
- Gupta B.L. and Amit Gupta “Concrete Technology”, 4<sup>th</sup> Edition, Standard Publishers, New Delhi, 2014.

### REFERENCE BOOKS:

- Neville, A.M and Brooks, J.J. “Concrete Technology”, Addition Wesley Longman Limited, London, 1999.
- Gambhir, M.L. “Concrete Technology”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
- Santhakumar, A.R, “Concrete Technology”, 3<sup>rd</sup> Edition, Oxford University Press Publications, New Delhi, 2006.
- Kumar Mehta, P. and Paulo J.M.Monteiro, “Concrete: Microstructure, Properties and Materials”, McGraw Hill, Singapore, 2006.
- <http://nptel.ac.in/courses/105104030/>
- <http://nptel.ac.in/courses/105102012/>
- <http://civilblog.org/2014/05/16/6-methods-of-curing-of-concrete/>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: Indicate suitable ingredients for concrete
- CO2: design concrete mix with proper ingredients
- CO3: Infer the properties of fresh and hardened concrete
- CO4: execute the factors responsible for the deterioration of concrete and apply suitable measures to improve durability of concrete
- CO5: recommend special concretes for specific applications

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3	2					2	3	3
CO3	2	1				2							3	2
CO4	3	2	1			3	1					1	3	3
CO5	3	2	1			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CET35 SURVEYING**

**3    0    0    3**

**UNIT – I**

**Chain and Compass Surveying:** Definition - Principles - Classification - Scales - Ranging and chaining - well conditioned triangles –Corrections - Prismatic compass – Surveyors compass - Bearing - Systems and conversions - Local attraction - Adjustment of errors. **9**

**UNIT – II**

**Leveling and Contouring:** Level line - Horizontal line - Spirit level - Sensitiveness (No derivation)- Bench marks – Types of levelling - Booking and Reduction - Curvature and refraction (No derivation)- Calculation of areas and volumes - Contouring - Characteristics and uses of contours – Calculation of Earth work volume - Capacity of reservoirs. **9**

**UNIT – III**

**Theodolite Surveying and Curve Setting:** Theodolite - Description and uses - Horizontal angles - Vertical angles - Traversing - Closing error and distribution - Omitted measurements – Curves –Types- components and elements of simple curve – Setting out a simple curve - Transition curves - Functions and requirements. **9**

**UNIT – IV**

**Tachometric and Triangulation Surveying:** Tacheometric systems – Tangential and stadia methods - Stadia systems - Horizontal and inclined sights - Vertical staffing - Fixed and movable hairs – Determination of Stadia constants - Anallactic lens - Triangulation - Corrections - Satellite station - Reduction to centre - Trigonometric Leveling - Single and reciprocal observations. **9**

**UNIT – V**

**Control Surveying and Hydrographic Surveying:**– Survey adjustments - True and most probable values - weighted observations - Principle of least squares - Normal equation - Hydrographic Surveying – MSL(basics only) - Sounding methods - Cartography - Cartographic concepts and techniques - Introduction to GPS and total station. **9**

**TOTAL: 45**

**TEXT BOOKS:**

1. Punmia, B.C., “Surveying”, Volume. I and II, Laxmi Publications, New Delhi, 2008.

**REFERENCE BOOKS:**

1. Duggal, “Surveying”, Volumes - I and II, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
2. Kanetkar T.P., “Surveying and Levelling”, Volumes - I and II, United Book Corporation, Pune, 1994.
3. Subramanian R., “Surveying and Levelling”, Oxford University Press, New Delhi, 2007.
4. <http://nptel.ac.in/courses/105107122>
5. <http://nptel.ac.in/courses/105104101>
6. <http://nptel.ac.in/courses/105104100>
7. <http://nptel.ac.in/courses/105107121>
8. <http://nptel.ac.in/courses/105107157>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: carry out ranging and adjustment of errors
- CO2: prepare the profile map and contour map of an area
- CO3: design the simple curve
- CO4: determine the horizontal and vertical positions of points
- CO5: summarize the precise position of a stations

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			2						1	3	3
CO3	3	2	1			3						2	3	3
CO4	3	2	1			2						1	3	3
CO5	2	2				1							3	2

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEL31 SURVEY PRACTICAL

0    0    3    1

### LIST OF EXPERIMENTS / EXERCISES:

1. Ranging and Chain Traversing- Measurement of distance and setting the perpendiculars
2. Setting out works - Foundation trench/Wall marking
3. Compass Traversing – Determination of area of closed traverse
4. Plane table surveying: Traversing- Plotting the boundary of given building/site and determination of the area
5. Plane table surveying: Resection –Solving Three point problem (Bessel’s Graphical Method)
6. Plane table surveying: Resection – Solving Two point problem
7. Leveling – Determination of elevation of given points
8. Leveling – Determination of height difference between the points by conducting Differential and Reciprocal Leveling
9. Leveling - LS and CS –Plotting longitudinal section and cross section of given proposed Roadway/Rail line/ Water line/Sewerage line
10. Contouring- Preparation of contour map and calculating the area enclosed by contours
11. Theodolite – Determination of Distance and elevation
12. Setting out the simple curve

**TOTAL : 45**

### REFERENCES / MANUALS / SOFTWARE:

1. Punmia, B.C., “Surveying”, Volumes – I and II, Laxmi Publications, New Delhi, 2008.
2. Lab Manual.
3. <http://nptel.ac.in/courses/105107122/20>
4. <http://nptel.ac.in/courses/105107122/20>
5. <http://nptel.ac.in/courses/105104100/4>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: sketch the foundation trenches and set out the building layouts
- CO2: provide solution for two-point problem and three-point problem
- CO3: conduct longitudinal and cross section leveling
- CO4: plot the contour map
- CO5: calculate the volume of cutting and filling of land

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1		3		1	1	3		2	3	3
CO2	3	2	1	1		3		1	1	3		2	3	3
CO3	3	2	1	1		3		1	1			2	3	3
CO4	3	2	1	1		3		1	1	3		2	3	3
CO5	3	2	1	1		3		1	1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**LIST OF EXPERIMENTS / EXERCISES:**

1. Introduction: Coordinate systems, planes, drawing basic entities, Symbols and sign conventions
2. Principles of Planning and Building Bye-Laws
3. Joinery details of paneled doors and windows.
4. Elements of steel roof truss.
5. Plan, Elevation and Cross Section of
  - a. Residential Building – one storied & two storied
  - b. RCC Framed structure - commercial and institutional
  - c. Industrial Building with north light roof truss
  - d. Rain water Harvesting and Septic tank
6. Preparation of Detailed drawing
7. Building Information Modeling (BIM)

**TOTAL : 45****REFERENCES / MANUALS / SOFTWARE:**

1. Verma B.P., “Civil Engineering Drawing & House Planning”, Khanna Publishers, New Delhi, 2008.
2. Shah M.G., Kale C.M. and Patki S.Y., “Building Drawing with an Integrated Approach to Built Environment”, Tata McGraw Hill Publishers Limited, 2004.
3. J.S. Loyal, “Civil Engineering Drawing”, 3<sup>rd</sup> Edition Reprint, Satya Prakashan Publications, 2014.
4. <http://nptel.ac.in/courses/105104148/31>
5. [http://civilengineeringnotes.weebly.com/uploads/1/1/7/5/11750056/building\\_bye\\_laws.pdf](http://civilengineeringnotes.weebly.com/uploads/1/1/7/5/11750056/building_bye_laws.pdf)
6. [https://cphbooks.in/pdf/Building\\_Planning\\_Drawing.pdf](https://cphbooks.in/pdf/Building_Planning_Drawing.pdf)
7. [http://docs.autodesk.com/ACDMAC/2013/ENU/PDFs/acdmac\\_2013\\_users\\_guide.pdf](http://docs.autodesk.com/ACDMAC/2013/ENU/PDFs/acdmac_2013_users_guide.pdf)

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: implement the principles of planning and bylaws
- CO2: draw the plan, elevation and section of load bearing and framed structures
- CO3: prepare detailed working drawing for doors, windows, roof trusses etc.
- CO4: incorporate the concept of BIM

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	3		1	1			2	3	3
CO2	3	3	2	2	2	3		1	1	3		2	3	3
CO3	3	3	2	2	2	3		1	1	3		2	3	3
CO4	3	3	3	3	3	3		1	1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**LIST OF EXPERIMENTS:**

1. Specific gravity of cement and aggregates
2. Fineness modulus of aggregates - Sieve analysis
3. Fineness and Soundness test on cement
4. Consistency, Initial and final setting time of cement
5. Compressive strength of cement
6. Workability of fresh concrete – slump value, Vee Bee consistometer and Compaction factor
7. Compressive Strength of Concrete
8. Split Tensile Strength of Concrete
9. Flexural Strength of Concrete
10. Test on Concrete blocks(Hollow blocks and paver blocks)
11. NDT on Concrete (Rebound Hammer test and UPV test)
12. Durability on concrete – Permeability and RCPT (Demonstration only)

**TOTAL : 45**

**REFERENCES / MANUALS / SOFTWARE:**

1. Shetty M.S., “Concrete Technology Theory and Practice”, S.Chand& Company Ltd., New Delhi, 2008.
2. Gambhir M.L., “Concrete Testing Manual”, Dhanpat Rai & Sons, New Delhi, 2010.
3. <http://nptel.ac.in/courses/105104030>
4. <http://nptel.ac.in/courses/105102012/>
5. <http://civilblog.org/2014/05/16/6-methods-of-curing-of-concrete/>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: examine the properties of ingredients of concrete
- CO2: infer the properties of fresh concrete and hardened concrete
- CO3: carry out non destructive testing on concrete
- CO4: experiment the durability properties of concrete

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1		3	2	1	1			2	3	3
CO2	2	1				3	2	1	1			2	3	2
CO3	3	2	1	1		3	2	1	1			2	3	3
CO4	3	2	1	1		3	2	1	1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial



## 14MAT41 NUMERICAL METHODS

(Common to Civil, EEE, EIE, ECE, CSE, IT, Chemical & Food Technology)

**3    1    0    4**  
**9**

### UNIT – I

**Solution to Algebraic and Transcendental Equations:** Iteration method – Method of false position – Newton-Raphson method – Solution of linear system of equations – Direct methods: Gauss elimination method and Gauss - Jordan method – Iterative methods: Gauss Jacobi and Gauss – Seidel methods.

### UNIT – II

**Interpolation:** Interpolation with equal intervals: Newton’s forward and backward difference formulae – Central difference interpolation formulae: Gauss forward and backward interpolation formulae – Interpolation with unequal intervals: Lagrange’s interpolation formula – Newton’s divided difference formula.

### UNIT – III

**Numerical Differentiation and Integration:** Differentiation using Newton’s forward, backward and divided difference formulae – Numerical integration: Trapezoidal rule – Simpsons 1/3<sup>rd</sup> rule – Double integrals using Trapezoidal and Simpson’s rules.

### UNIT – IV

**Numerical Solution of First order Ordinary Differential Equations:** Single step methods: Taylor series method – Euler method – Modified Euler method – Fourth order Runge-Kutta method – Multi step methods: Milne’s predictor corrector method – Adam’s Bashforth method.

### UNIT – V

**Solutions of Boundary Value Problems in PDE:** Solution of one dimensional heat equation – Bender -Schmidt recurrence relation – Crank - Nicolson method – One dimensional wave equation – Solution of two dimensional Laplace equations – Solution of Poisson equation.

**Lecture: 45, Tutorial: 15, TOTAL: 60**

### TEXT BOOKS:

1. Kandasamy P., Thilakavathy K. and Gunavathy K., “Numerical Methods”, Reprint Edition, S.Chand& Co, New Delhi, 2014.
2. Veerarajan T., Ramachandran T., “Numerical Methods with Programming C”, 2<sup>nd</sup> Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2008.

### REFERENCE BOOKS:

1. Balagurusamy E., “Numerical Methods”, Reprint Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
2. Jain M.K., Iyengar S.R.K. and Jain R.K., “Numerical Methods for Scientific and Engineering Computation”, 6<sup>th</sup> Reprint, New Age International Pvt. Ltd., New Delhi, 2014.
3. Sankara Rao K., "Numerical Methods for Scientists and Engineers", 3<sup>rd</sup> Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
4. Gerald C.F. and Wheatley P.O., "Applied Numerical Analysis", 7<sup>th</sup> Edition, Pearson Education, Asia, New Delhi, 2006.
5. Grewal B.S., “Numerical Methods in Engineering and Science”, 9<sup>th</sup> Edition, Khanna Publishers, 2007.

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: know the various methods of solving algebraic and transcendental equations numerically
- CO2: understand the concept of interpolation
- CO3: gain knowledge on the concepts of numerical differentiation and integration
- CO4: obtain the solution of ordinary differential equations numerically
- CO5: apply various numerical techniques in solving complex partial differential equations

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CET41 MECHANICS OF DEFORMABLE BODIES

3    1    0    4

### UNIT – I

**Stresses and Strain:** Stability, strength, stiffness – tension, compression and shear stresses – strain, elasticity, Hooke’s law, limit of proportionality, modulus of elasticity, stress-strain curve, lateral strain – temperature stresses – deformation of simple and compound bars – shear modulus, bulk modulus and relationship between elastic constants. Compound stress - Principal stresses and Planes – Mohr’s circle of stress - thin cylinder. 9

### UNIT – II

**Statically Determinate Beams:** Beams - Types and transverse loading on beams – shear force and bending moment diagrams – simply supported, cantilever and over hanging beams - Theory of simple bending – Assumptions - Analysis of stresses – load carrying capacity – Proportioning sections – Shear Stress Distribution. 9

### UNIT – III

**Deflection of Beams:** Slope and Deflection of beams - Double integration method - Macaulay's method – Moment Area Method - Conjugate beam method. 9

### UNIT – IV

**Columns and Torsion:** - Columns - short column - long column – Euler’s formula – effective length - Rankine’s formula. Theory of simple torsion - torsion equation - Stresses in circular and hollow circular shafts . 9

### UNIT – V

**Analysis of Plane Trusses:** Stability and equilibrium of plane frames – perfect frames – analysis of forces in truss members – method of joints – method of tension coefficients – method of sections. 9

**Lecture: 45, Tutorial: 15, TOTAL: 60**

#### TEXT BOOKS:

1. Rajput R.K., “Strength of Materials”, Revised Edition, S. Chand & Co, New Delhi, 2006.
2. Bansal R.K., “Strength of Materials”, Laxmi Publications, New Delhi, 2007.

#### REFERENCE BOOKS:

1. Gambhir M. L., “Fundamentals of Solid Mechanics : A Treatise on Strength of Materials”, PHI Learning Pvt. Ltd., New Delhi, 2009.
2. Ramamrutham S., “Strength of Materials”, Dhanpat Rai Publications, New Delhi, 2010.
3. Hibbeler, “Mechanics of Materials”, Pearson Education, New Delhi, 2007.
4. Strength of Materials by Khurmi R S (<https://www.scribd.com/document/282423021/Rs-Khurmi-Strength-of-Materials>)
5. Strength of Materials – National Program on Technology Enhanced Learning - Course Material ([nptel.ac.in/courses/105105108/](http://nptel.ac.in/courses/105105108/))

#### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: compute the elastic constants of the member for the given stress condition and the principal stresses at the section
- CO2: analyze of flexural and shear stresses developed in the beam
- CO3: determine the deflection developed in the beam
- CO4: analyze the column and torsional behaviour of structural members
- CO5: analyze the axial force induced in the truss members

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	3	2			3				1		1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	3	2			3						1	3	3
CO5	3	3	2			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CET42 APPLIED HYDRAULIC ENGINEERING**

**3 1 0 4**

**UNIT – I**

**Open Channel Flow:** Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Critical flow and its computation. **9**

**UNIT – II**

**Uniform Flow:** Velocity measurement – Manning’s and Chezy’s formula – roughness co-efficient – normal depth and velocity – Most economical sections ( rectangular, trapezoidal, circular and triangular sections) – Non-erodible channels. **9**

**UNIT – III**

**Varied Flow:** Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions – Hydraulic jump – Types – Energy dissipation – Surges – Surge channel transitions. **9**

**UNIT – IV**

**Pumps:** Application of momentum principle – Impact of jets on plane and curved plates – Centrifugal pump – Minimum speed to start the pump – Multistage pumps – Reciprocating pump – Negative slip – Air vessels – Indicator diagrams. **9**

**UNIT – V**

**Turbines:** Turbines – Classification – Radial flow turbines – Axial flow turbines – Impulse and reaction turbines – Draft tube and cavitations – Performance of turbines. **9**

**Lecture: 45, Tutorial: 15, TOTAL: 60**

**TEXT BOOKS:**

1. Subramanya K., “Flow in Open Channels”, Tata McGraw-Hill Publishing Company Ltd., New Delhi 1994.
2. Modi P.M. and Seth S.M., “Hydraulics, Fluid Mechanics and Hydraulic Machinery”, Standard Book House, New Delhi, 2005.

**REFERENCE BOOKS:**

1. Bansal R.K., “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications Pvt. Ltd., New Delhi, 2008.
2. Kumar K.L., “Engineering Fluid Mechanics”, 7<sup>th</sup> Edition, Eurasia Publishing House Pvt. Ltd., New Delhi, 1995.
3. Srivastava Rajesh, “Flow Through Open Channels”, Oxford University Press, New Delhi, 2008.
4. <http://www.efm.leeds.ac.uk/CIVE/CIVE2400/OpenChannelHydraulics2.pdf>
5. [http://fmcet.in/CIVIL/CE6403\\_uw.pdf](http://fmcet.in/CIVIL/CE6403_uw.pdf)

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: identify different regimes of flow
- CO2: determine the most economical sections of a channel
- CO3: compute the flow profile of varied flows
- CO4: analyze performance characteristics of pumps
- CO5: examine the performance characteristics of turbines

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	3	2			3						1	3	3
CO5	3	3	2			3						1	3	3

1 – Slight, 2 – moderate, 3 – Substantial

## 14CET43 WATER SUPPLY ENGINEERING

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### UNIT – I

9

**Introduction:** Objectives and importance of Public Water Supply systems - Health , Acceptability, Adequacy, Convenience and Economy - Factors influencing Water Supply in India - Water Analysis -Population Forecasts - Variations in Demands - Continuous and Intermittent water supplies – water quality standards.

### UNIT – II

9

**Sources of Water:** Surface and Ground Water Sources - Source selection - Computation of storage requirements - Mass Curve Analysis - Intake Structures - Wells, Infiltration Galleries -Tube wells -Sanitary Protection of Wells - Hydraulics of Ground Water Flow - Darcy's Law - Estimating Yield of Wells.

### UNIT – III

9

**Conveyance of Water:** Pipes and Channels for Transmitting water - Materials for Pipes and Conduits - Selection of Materials - Laying, Jointing and Testing of Pipes - Appurtenances of Pipes - Pumps and Pumping Stations - Selection of Pumps.

### UNIT – IV

9

**Storage and Distribution:** Analysis of Distribution networks using Hardy Cross Method - Equivalent Pipe method - Operation and Maintenance - Leak Detection, Corrosion control, lining of pipes -Elevated and ground level reservoirs - Location - Determination of Storage Capacity -Software applications.

### UNIT – V

9

**Design Principles of Water Treatment:** Unit process of Water Treatment -Principles, functions and design of flash mixers, Flocculators, Sedimentation Tanks and Sand Filters - Principles of Disinfection, Water Softening Methods, Aeration, iron and Manganese Removal, Fluoride Removal.

**TOTAL: 45**

### TEXT BOOKS:

1. Garg S.K., “Water Supply Engineering”, Khanna Publishers, New Delhi, 2013.
2. Birde G.S. and Birde J.S., “Water Supply and Sanitary Engineering”, Dhanpat Raj Publishing Co., New Delhi,1997.

### REFERENCE BOOKS:

1. Babbitt H.E. and Donald J.J., “Water Supply Engineering”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1959.
2. Hussain S.K., “A Text Book on Water Supply and Sanitary Engineering”, Oxford & IBH Publishing Co, New Delhi, 1976.
3. “Manual on Water Supply and Treatment”, CPHEEO, Government of India, New Delhi, 2010.
4. <http://nptel.ac.in/courses/105106119/> - Lectures Series on Water & Waste Water Engineering by Prof C.Venkobachar, Prof. Ligy Philip, Prof. B. S. Murty.
5. <http://nptel.ac.in/courses/105106056/> - Waste Management (Physico – Chemical).
6. <http://www.nptelvideos.com/video.php?id=1127> – Lecture on Wastewater Treatment Reactor analysis by Prof. Ligy Philip.

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: estimate the population and determine the water demand
- CO2: identify sources of water and compute the yield of wells
- CO3: summarize water transmission systems
- CO4: analyze the reservoirs storage and distribution capacities
- CO5: design suitable water treatment units

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3	1					1	3	3
CO2	3	3	2			3	1					1	3	3
CO3	2	1				3	1					1	3	2
CO4	3	3	2			3	1					1	3	3
CO5	3	3	2			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CET44 SOIL MECHANICS

(Newmark's influence chart , Taylors stability chart and equivalent point load distribution tables are permitted)

3    0    0    3

### UNIT – I

**Introduction and Soil Properties:**Origin of soil- rock- soil structure and clay mineralogy - Basic definitions - phase diagram - relationships - index properties of soil - classification of soils.

### UNIT – II

**Soil-Water and Seepage:**Permeability: Soil water – capillary rise – suction- flow of water through soils – Darcy's law- permeability – Factors affecting permeability – coefficient of permeability – Effective stress concepts in soils – quick sand conditions - Seepage - seepage velocity- discharge velocity- Introduction to flow nets –properties and uses.

### UNIT – III

**Stress Distribution in Soil:** Stress distribution in soil- assumptions in elastic theories- Boussinesq's equation for point and line loads- Westergaard's equation for point load- concept and use of pressure bulbs- principle and use of Newmark's influence chart, contact pressure- Equivalent point load – two point method – three point method.

### UNIT – IV

**Compaction and Consolidation:** Compaction - Mechanism - factors affecting compaction - effects on soil properties- measurement of compaction. Consolidation - mechanism - components - basic definitions- Terzaghi's theory of one dimensional consolidation - co efficient of consolidation - computation of rate of settlement- factors influencing compression behaviour of soils.

### UNIT – V

**Shear Strength and Slope Stability:** Introduction- Mohr – Coulomb Failure theories - measurement of shear parameters - direct shear test- triaxial shear test- unconfined compression test- Vane shear test- Factors influencing shear strength of soils (theory only). Slope failure mechanisms – Types: Infinite slopes - Finite slopes - Stability analysis for purely cohesive and cohesionless soils. Method of slices, Swedish circle method – stability number – slope protection measures.

**TOTAL: 45**

### TEXT BOOKS:

1. Punmia B.C., “Soil Mechanics and Foundation Engineering”, 16<sup>th</sup> Edition, Laxmi Publications, 2005.
2. Arora K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors,2005.

### REFERENCE BOOKS:

1. Gopal Ranjan and Rao A.S.R., “Basic and Applied Soil Mechanics”, New Age International Pvt. Ltd, 2003.
2. Das B.M., “Principles of Geotechnical Engineering”,Brooks/Cole, 2010.
3. T.W. Lambe and Whitman, “Soil Mechanics”, Tata Mc-Graw Hill Publishing Company, New Delhi,2009.
4. PurushothamaRaj P., “Soil Mechanics and Foundation Engineering”, 2<sup>nd</sup> Edition, Pearson Education, 2013.
5. Venkataramiah C., “Geotechnical Engineering”, New Age International Pvt. Ltd., 2012.
6. [http://civil.uonbi.ac.ke/sites/default/files/cae/engineering/civil/FCE311\\_Tutorial.pdf](http://civil.uonbi.ac.ke/sites/default/files/cae/engineering/civil/FCE311_Tutorial.pdf)
7. <http://nptel.ac.in/courses/105103097/12>
8. [http://geotech.fce.vutbr.cz/studium/mech\\_zemin/soil\\_mechanics.pdf](http://geotech.fce.vutbr.cz/studium/mech_zemin/soil_mechanics.pdf)

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: classify the soil and solve three phase system problems
- CO2: calculate the effective stress, permeability and seepage
- CO3: determine the vertical stress distribution in soil
- CO4: solve soil related problems by applying the principles of compaction and consolidation
- CO5: determine the stability of slopes based on shear strength parameters

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3						1	3	2
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3
CO6	2	1				3						1	3	2

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT – I**

9

**Dimension Relationships and Perspective:** Dimensions and space requirement in relation to body measurements, space design for passage between walls, service access, stair, ramps, and elevators. Elements of perspective drawings, parallel perspective and angular perspective.

**UNIT – II**

9

**Planning of Buildings:** Site selection, layout for various types of building such as: residential, educational building, hospitals, assembly, industrial and commercial buildings.

**UNIT – III**

9

**Acoustic:** Sound frequency, intensity, sound decibel rating, absorption of sound-Various materials. Sabine’s formula, optimum reverberation time, conditions for good acoustics, effect of reflectors, flat ceiling, design of an auditorium, defects in auditorium and remedies, acoustical design for classrooms, broadcasting room etc.**Sound insulation:** Acceptable noise level – Noise prevention at its source, transmission of noise, noise control- general consideration.

**UNIT – IV**

9

**Lighting:** Natural and Artificial Lighting – Requirements of good lighting – Day light factors – Day light Penetration – Aims of good lighting – General Principles of openings to afford good lighting – Reflection factors – Illumination – Units of measurement – Lux, candela, Luminous flux.**Ventilation:** Definition - Necessity – Types – Natural / Mechanical Ventilation – wind effect – Factors to be considered in the design of ventilation - General rules for natural ventilation – Advantages and Disadvantages of Mechanical Ventilation – Methods of Mechanical Ventilation – Combined Systems.

**UNIT – V**

9

**Fire Resistant Structures:** Fire protection, confining of fire, Fire hazards, characteristics of fire resistant material, Fire resisting construction, fire load- Normal and abnormal, distribution of fire load, grading of structural elements and buildings, fire escapes.

**TOTAL: 45**

**TEXT BOOKS:**

1. Mckay W.B. and Mckay J.M., “Building Construction”, Vol.III and IV, Donhead Publishing Ltd., 2004.
2. Warland D.E., “Modern Building Construction”, Vol.I and II, Pitman Publishing, 1969.
3. Shah, Kale and Patki, “Building Drawing”, Tata McGrawHill Education, 2002.

**REFERENCE BOOKS:**

1. Philips, “Lighting in Architectural Design”, McGraw-Hill, New York, 1964.
2. Hopkinson R.G. and Kay J.D., “The Lighting of buildings”, Faber and Faber, London, 1969.
3. William H. Severns and Julian R. Fellows, “Air-conditioning and Refrigeration”, John Wiley and Sons, London, 1988.
4. Sherratt A.F.C., “Air-conditioning and Energy Conservation”, The Architectural Press, London, 1980.
5. Udyakumar R., “A Text Book on Building Services”, Eswar Press, Chennai, 2007.
6. <https://www.visualbuilding.co.uk/>
7. <http://nptel.ac.in/courses/105106115/>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: interpret the basic concepts of space requirements for an infrastructure development
- CO2: apply the knowledge of planning in the establishment of the infrastructure
- CO3: develop the concept of acoustical design for the buildings
- CO4: apply the knowledge of lighting and ventilation in the buildings
- CO5: solve the problems in fire resistant design of structures

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**LIST OF EXPERIMENTS / EXERCISES:**

1. Determination of co-efficient of discharge of orifice and mouthpiece
2. Determination of co-efficient of discharge of notches
3. Determination of co-efficient of discharge of venturimeter
4. Determination of co-efficient of discharge of orifice meter
5. Determination of efficiency by impact of jet on vanes.
6. Determination of friction losses in pipes
7. Determination of minor losses in pipes
8. Study on performance characteristics of Pelton wheel
9. Study on performance characteristics of Francis turbine
10. Study on performance characteristics of Centrifugal pump
11. Study on performance characteristics of reciprocating pump
12. Study on performance characteristics of submersible pump

**TOTAL : 45**

**REFERENCES / MANUALS / SOFTWARE:**

1. Bansal R.K., “Fluid mechanics and Hydraulic Machines”, Laxmi Publishing Pvt. Ltd., New Delhi, 2007.
2. Lab Manual
3. <http://nptel.ac.in/courses/105101082>
4. <http://nptel.ac.in/courses/105103096>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: compute the rate of flow of fluids
- CO2: analyze determine the major and minor losses in pipelines
- CO3: determine the performance characteristics of turbines and pumps

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1		2			1			2	3	3
CO2	3	3	2	1		2			1			2	3	3
CO3	3	3	2	1		2			1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**LIST OF EXPERIMENTS / EXERCISES:**

1. Determination of tacheometric constants
2. Determination of distance and elevation of points by stadia method.
3. Triangulation by stadia method.
4. Determination of distance and elevation of points by tangential method
  - i) Both angles are angles of elevation.
  - ii) Both angles are angles of depression
5. Determination of distance and elevation of points by tangential method (one angle as angle of elevation and another as angle of depression)
6. Determination of distance and elevation of points by trigonometric levelling (same vertical plane method).
7. Determination of distance and elevation of points by trigonometric levelling (double vertical plane method).
8. Tacheometric Contouring.
9. Measurement of distance and elevation using Advanced Total Station.
10. Measurement of area using Advanced Total Station.
11. Determination of L.S and C.S using Advanced Total Station.

**TOTAL : 45**

**REFERENCES / MANUALS / SOFTWARE:**

1. Punmia B.C., “Surveying”, Volume. I and II, Laxmi Publications, New Delhi, 2008.
2. Lab Manual
3. Advanced Total Station Manual
4. <http://nptel.ac.in/courses/105104100/>
5. <http://nptel.ac.in/courses/105107158/>
6. <http://nptel.ac.in/courses/105107157/>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: calculate distance, elevation and contouring by tachometric methods
- CO2: solve the distance and elevation of incredible points by trigonometric levelling
- CO3: carry out distance, elevation, LS & CS, area by total station

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1		3		1	1			2	3	3
CO2	3	2	1	1		3		1	1			2	3	3
CO3	3	2	1	1		3		1	1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial



**LIST OF EXPERIMENTS / EXERCISES:**

1. Determination of water content by
  - a. oven drying method
  - b. Infrared method
2. Determination of specific gravity of cohesionless soil using Pycnometer
3. Determination of grain size distribution by sieve analysis
4. Determination of Consistency limits
  - a. Liquid limit
  - b. Plastic limit
  - c. Shrinkage limit
5. Determination of field density by
  - a. sand replacement method
  - b. core cutter method
6. Determination of relative density of cohesionless soil
7. Determination of compaction properties of soil by standard proctor compaction test
8. Determination of coefficient of permeability by
  - a. Constant head method
  - b. Variable head method
9. Determination of shear parameters of soil by direct shear method
10. Determination of shear parameters of soil by Unconfined Compression Test
11. Determination of coefficient of consolidation by one dimensional consolidation test.
12. Study on shear parameters of soil by Triaxial test

**TOTAL : 45**

**REFERENCES / MANUALS / SOFTWARE:**

1. Lambe T.W., “Soil Testing for Engineers”, John Wiley and Sons, New York, 1990.
2. Compendium of Indian Standards on Soil Engineering, SP 36 (Part 1 & 2), 1988.
3. Lab Manual.
4. <https://goo.gl/umTS3G>
5. <http://www.iitgn.ac.in/research/stl/lab-manual.php>
6. <http://eerc05-iiith.virtual-labs.ac.in/>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: determine the index and engineering properties of given soil sample
- CO2: compute compaction characteristics of given soil samples
- CO3: examine consolidation and shear strength properties of soils

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1		3			1			2	3	3
CO2	3	2	1	1		3			1			2	3	3
CO3	3	3	2	1		3			1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CET51 FOUNDATION ENGINEERING**  
(IS 6403 & IS2911 are permitted)

3    0    0    3

**UNIT – I** 9

**Soil Exploration and Site Investigation:** Soil Exploration: Need – Methods of soil exploration – Boring- depth and spacing of bore holes- Sampling methods – Field tests – Penetration Tests (SPT, SCPT & DCPT)– geophysical methods- preparation of soil investigation report- Selection of foundation based on soil condition.

**UNIT – II** 9

**Bearing Capacity:** Introduction–Bearing Capacity of soil - Terzaghi method – Meyerhoff method - effect of ground water table- IS Methods- Safe bearing pressure based on N- value – allowable bearing pressure- plate load test– Settlement of foundations on granular and clay deposits- allowable settlements of structures – Settlement Analysis- Codal provisions -Methods of minimizing settlement

**UNIT – III** 9

**Shallow Foundation:** Types of foundation –design of isolated and spread footing – Design aspects of combined trapezoidal footing- design aspects of strap footings and mat foundation – Contact Pressure.

**UNIT – IV** 9

**Pile Foundation:** Types – Load carrying capacity - Static analysis – Dynamic - pile formulae - Pile load tests –uplift pressures – Negative skin friction.Group action of piles- Load carrying capacity of pile groups– Settlement of pile groups- pile caps- Under reamed piles.

**UNIT – V** 9

**Earth Pressure Theory:** Introduction- Plastic equilibrium in soils – active and passive earth pressure – Rankine’s theory – Coulomb’s wedge theory – Graphical method (Rebhann and Culmann) – Stability analysis of retaining wall.

**TOTAL: 45**

**TEXT BOOKS:**

1. Venkataramiah C., “Geotechnical Engineering”, 4<sup>th</sup> Edition, New Age International Pvt. Ltd.,2013.
2. Varghese P.C., “Foundation Engineering”, 1<sup>st</sup> Edition, Prentice Hall of India, 2009.
3. Gopal Ranjan and Rao, “Basic and Applied Soil Mechanics”, 2<sup>nd</sup> Edition, New Age International (P) Limited, New Delhi, 2011.

**REFERENCE BOOKS:**

1. Teng W.C., “Foundation Design”, 2<sup>nd</sup> Edition, Prentice Hall, 1984.
2. Swami Saran, “Analysis and Design of Substructures”, 2<sup>nd</sup> Edition, Oxford and IBH Publishing Company Pvt. Ltd., 2015.
3. Bowles J.E., “Foundation Analysis and Design”, 4th Edition, McGraw-Hill Publishing Company, 2001.
4. IS 6403:1981- “Code of Practice for Determination of Bearing Capacity of Shallow Foundation”.
5. <http://nptel.ac.in/downloads/105101083/>
6. <http://studentsfocus.com/ce6502-fe-notes-foundation-engineering-lecture-handwritten-notes-civil-5th-sem-anna-university/>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: prepare the soil investigation report
- CO2: determine bearing capacity and execute settlement analysis
- CO3: design the shallow foundation
- CO4: analyse pile foundation systems
- CO5: analyse the earth retaining structures

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	POS1	PSO2
CO1	3	2	1			3				1		1	2	3
CO2	3	2	1			3						1	2	3
CO3	3	2	1			3						1	2	3
CO4	2	3	2			3						1	3	3
CO5	2	3	2			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CET52 HIGHWAY ENGINEERING**  
(IRC 37:2012 & IRC 58:2002 Code of Practices are permitted)

3    0    0    3

**UNIT – I** **9**

**Highway Planning and Alignment:** Role of Transportation - Characteristics, merits and demerits of road transportation - Historical development of Road Construction - Highway development in India - Classification of roads - Road patterns - Highway alignment - Engineering surveys for Highway location .

**UNIT – II** **9**

**Geometric Design:** Highway cross sectional elements - Typical cross sections of Urban and Rural roads - Sight distance - Design of Horizontal alignment - horizontal curves, camber, super elevation, widening of curves, transition curves, set-back distance - Design of Vertical alignment - gradients, grade compensation, vertical curves.

**UNIT – III** **9**

**Design of Pavements:** Flexible Pavements: materials – tests (CBR) - mix design - design factors - flexible pavement design as per IRC. Rigid Pavements: design of rigid pavements - general design considerations - stresses in rigid pavements - design of joints, dowel bar, tie bar - IRC method of design of concrete pavements

**UNIT – IV** **9**

**Highway Construction:** Types - Standard construction practice for WBM and WMM, Bituminous concrete and Cement concrete roads - Construction of joints in cement concrete pavements - Materials and methods of construction - Fly ash embankments, Crumb rubber modified bitumen and geo-textiles.

**UNIT – V** **9**

**Highway drainage and Maintenance:** Highway drainage - Importance and requirements - Surface and sub-surface drainage - Highway maintenance - Pavement failures - Distress in flexible and rigid pavements - Causes and treatments - Pavement evaluation - Strengthening of existing pavements – overlays - Benkelman beam deflection studies - Pavement maintenance management system.

**TOTAL: 45**

**TEXT BOOKS:**

1. Khanna, S.K., Justo C.E.G. and Veeraragavan A., “Highway Engineering”, 10<sup>th</sup> Edition, New Chand and Brothers, Roorkee, 2013.
2. Subramanian K.P., “Highways, Railways, Airport and Harbour Engineering”, 4<sup>th</sup> edition, Scitech Publications (India), Chennai, 2010

**REFERENCE BOOKS:**

- 1 Kadiyali L.R. and Lai N.B., “Highway Engineering (Including Expressways and Airport Engineering)”, 5<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2013.
- 2 Sharma S.K., “Principles, Practice and Design of Highway Engineering (Including Airport Pavements)”, 3<sup>rd</sup> Edition, S.Chand & Company, New Delhi, 2012.
- 3 Highway Alignment - <https://www.slideshare.net/khaledalshami93/highway-geometric-design>.
- 4 Design of Rigid & Flexible Pavements – <https://www.slideshare.net/HARITSEHRAWAT/flexible- and rigid pavements>
- 5 Pavement Construction - <https://www.slideshare.net/amoldpawar9/session-ii-pavements>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: summarize the basic elements of Highway Engineering and illustrate the surveys conducted in it
- CO2: design the geometric features of a Highway
- CO3: design the flexible and Rigid pavements as per IRC and outline the properties of pavement materials
- CO4: explain the construction methodology based on the pavement types
- CO5: describe the types of distress in pavements and recall the drainage pattern

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						2	3	3
CO3	3	2	1			3						2	3	3
CO4	2	1				2							3	2
CO5	2	1				2							3	2

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT – I** **9**

**Deflection of Determinate Structures:** Principles of virtual work for deflections – Deflections of pin-jointed plane frames and rigid plane frames – Concepts of Williot diagram and Mohr’s correction – Maxwell Betti’s Reciprocal theorem - Analysis of continuous beams by Clapeyron’s theorem of three moments.

**UNIT - II** **9**

**Arches:** Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged and two hinged arches, parabolic and circular arches – Settlement and temperature effects.

**UNIT - III** **9**

**Moving Loads and Influence Lines:** Influence Lines for reactions in statically determinate structures, for member forces in pin-jointed frames and for shear force and bending moment in beam sections. Muller Breslau’s principle – Influence lines for continuous beams and single storey rigid frames (2 degree redundant structures).

**UNIT - IV** **9**

**Slope Deflection Method:** Introduction – Static and Kinematic Indeterminacy - Slope deflection equations - Analysis of continuous beams and rigid frames with and without sway – Settlement of supports

**UNIT - V** **9**

**Moment Distribution Method:** Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway- Settlement of supports

**Lecture: 45, Tutorials:15, TOTAL: 60**

**TEXT BOOKS:**

1. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, “ Theory of Structures”, 12<sup>th</sup> Edition, Laxmi Publications Pvt. Ltd., New Delhi, 2006.
2. Vaidyanathan R. and Perumal P., “Comprehensive Structural Analysis”, 4<sup>th</sup> Edition Volume I and II, Laxmi Publications Pvt. Ltd., Chennai, 2007.

**REFERENCE BOOKS:**

1. Wang C.K., “Indeterminate Structural Analysis”, 1<sup>st</sup> Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
2. Devadas Menon, “Structural Analysis”, Narosa Publishing House, Reprint, 2015.
3. Ghali A., Nebille and Brown T.G., “Structural Analysis - A unified classical and matrix approach”, 6<sup>th</sup> Edition, SPON Press, New York, 2013.
- 4 <http://nptel.ac.in/downloads/105101085>
- 5 <http://nptel.ac.in/courses/105101086>
- 6 <http://nptel.ac.in/courses/105106050>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: inspect the behavior of determinate structures and continuous beams
- CO2: calculate the design parameters for different types of arches.
- CO3: draw the influence line diagram for varying load condition.
- CO4: examine the indeterminate structure using slope deflection method.
- CO5: analyse the indeterminate structures using moment distribution method.

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3						1	3	3
CO2	3	2	1			3				1		2	3	3
CO3	3	2	1			3				1		2	3	3
CO4	3	3	2			3				1		2	3	3
CO5	3	3	2			3				1		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT – I**

**Sewerage System:** Definitions-Classification- Sources of waste water-Quantity of sewage-fluctuations in flow pattern - Estimation of storm runoff- Hydraulics of sewers - sewer appurtenances - materials for sewers- sewer joints-jointing materials- Specifications - Sewer laying under various conditions-Test for sewers-sewer maintenance-sewage pumping-types of pumps - selection of pumps

**UNIT - II**

**Sewage Treatment:** Characteristics and composition of sewage-Physical and chemical analysis-DO, BOD, COD and their significance-Cycles of decomposition- Fundamentals of microbiology of waste water-Objectives and basic principles of sewage treatment- Primary treatment-Screens-Grit chamber-Principles of sedimentation-Design of settling tanks-Types of settling tanks.

**UNIT- III**

**Biological Treatment:** Basic principles of biological treatment- Trickling filter- Principles and operation of standard and High rate filters- Activated sludge process-Diffuser/mechanical aeration-conventional, high rate and extended aeration process -Modifications-Oxidation Ditch-principles and design of waste stabilization ponds-Principles and design of Septic tanks.

**UNIT-IV**

**Sludge Treatment and Sewage Disposal:** Objectives of sludge treatment- properties and characteristics of sludge- Conventional and high rate digestors - Sludge lagoons- sewage farming practices - Dilution- Discharge into rivers, lakes, estuaries and ocean- River pollution- Oxygen sag curve-Eutrophication-Recycle and reuse of waste effluents.

**UNIT- V**

**House Drainage Systems and Rural Sanitation:** Sanitary fixtures/fittings- One pipe system, Two pipes systems - General Layout of house drainage- Street connections. Rural sanitation system – Environmental Protection Acts.

**TOTAL: 45**

**TEXT BOOKS:**

1. Garg S.K., “Environmental Engineering - II”, 13<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2013.
2. Modi P.N., “Environmental Engineering - II”, 15<sup>th</sup> Edition, Standard Book House, Delhi, 2013.

**REFERENCE BOOKS:**

1. Birdie G.S. and Birdie J.S., “Water Supply and Sanitary Engineering”, 9<sup>th</sup> Edition, Dhanpat Rai and Sons, New Delhi, 1992.
2. Hussain S.K., “A Text Book on Water Supply and Sanitary Engineering”, 2<sup>nd</sup> Edition, Oxford & IBH Publishing Co, New Delhi, 1976.
3. “Manual on Water Supply and Treatment”, CPHEEO, Government of India, New Delhi, 2010.
4. Metcalf and Eddy, “Waste Water Engineering: Treatment and Reuse”, 4<sup>th</sup> Edition, McGraw-Hill, New Delhi, 2002.
5. <http://nptel.ac.in/courses/105104102/>
6. [http://www.readorrefer.in/subject/Environmental-Engineering-II\\_24/](http://www.readorrefer.in/subject/Environmental-Engineering-II_24/)
7. <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and-wastewater-treatment-engineering-spring-2006/lecture-notes/>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: estimate the quantity of waste water generated from various sources
- CO2: analyze the quality of waste water from various sources
- CO3: design the principal components of a waste water treatment plant
- CO4: apply suitable sludge treatment and disposal practices
- CO5: categorize the appropriate sanitary fixtures

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3	1					1	3	3
CO2	3	3	2			3	1					1	3	3
CO3	3	3	2			3	1					1	3	3
CO4	3	2	1			3	1					1	3	3
CO5	3	2	1			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CET55 DESIGN OF RC ELEMENTS

[IS 456 -2000 & SP 16 codes are permitted]

3    1    0    4  
9

### UNIT - I

**Design Philosophies:** Stress – Strain curve for concrete in compression – Types of reinforcement – Stress – Strain curve for reinforcing steel. Concept of Working Stress Method (WSD), Ultimate Load Method (ULD) and Limit State Method (LSD) – Design codes and Specifications – Permissible stress - Characteristic strength and Characteristic load – Factor of safety and Partial safety factors – Various limit states.

### UNIT - II

**Design of Slabs:** Types of slabs – Design of cantilever, simply supported, one-way, two way and continuous slab.

### UNIT - III

**Design of Beams for Flexure, Shear, Torsion, Bond and Anchorage:** Behaviour and design of singly and doubly reinforced rectangular and flanged beams for flexure, shear - combined action of bending moment, twisting moment and transverse shear - Design for bond and anchorage.

### UNIT – IV

**Design of Column:** Column - Types - Design of short and slender columns subjected to axial, uni-axial and bi-axial bending.

### UNIT - V

**Design of Footings:** Footing – Types - Design of axially and eccentrically loaded square and rectangular footing – Design of combined rectangular footing.

**Lecture: 45, Tutorial: 15, TOTAL : 60**

#### TEXT BOOKS:

1. Krishna Raju N., “Design of Reinforced Concrete Structures”, 3<sup>rd</sup> Edition, CBS Publishers & Distributors, New Delhi, 2013.
2. Varghese P.C., “Limit State Design of Reinforced Concrete”, 2<sup>nd</sup> Edition, Prentice Hall of India, New Delhi, 2006.

#### REFERENCE BOOKS:

1. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, “Limit State Design of Reinforced Concrete”, Laxmi Publications Pvt. Ltd., New Delhi, Reprint, 2014.
2. Sinha S.N., “Reinforced Concrete Design”, 3<sup>rd</sup> Edition, Tata McGraw-Hill, New Delhi, 2014.
3. Unnikrishna Pillai S. and Devdas Menon, “Reinforced Concrete Design”, 3<sup>rd</sup> Edition, Tata McGraw-Hill, New Delhi, 2009.
4. Subramanian N., “Design of Reinforced Concrete Structures”, 1<sup>st</sup> Edition, Oxford University Press, 2014.
5. <http://nptel.ac.in/courses/105105105/3>
6. <http://nptel.ac.in/downloads/105105104>
7. <https://www.youtube.com/playlist?list=PL6E6B99AC15DD94D6>

#### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: explain the basic concept of design philosophies
- CO2: design the different types of slabs
- CO3: formulate the procedure to design the beams for flexure, shear & torsion
- CO4: categorize the column and apply the appropriate design procedure
- CO5: design the isolated and combined rectangular footing

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	3
CO2	3	3	2			3				1		2	3	3
CO3	3	3	2			3				1		2	3	3
CO4	3	3	2			3				1		2	3	3
CO5	3	3	2			3				1		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**LIST OF EXPERIMENTS /EXERCISES:**

1. Tension test on metal specimens.
2. Compression test on wooden specimen.
3. Shear test on metal specimens
4. Torsion test on metal specimen
5. Impact tests on metal specimens
6. Hardness tests on metal specimens
7. Bending test -I – Verification of Maxwell’s reciprocal theorem
8. Bending test -II – Verification of Maxwell’s reciprocal theorem
9. Test on closed coil helical springs
10. Test on open coil helical springs
11. Study on mechanical and electrical strain gauges
12. Fatigue Test (Study Experiment)

**TOTAL:45**

**REFERENCES / MANUALS / SOFTWARE:**

1. Bansal R.K., “Strength of Materials”, 4<sup>th</sup> Edition, Laxmi Publications, New Delhi, 2012.
2. Lab Manual
3. <http://nptel.ac.in/courses/105102090/>
4. <http://nptel.ac.in/courses/105105109/>
5. <http://nptel.ac.in/courses/105105108/>

**COURSE OUTCOMES:**

On completion of the course the students will be able to

- CO1: examine the behavior of various materials under tension, compression and deflection
- CO2: determine the shear and torsion and stiffness properties of the material
- CO3: investigate the hardness of materials

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2		3		1	1			2	1	2
CO2	3	3	2	2		3		1	1			2	1	2
CO3	3	3	2	2		3		1	1			2	1	2

1 – Slight, 2 – Moderate, 3 – Substantial

**LIST OF EXPERIMENTS:**

1. Sampling and preservation methods of water and wastewater.
2. Determination of i) pH and turbidity ii) Hardness
3. Determination of Acidity & Alkalinity
4. Estimation of iron and fluoride in given water sample.
5. Determination of Chlorides
6. Determination of Sulphate
7. Determination of Optimum Coagulant Dosage
8. Determination of available Chlorine in Bleaching powder
9. Determination of dissolved oxygen
10. Determination of Total Dissolved Solids and Suspended Solids
11. Determination of B.O.D
12. Determination of C.O.D

**TOTAL: 45****REFERENCE/ MANUALS/ SOFTWARES:**

1. Garg S.K., "Environmental Engineering", 28<sup>th</sup> Edition, Volume - I and II, Khanna Publishers, New Delhi, 2013.
2. "Manual on Water Supply and Treatment", 3<sup>rd</sup> Edition, CPHEEO, New Delhi, 2010.
3. "Standard Methods for Examination of Water and Wastewater Engineering", 22<sup>nd</sup> Edition, American Public Health Association, Washington, 2005.
4. [http://web.iitd.ac.in/~arunku/files/CVL212\\_Y15/Lab\\_CVL212v1.pdf](http://web.iitd.ac.in/~arunku/files/CVL212_Y15/Lab_CVL212v1.pdf)
5. <https://www.slideshare.net/RambabuPalaka/environmental-engineering-lab-manual>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: analyze the physical and chemical impurities present in the water
- CO2: examine the amount of chlorine required for public supplies
- CO3: estimate the amount of coagulant required for water treatment

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2		3	2	1	1			2	3	3
CO2	3	3	2	2		3	2	1	1			2	3	3
CO3	3	3	2	2		3	2	1	1			2	3	3

1 – Slight, 2 – moderate, 3 – Substantial 2



**14EGL41 COMMUNICATION SKILLS LABORATORY**  
( Common to all Engineering and Technology branches )

**0    0    3    1**

**LIST OF EXPERIMENTS:**

1. Listening Skills: Listening activity using software package in the communication laboratory - Listening to native speakers - Developing oral communication by imitating the model dialogues. Listening for specific information – Listening to improve pronunciation – Listening and typing – Filling the blanks–TV programmes and News.

**Audio Visual Lab: Activity based learning**

2. Activity based Reading Skills: Reading for getting information and understanding; scanning, skimming and identifying topic sentences – Reading for gaining knowledge-Group activity.

3. Activity based Writing Skills: Preparing a draft – Word editing features, editing and proof reading; Writing a short essay using the draft prepared - Group activity.

4. Speaking Skills: Verbal and Non-Verbal Communication; Introducing oneself -Describing a place, Expressing views and opinions; Giving a presentation on a Topic - eye contact, speaking audibly, clearly and with confidence; Group discussion. Conversations – Face-to-Face conversation – Simulated Telephonic Conversation.

**Career Lab**

5. Interview Skills: Introducing oneself – Answering other FAQ’s. Presentation Skills: Elements and structure of effective presentation – Presentation Tools – Voice modulation – Body language –Video samples. Group Discussion: Structure of Group Discussion – Strategies in group discussion - Team work – Video Samples. Soft Skills: Fundamentals of Soft Skills – Work Place Culture and Inter-Personal Relationships.

**TOTAL : 45**

**REFERENCES / MANUALS / SOFTWARE:**

- Orell Digital Language Lab Software

**COURSE OUTCOMES**

On completion of the course the students will be able to

CO1: communicate efficiently in English in real life and career related situations

CO2: demonstrate good presentation and team skills

CO3: familiarize in using modern communication software packages to enhance their soft skills

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									3	3		2		
CO2									2	3		1		
CO3									1	3		2		

1 – Slight, 2 – Moderate, 3 – Substantial

## 14GET61 ECONOMICS AND MANAGEMENT FOR ENGINEERS

(Common to all Engineering and Technology branches)

3 0 0 3

### UNIT – I

9

Economics – Basics Concepts and Principles – Demand and Supply – Law of demand and Supply – Determinants – Market Equilibrium – Circular Flow of Economic activities and Income.

### UNIT – II

9

National Income and its measurement techniques. Inflation - Causes of Inflation – Controlling Inflation – Business Cycle. Forms of business – Management Functions: Planning, Organizing, Staffing, Leading and Controlling - Managerial Skills - Levels of Management - Roles of manager.

### UNIT – III

9

Marketing - Core Concepts of Marketing - Four P's of Marketing - New product development - Product Life Cycle - Pricing Strategies and Decisions.

### UNIT – IV

9

Operations Management - Resources - Types of Production system - Site selection, Plant Layout, Steps in Production Planning and Control - Inventory - EOQ Determination.

### UNIT – V

9

Accounting Principles – Financial Statements and its uses – Depreciation: Straight Line and Diminishing Balance Method – Break Even Analysis – Capital Budgeting: Meaning – Types of decisions – Methods (Theory).

**TOTAL : 45**

### TEXT BOOK:

1. “Economics and Management for Engineers”, Compiled by Department of Management Studies, Kongu Engineering College, McGraw-Hill Education, India, 2013.

### REFERENCE BOOKS:

1. Geetika, Piyali Ghosh and Purba Roy Choudhury, “Managerial Economics”, 1<sup>st</sup> Edition, Tata McGraw-Hill, New Delhi, 2008.
2. Jeff Madura, “Fundamentals of Business”, Cengage Learning Inc., India, 2007.
3. Stanley L. Brue and Campbell R. McConnell, “Essentials of Economics”, Tata McGraw-Hill, New Delhi, 2007.
4. Jain S.P., Narang K.L. and Simi Agrawal, “Accounting for Management”, 1<sup>st</sup> Edition, Tata McGraw-Hill, New Delhi, 2009.

### COURSE OUTCOMES

On completion of the course the students will be able to

CO1: estimate market equilibrium and interpret national income calculation and inflation issues

CO2: categorize the forms of business and analyse the functions of management

CO3: appraise marketing management decisions

CO4: apply appropriate operation management concept in business situations

CO5: interpret financial and accounting statements

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2			3		2	2	3	2	2	1	2
CO2		1	2			2	2	2	2	3	2	2	1	2
CO3	1	2	1			2		2	2	3	2	2	1	3
CO4	1	2	1			2		2	2	3	2	2	2	3
CO5	1	2				2		2	2	3	2	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT - I**

**Flexibility Matrix Method:** Introduction – Primary structure– Equilibrium and Compatibility conditions– Analysis of continuous beams, rigid jointed plane frames and indeterminate pin-jointed plane frames (with redundancy restricted to two). 9

**UNIT - II**

**Stiffness Method:** Element and global stiffness matrices – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of continuous beams, rigid frames and pin-jointed plane frames (with redundancy restricted to two). 9

**UNIT - III**

**Plastic Analysis of Structures:** Plastic moment of resistance-Plastic modulus-Shape factor-Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems. 9

**UNIT – IV**

**Space and Cable Structures:** Analysis of Space trusses using method of tension coefficients – Beams curved in plan - Suspension Cables - cables with two and three hinged stiffening girders - Analysis of Portal frames by Substitute frame method. 9

**UNIT – V**

**Deflection of Indeterminate Structures:** Application of virtual work – Deflection of indeterminate structures.**Finite Element Method:** Introduction – Discretization of a structure – Displacement functions – Bar elements, Truss element – Beam element – Plane stress and plane strain Triangular elements. 9

**Lecture: 45, Tutorial: 15, TOTAL: 60**

**TEXT BOOKS:**

1. Pandit G.S. and Gupta S.P., “Structural Analysis: A Matrix Approach”, 2<sup>nd</sup> Edition, Tata McGraw-Hill, New Delhi, 2008.
2. Negi L.S. and Jangid R.S., “Structural Analysis”, 1<sup>st</sup> Edition, Tata McGraw-Hill Publications, New Delhi, 2003.

**REFERENCE BOOKS:**

1. Ghali A., Neville A.M. and Brown T.G., “Structural Analysis: A Unified Classical and Matrix Approach”, 4<sup>th</sup> Edition, Spon Press, London, 2003.
2. Vazirani V.N. and Ratwani M.M., “Analysis of Structures”, 17<sup>th</sup> Edition, Khanna Publishers, Delhi, 2015.
3. Weaver William and Gere James M., “Matrix Analysis of Framed Structures”, 2<sup>nd</sup> Edition, CBS Publishers and Distributors, Delhi, 2003.
4. Hutton D.V., “Fundamentals of Finite Element Analysis”, 1<sup>st</sup> Edition, Tata McGraw-Hill, New Delhi, 2004.
5. <http://nptel.kongu.edu/Civil/SAII/index.html>
6. <https://www.youtube.com/watch?v=NYiZQsxx9cQ>
7. <https://www.youtube.com/watch?v=1Ot81YLZV2Q>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: analyse the structures using flexibility matrix method
- CO2: examine the continuous beams, rigid frames and pin-jointed plane frames using stiffness matrix method
- CO3: apply the plastic analysis in indeterminate structures
- CO4: use different methods of analysis in space and cable structures
- CO5: compute the deflection of structures using virtual work and Finite Element method

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO <sub>1</sub>	PSO2
CO1	3	3	2			3				1		2	3	3
CO2	3	3	2			3				1		2	3	3
CO3	3	2	1			3				1		2	3	3
CO4	3	2	1			3				1		2	3	3
CO5	3	2	1			3				1		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CET62 ADVANCED RC DESIGN

[IS 456 -2000, SP16, IS 3370 – 2009 (Part-I, II & IV) and IS1893-2002 (Part-I) are permitted]

3    1    0    4

### UNIT –I

9

**Retaining Wall:** Introduction - Requirements – Types - Earth pressure theories –Design and detailing of cantilever and counter fort retaining wall.

### UNIT –II

9

**Flat Slab, Bunkers and Silos:** Introduction - Design of flat slab (IS Code Method) -Design of bunkers and silos.

### UNIT –III

9

**Water Tank:** Design of circular and rectangular water tank - Resting on ground for different end conditions - Design principles of over head tanks -Design and detailing of corbels (IS code method).

### UNIT –IV

9

**Shear Wall:** Introduction-Calculation of wind and seismic loads-Types and use of shear walls –Design of Cantilever solid shear walls-Design principles of elevator shaft and coupled shear walls.

### UNIT-V

9

**Yield Line Theory:** Application of virtual work and equilibrium method to square, rectangular, circular and triangular slabs for fixed and simply supported conditions.

**Lecture: 45, Tutorial: 15, TOTAL: 60**

**Note: No Drawings for end semester Examination**

#### TEXT BOOKS:

- Varghese P.C., “Limit State Design of Reinforced Concrete Structures”, 2<sup>nd</sup> Edition, Prentice Hall of India, New Delhi, 2011.
- Krishna Raju N., “Structural Design and Drawing”, 3<sup>rd</sup> Edition, University Press (India) Pvt. Ltd., New Delhi, 2006.

#### REFERENCE BOOKS:

- Krishna Raju N., “Design of RC Structures”, 3<sup>rd</sup> Edition, CBS Publishers, Delhi, 2009.
- Syal I.C. and Goel A.K., “Reinforced Concrete Structures”, 5<sup>th</sup> Edition, A.H.Wheelers & Co. Pvt. Ltd., Allahabad, 2008.
- Sinha N.C. and Roy S.K., “Fundamentals of Reinforced Concrete”, 1<sup>st</sup> Edition, S. Chand & Company Ltd., New Delhi, 2007.
- Unnikrishnan Pillai S. and Menon Devadas, “Reinforced Concrete Design”, 3<sup>rd</sup> Edition, Tata McGraw Hill, New Delhi, 2009.
- Design of concrete structures - Introduction ( <http://nptel.ac.in/courses/105105105/> )
- Working Stress Method - <http://nptel.ac.in/courses/105105105/4>

#### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: design the retaining wall and perform the stability check
- CO2: design the flat slab, bunkers and silos
- CO3: design the water tank and RC corbel with appropriate design procedure
- CO4: formulate the procedure to design the shear wall for lateral forces
- CO5: analyze and design the different types of slab using virtual work and equilibrium methods

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3				1		2	3	3
CO2	3	2	1			3				1		2	3	3
CO3	3	2	1			3				1		2	3	3
CO4	3	3	2			3				1		2	3	3
CO5	3	3	2			3				1		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CET63 DESIGN OF STEEL STRUCTURES**  
( IS 800:2007, Steel Tables, IS 875 and SP 38 are permitted)

**3 1 0 4**  
**9**

**UNIT -I**

**Introduction:** Mechanical Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using welded and bolted connections – Design of bolted and welded joints subjected to axial loading– Efficiency of joints.

**UNIT -II**

**Tension Members:** Types of Tension Members – Net area – Net effective sections for angle and Tee in tension – Design of tension members – Design of tension splice

**UNIT -III**

**Compression Members:**Types of compression members – Theory of columns – Codal provision for compression member design – Slenderness ratio – Design of simple and built-up compression members – Design of braced columns.

**UNIT -IV**

**Beams:** Lateral stability of beams – Design of laterally supported and unsupported beams – Built up beams

**UNIT -V**

**Roof Trusses:** Design of Roof truss – Wind Pressure analysis-Design of Purlin.

**Lecture: 45, Tutorial: 15, TOTAL: 60**

**TEXT BOOKS:**

1. Subramanian N., “Design of Steel Structures”, 1<sup>st</sup> Edition, Oxford University Press, New Delhi, 2011.
2. Bhavikatti S.S., “Design of Steel Structures”, 4<sup>th</sup> Edition, I.K. International Publishing House Pvt. Ltd., New Delhi, 2009.

**REFERENCE BOOKS:**

1. Ramachandra S.and Virendra Gehlot, “Limit State Design of Steel Structures”, 12<sup>th</sup> Edition, Scientific Publishers (India), Jodhpur, 2010.
2. “Teaching Resources for Structural Steel Design” - Volume I, II & III, INSDAG, Kolkatta.
3. Dayaratnam P., “Design of Steel Structures”, 2<sup>nd</sup> Edition, S. Chand Company, New Delhi, 2003.
4. <http://nptel.ac.in/courses/105106112/>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: discriminate the various connection methods
- CO2: analyze and design the various profiles of tension members
- CO3: analyze and design the forms of compression members
- CO4: discriminate and design the flexural members
- CO5: examine and design the roof truss

**Mapping of COs with POs and PSOs and Program Specific Outcomes (PSOs)**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3						1	3	3
CO2	3	3	2			3				1		2	3	3
CO3	3	3	2			3				1		2	3	3
CO4	3	3	2			3				1		2	3	3
CO5	3	3	2			3				1		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEL61 COMPUTER APPLICATIONS LABORATORY

(Use of IS 456:2000, IS 3370:2009, IS 1893:2002, IS 13920, SP 16, SP 34, IS 800:2007, Steel Tables, IS 875 and SP 38 are permitted)

0 0 3 1

### LIST OF EXERCISES:

#### Analysis, Design and Detailing of Reinforced Concrete Structures of

1. Rectangular water tank resting on ground.
2. Elevated Circular water tank (with stag tower)
3. Multi storied building (subjected to lateral loads)
4. Multi storied building (subjected to lateral loads)
5. Shear and diaphragm elements (subjected to lateral loads)
6. Mat foundation

#### Analysis and Design Steel Structures of

7. Plane trusses
8. Industrial building(space trusses)
9. Steel chimney
10. Multi storied steel building (subjected to lateral loads)
11. Water tank
12. Lattice tower

**TOTAL : 45**

### REFERENCES / MANUALS / SOFTWARE:

1. STRAP / STAAD Pro / SAP / ETABS.
2. Krishnaraju N., "Structural Design & Drawing - Reinforced Concrete and Steel", 3<sup>rd</sup> Edition, University Press (India) Ltd., Hyderabad, 2014.
3. Punmia B.C., Jain, Ashok Kumar and Jain, Arun Kumar, "Comprehensive Design of Steel Structures", 2<sup>nd</sup> Edition, Laxmi Publications Pvt. Ltd., 2012.
4. Krishnamurthy D., "Structural Design and Drawing", 1<sup>st</sup> Edition, Volume II& III, CBS Publishers & Distributors, Delhi, 1992.
5. <http://www.mahalakshmiengineeringcollege.com/pdf/civil/VII%20Sem/CE2401/UNIT%20II.pdf>
6. [http://nptel.ac.in/courses/105106113/2\\_industrial\\_building/4\\_roof\\_systems.pdf](http://nptel.ac.in/courses/105106113/2_industrial_building/4_roof_systems.pdf)
7. <http://nptel.ac.in/courses/105106113/7>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: analyse and design of reinforced concrete structures  
CO2: analyse and design of steel structures  
CO3: plot structural drawing using software

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	3		1	1			2	3	3
CO2	3	3	2	2	2	3		1	1			2	3	3
CO3	3	3	2	2	2	3		1	1	3		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**LIST OF EXPERIMENTS /EXERCISES:**

1. Water absorption and Specific gravity test on aggregates
2. Sieve analysis and fineness modulus test on aggregates
3. Aggregate Impact value test and crushing value test
4. Attrition and Abrasion test on aggregates
5. Flakiness and Elongation test on aggregates
6. Penetration and Specific Gravity test on Bitumen
7. Viscosity and Softening point test on bitumen
8. Ductility test on bitumen
9. Stripping test on bituminous mixes
10. Marshall stability of bituminous mixes
11. Skid resistance test
12. CBR test on sub-grade soil

**TOTAL: 45**

**REFERENCES / MANUALS / SOFTWARE:**

1. Khanna S.K., Justo C.E.G. and Veeraragavan A., “Highway Materials and Pavement Testing”, 5<sup>th</sup> Edition, New Chand and Brothers, Roorkee, 2009.
2. “Methods of Test for Bitumen and Tar Materials”, IS 1201-1978 to 1220-1978, Bureau of Indian Standards
3. “Methods of Test for Aggregates”, IS 2386-1978, Bureau of Indian standards
4. <http://nptel.ac.in/courses/105101087/>
5. <http://nptel.ac.in/courses/105105107/>

**COURSE OUTCOMES**

On completion of the course the students will be able to

CO1: identify the physical properties of aggregates and bitumen

CO2: design a mix ratio for required grade of bitumen

CO3: determine the sub grade strength of the soil and assess the surface condition of the pavement

**Mapping of COs with POs and PSOs**

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	3		3		1	1			2	3	3
CO2	3	2	1	3		3		1	1			2	3	3
CO3	3	2	1	3		3		1	1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEL63 SURVEY CAMP****0 0 3 1****LIST OF EXERCISES:**

1. Triangulation
2. Highway project
3. Water supply project
4. Irrigation project
5. Foundation marking
6. Curve setting
7. Contouring

**TOTAL:45****REFERENCES:**

1. Lab Manual
2. Punmia ,B.C.,surveyingvol I and vol II , lakshmi publications, New Delhi
3. <http://nptel.ac.in/courses/105107122/home.htm>
4. <http://nptel.ac.in/courses/105107122/home.htm>
5. <https://sites.google.com/a/mitr.iitm.ac.in/iitmcivil/ce2080/surveying-practical>
6. <http://nptel.ac.in/courses/105107122/20>
7. <http://nptel.ac.in/courses/105107122/20>
8. <http://nptel.ac.in/courses/105104100/4>

**MARKS:**

- |  |          |
|--|----------|
| 1. Internal Marks<br>(based on observation of students field work) | 30 marks |
| 2. Evaluation of Survey Camp Report                                | 20 marks |
| 3. Viva Voice Examination  | 50 marks |

**TOTAL: 100Marks****COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: investigate the Distance and Elevation of In-Assessable Points
- CO2: preparing the Volume of Cutting and Filling for the Engineering Projects
- CO3: set out the Foundation and Curves

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	3		3		1	1	1		2	3	3
CO2	3	2	1	3		3		1	1	1		2	3	3
CO3	3	2	1	3		3		1	1	1		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial



**14GET71 TOTAL QUALITY MANAGEMENT**  
(Common to all Engineering and Technology branches)

**3 0 0 3**  
**9**

**UNIT – I**

**Quality (Basic concepts and principles)** :Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs, Basic concepts of Total Quality Management, Historical Review. Principles of TQM, Leadership – Concepts, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

**UNIT – II**

**9**

**TQM Principles and strategies** : Customer satisfaction – Customer Perception of Quality, Customer Complaints, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits. Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development

**UNIT – III**

**9**

**TQM Tools (Process Control)**: The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

**UNIT – IV**

**9**

**TQM Tools**: Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, Poka Yoke.

**UNIT – V**

**9**

**Quality Systems** -Need for ISO 9000 and Other Quality Systems, ISO 9000:2008 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, Introduction to TS 16949, QS 9000, ISO 14000, ISO 18000, ISO 20000, ISO 22000.

**TOTAL : 45**

**TEXT BOOKS:**

1. Besterfield, Dale H. et al., “Total Quality Management”, 3<sup>rd</sup> Edition (Revised), Pearson Education, 2011.
2. Subburaj Ramasamy, “Total Quality Management”, Tata McGraw Hill, New Delhi, 2008.

**REFERENCE BOOKS:**

1. Feigenbaum A.V., “Total Quality Management”, 4<sup>th</sup> Edition, Tata McGraw Hill, New Delhi, 2004.
2. Suganthi L. and Samuel A. Anand, “Total Quality Management”, PHI Learning, New Delhi, 2011.
3. Evans James R. and Lindsay William M., “The Management and Control of Quality”, 7<sup>th</sup> Edition, South-Western (Thomson Learning), 2011.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: understand the meaning of quality and its importance
- CO2: know the principles of total quality management and peculiarities of their implementation
- CO3: develop in-depth knowledge on various tools and techniques of quality management
- CO4: learn the applications of quality tools and techniques in both manufacturing and service industry
- CO5: develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2	2	3	2	2	2	3		3
CO2						3	2	3	3	3	2	3		3
CO3	3	2	2	2	2	2		1	2	2	3	2		3
CO4	2	2	2	2	2	2		1	2	2	3	2		3
CO5						3	3	2	3	2	2	2		3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CET71 ESTIMATION AND QUANTITY SURVEYING

(PWD and CPWD Schedule of rates are permitted)

3 0 0 3

### UNIT – I

**Estimation of Buildings:** Types of estimates – Units of measurements – Methods of estimates – Load bearing and framed structures – Calculation of quantities of various items for residential building with flat roof – Steel requirement and bar bending schedule- Various types of arches – Calculation of brick work and RCC works in arches.

### UNIT – II

**Estimation of other Structures and Specifications:** Doors and windows (paneled and glazed) - septic tank - soak pit - bituminous and cement concrete roads – retaining walls – culverts - Specifications – sources – Detailed and general specifications – Measurement book.

### UNIT – III

**Analysis of Rates:** Rate for material and labour - Rate analysis for Stone masonry, Brick masonry, concreting, plastering and Tiles laying, Schedule of PWD and CPWD rate- rate analysis for special works

### UNIT – IV

**Valuation:** Basics of valuation – Capitalized value – Factors affecting the value of plot and building - depreciation - Valuation of residential building – Escalation – Calculation of standard rent – Mortgage – Lease.

### UNIT – V

**Tenders and Report Preparation:** Tenders – e Tendering - Contracts – Types of contracts – Arbitration and legal requirements- Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations.

**TOTAL: 45**

### TEXT BOOKS:

1. Dutta B.N., “Estimating and Costing in Civil Engineering”, 27<sup>th</sup> Edition, UBS Publishers & Distributors Pvt. Ltd., Chennai, 2012.
2. Kohli D.D and Kohli R.C., “A Text Book of Estimating and Costing (Civil)”, 12<sup>th</sup> Edition, S.Chand & Company Ltd., New Delhi, 2011.

### REFERENCE BOOKS:

1. Kanagasabapathy B., “Practical Valuation Engineering”, 1<sup>st</sup> Edition, Volume. I, II & III, K. Ehilaalarasi Kanagasabapathy Publications, Trichy, 2006.
2. Malhotra J.C., “Quantity Surveying and Costing”, 1<sup>st</sup> Edition, Khanna Publishers, New Delhi, 1986.
3. “Schedule of Rates”, PWD, Government of Tamilnadu, Chennai.
4. “Schedule of Rates”, C PWD, Government of India.
5. <https://www.youtube.com/watch?v=RvDO4KcmHRQ>
6. <https://www.youtube.com/watch?v=qsQdglNy6so>
7. <https://www.youtube.com/watch?v=z3vk2ETTh-7g>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: compute quantities of various items for load bearing and framed structures
- CO2: calculate the quantities of various items for other structures
- CO3: analyze the rates for various items of works
- CO4: carry out valuation of plots and buildings
- CO5: prepare tenders, contract documents and reports as per norms

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	3	3	2			3						1	3	3
CO4:	3	2	1			3						1	3	3
CO5:	3	2	1			3					1	1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CET72 PRE-STRESSED CONCRETE STRUCTURES

(IS 1343:2012 & IS 3370 (Part-III): 2009 are permitted)

3 0 0 3  
9

### UNIT – I

**Introduction:** Basic Concepts of Prestressing-Need for High Strength Steel and Concrete-Terminology- Advantages of Prestressed Concrete-Applications of Prestressed Concrete-Materials for Prestressed Concrete – Prestressing Systems-Analysis of Prestress and Bending Stresses

### UNIT – II

**Loss of Prestress and Deflection of Prestressed Concrete Beams:** Losses of Prestress – Deflections of Prestressed Concrete Members – Factors Influencing Deflections – Short-Term Deflections of Uncracked Members – Prediction of Long Time Deflections - Flexural Strength of Prestressed Concrete Sections – Types of Flexural Failure.

### UNIT – III

**Design of Prestressed Concrete Sections:** Design of Sections for Flexure-Design of Sections for Axial Tension-Design of sections for compression and bending- Design of Prestressed Sections for Shear and Torsion (design concepts only) - Design of Anchorage Zone by Guyon’s method-Concept of Magnel’s method (IS 1343 recommendations).

### UNIT – IV

**Composite Construction of Prestressed and insitu Concrete:** Types of Composite Structures – Design procedure- Calculation of stresses at important stages both for propped and unpropped construction-Design of shear connector-Shrinkage Stresses.

### UNIT – V

**Circular and Vertical Prestressing:** General Aspects – Design of a prestressed circular tank–Design of Poles .

**TOTAL: 45**

### TEXT BOOKS:

1. Krishna Raju N., “Prestressed Concrete”, 4<sup>th</sup> Edition, Tata McGraw Hill Company, New Delhi, 2011.
2. Praveen Nagarajan “Prestressed Concrete”, 1<sup>st</sup> Edition, Dorling Kindersley (I) Pvt. Ltd., 2011.

### REFERENCE BOOKS:

1. Malic S.K. and Gupta A.P., “Prestressed Concrete”, 2<sup>nd</sup> Edition, Oxford and IBH Publishing Co., New Delhi, 1997.
2. N. Rajagopalan., Prestressed Concrete, CRC Press, 2002Alpha Science International Ltd
3. <http://nptel.ac.in/courses/105106118/>
4. <http://nptel.ac.in/courses/105106117/>
5. <https://theconstructor.org/concrete/prestressed-concrete-principles-advantages/28/>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: determine the bending stresses in prestressed concrete section applying the design philosophy
- CO2: calculate the losses and deflections in prestressed concrete structural sections
- CO3: design the prestressed concrete structural elements
- CO4: design shear connectors
- CO5: design the prestressed circular tanks and concrete poles

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEL71 STRUCTURAL DRAWING

(Use of IS 456:2000, IS 3370, SP 16, SP 34 IS 800:2007, Steel Tables, IS 875 and SP 38 are permitted)

0 0 3 1

### LIST OF EXPERIMENTS /EXERCISES:

#### Design and Drawing of Concrete Structures of

1. One way simply supported slab.
2. Flat slab
3. Cantilever retaining walls
4. Circular Water tank
5. Dog legged staircase
6. Combined footing

#### Design and Drawing Steel Structures of

7. Bolted connections.
8. Welded connections.
9. Tension member
10. Tension splice
11. Lug Angles
12. Built-up columns

Study on structural drawings and report preparation (Study exercise only)

**TOTAL: 45**

### REFERENCES / MANUALS / SOFTWARE:

1. Krishnaraju N., "Structural Design & Drawing" (Concrete & Steel – Volume II and III), 3<sup>rd</sup> Edition, CBS Publishers, 2014.
2. Subramanian N., "Design of Steel Structures", 1<sup>st</sup> Edition, Oxford University Press, New Delhi, 2008.
3. Punmia B.C., Jain, Ashok Kumar and Jain, Arun Kumar, "Comprehensive Design of Steel Structures", 2<sup>nd</sup> Edition, Laxmi Publications Pvt. Ltd., 2003.
4. <http://nptel.ac.in/courses/105105108/>
5. <http://www.chennaiinstituteoftechnology.com/wp-content/uploads/2015/02/SOM.pdf>
6. <http://smec.ac.in/sites/default/files/lab1/Strength%20of%20Materials%20Lab.pdf>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: design and detailing of structural elements  
CO2: design and detailing of storage structures  
CO3: design and detailing of industrial structures

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3		3			1	1		2	3	3
CO2	3	3	2	3		3			1	1		2	3	3
CO3	3	3	2	3		3			1	1		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

# 14GET81 PROFESSIONAL ETHICS AND HUMAN VALUES

(Common to all Engineering and Technology branches)

3 0 0 3

## UNIT – I

9

Understanding: Morals – Values-Ethics–Honesty – Integrity – Work Ethic – Service Learning – Civic Virtue – caring – Sharing – Courage – Valuing Time – Co-operation – Commitment – Empathy –Self-Confidence – Character – Spirituality- Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry.

## UNIT – II

9

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. Meaning of Engineering experimentation - engineers as responsible experimenters.

## UNIT – III

9

Codes of ethics for engineers - a balanced outlook on law - the challenger case study. Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk, Bhopal Gas Tragedy and Chernobyl case studies.

## UNIT – IV

9

Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee rights – discrimination – Intellectual Property Rights (IPR) – Multinational corporations – Environmental ethics.

## UNIT – V

9

Computerethics – weapons development-engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of Electronics and Telecommunication Engineers(IETE).

**TOTAL : 45**

## TEXT BOOKS:

1. Martin Mike and Schinzinger Roland, "Ethics in Engineering", 4<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi, 2014.
2. Govindarajan M., Natarajan S., and Senthil Kumar V.S., "Engineering Ethics", Prentice Hall of India, New Delhi, Reprint 2013.

## REFERENCE BOOKS:

1. Fleddermann Charles D., "Engineering Ethics", 4<sup>th</sup> Edition, Pearson Education/Prentice Hall, New Jersey, 2014.
2. Harris Charles E., Protchard Michael S. and Rabins Michael J., "Engineering Ethics: Concepts and Cases", 4<sup>th</sup> Edition Wadsworth Thompson Learning, United States, 2008.
3. Seebauer Edmund G. and Barry Robert L., "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2008.

## COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: understand the components of ethics and values
- CO2: understand the knowledge interpersonal and organizational issues in ethics
- CO3: acquire knowledge on ethical theories and their application
- CO4: highlight ethical issues in risky situation
- CO5: understand the role of professional bodies

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3		3	2	2		2		2
CO2						3		3	2	3		2		2
CO3						3	2	3	2	1		2		2
CO4						3	3	3	2	3		2		2
CO5						2	2	3	2	2		2		2

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEE01ADVANCED STRENGTH OF MATERIALS**

**3    0    0    3**

**UNIT – I** **9**

**Unsymmetrical Bending:** Introduction - Stress at any point – Sign convention – Direction of neutral axis - Stresses in beams – Deflection of beams.

**UNIT – II** **9**

**Shear Centre and Shell Analysis:** Shear centre for sections symmetrical about both axis and about only one axis – Location of shear centre for unsymmetrical sections. Thin and thick walled pressure vessels, uniform torsion, combined and direct bending stresses.

**UNIT – III** **9**

**Curved Beams and Torsional Effects:** Bending strain energy and deflection of beams with small initial curvature - Strain energy deflection– Curved beams with large initial curvature. -Winkler Bach Formula - Crane hooks - rings and links. Energy Methods – Energy Theorems, Use of energy theories for calculating deflections, twists, solution to torsion.

**UNIT – IV** **9**

**Column:** Basic mode of buckling of column, Buckling and Fracture, Rankine formula, South well plot – Concept of equilibrium, Analysis for various boundary conditions –Energy method

**UNIT – V** **9**

**Energy Theorem:** Use of energy theorem for calculating deflections, twist, and torsion (non-circular) problems

**TOTAL: 45**

**TEXT BOOKS:**

1. Rajput S., “Strength of Materials”, 4<sup>th</sup> Edition, S. Chand & Co., 2006.
2. Sadhu Singh, “Theory of Elasticity”, 4<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2011.

**REFERENCE BOOKS:**

1. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, “Mechanics of Materials”, 1<sup>st</sup> Edition, Lakshmi Publications, 2014.
2. Ramamrutham S., “Strength of Materials”, 1<sup>st</sup> Edition, Dhanpat Rai Publishing Company, New Delhi, 2006.
3. Bansal R.K., “Strength of Materials”, 6<sup>th</sup> Edition, Lakshmi Publications, 2010.
4. <http://nptel.ac.in/courses/112101095>
5. <http://nptel.ac.in/courses/112107146>
6. <http://nptel.ac.in/courses/112107147/28>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: identify the stress characteristics in beam
- CO2: determine the shear centre in different sections
- CO3: find solution to torsion problems in structural elements
- CO4: analyse the behavior of columns
- CO5: solve structural problems using energy theorems

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	3	3	2			3						1	3	3
CO4	3	3	2			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEE02 RAILWAYS, AIRPORT AND HARBOUR ENGINEERING**

**3    0    0    3**

**UNIT – I**

**Railway Planning and Design:** Introduction - Merits and demerits - Engineering survey for track alignment - Permanent Way - Components and Functions - Gauges - Coning of wheels - Geometric design – Super elevation - Widening of gauges - Transition curves - Gradients and grade compensation - Vertical curves.

**UNIT – II**

**Railway Track Construction, Maintenance and Operation:** Construction and maintenance – Drainage - Lay outs of railway stations and yards - Turnouts - Points and Crossing - Signals - Types - Interlocking - Principles and mechanism - Methods - Track circuiting - Level crossings.

**UNIT – III**

**Airport Planning and Design:** Introduction - Merits and demerits - Aircraft characteristics - Airport planning - Site selection - Airport obstructions - Runway design - Orientation - Wind Rose Diagram - Corrections to basic runway length - Airport capacity and configuration - Taxiway design - Exit taxiways.

**UNIT – IV**

**Airport Layout and Visual Aids:** Terminal area - Passenger facilities - Parking and circulation area - Apron - Aircraft parking system - Terminal design concepts - Hangar - Typical airport layouts - Airport marking and lighting - Air Traffic Control - Instrument Landing System - Airport drainage.

**UNIT – V**

**Harbour Engineering:** Introduction - Merits and demerits - Terms - Natural phenomenon - Harbours - Site investigation - Planning, requirements and classification - Concept of satellite ports - Docks - Dry and Wet Docks - Dredgers and dredging - Mooring accessories - Navigational aids - Piers - Breakwaters - Wharves - Jetties - Quays - Spring fenders.

**TOTAL: 45**

**TEXT BOOKS:**

1. Subramanian K.P., “Highways, Railways, Airport and Harbour Engineering”, Scitech Publications, Chennai, 2014.
2. Saxena S.C. and Arora S.P., “Railway Engineering”, Dhanpat Rai Publications Pvt. Ltd., New Delhi, 2012.
3. Khanna S.K., Arora M.G. and Jain S.S., “Airport Planning and Design”, Nem Chand and Brothers, Roorkee, 2012.
4. Bindra S.P., “A Course Work in Docks and Harbour Engineering”, Dhanpat Rai Publications Pvt. Ltd., New Delhi, 2012.

**REFERENCE BOOKS:**

1. Chandra S. and Agrawal M.M., “Railway Engineering”, Oxford Publishers, New Delhi, 2013.
2. Saxena S.C., “Airport Engineering – Planning and Design”, CBS Publishers, New Delhi, 2012.
3. Oza H.P. and Oza G.H., “Dock and Harbour Engineering”, Charotar Publishing House, Anand, 2013.
4. Railway Engineering - (dl4a.org/uploads/pdf/Ebook%20-%20Railway%20Engineering%20.pdf)
5. Transportation Engineering-II - ([https://www.vssut.ac.in/lecture\\_notes/lecture1428280600.pdf](https://www.vssut.ac.in/lecture_notes/lecture1428280600.pdf))
6. Introduction to Railway Engineering - ([nptel.ac.in/courses/105107123/](https://www.nptel.ac.in/courses/105107123/))

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: plan and design the components of railway
- CO2: explain construction, drainage and maintenance practices in railways
- CO3: identify the orientation of runway and taxiways at airports
- CO4: illustrate terminal design concepts
- CO5: explain various harbour elements

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	2	1				3						1	3	2
CO3	3	2	1			3						1	3	3
CO4	2	1				3						1	3	2
CO5	2	1				3						1	3	2

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEE03 WATER RESOURCES ENGINEERING**

**3    0    0    3**

**UNIT – I**

**Introduction:** Irrigation - necessity - Types of irrigation - Methods of supplying water - Assessment of irrigation water - Consumptive use and its determination - water requirement of various crops - Duty - Delta - Base period and crop period.

**UNIT – II**

**Diversion head work:** Functions and components of a diversion head work – weir, barrage, sluice, selection of site - type of weirs on pervious foundations - cause of failure - Bligh's creep theory and Khosla's theory.

**UNIT – III**

**Dams:** Gravity dams - Non overflow section - forces acting on dams- stability rules - elementary profile - Low and High dams - drainage gallery - Earthen dams - Arch dams – Spillways.

**UNIT – IV**

**Canals:** Types of canals - canal alignment - Kennedy's silt theory - Lacey's silt theory - Design of canals using the above theories - economical depth of cutting - canal losses - canal maintenance – lining of canals –types of lining- Canal falls - Necessity and location

**UNIT – V**

**Irrigation Management:** Design of a cross regulator - cross drainage works - selection of suitable type of cross drainage work - River training works – Need for optimization of water use – Minimizing irrigation water losses –Percolation ponds – Participatory irrigation management – Water users association.

**TOTAL: 45**

**TEXT BOOKS:**

- Garg S.K., “Irrigation Engineering & Hydraulic Structures”, 30<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2002.
- Sharma R.K. and Sharma T.K., “Irrigation Engineering”, 1<sup>st</sup> Edition, S.Chand and Company, New Delhi, 2001.

**REFERENCE BOOKS:**

- Majumdar Dilip Kumar, “Irrigation Water Management: Principles and Practices”, 1<sup>st</sup> Edition, Prentice Hall of India, New Delhi, 2003.
- Basak N.N., “Irrigation Engineering”, 3<sup>rd</sup> Edition, Tata McGraw-Hill, New Delhi, 2004.
- Punmia B.C., Pande and Lal B.B., “Irrigation and Water Power Engineering”, 16<sup>th</sup> Edition, Laxmi Publications, 2007.
- Majumdar Dilip Kumar, “Irrigation Water Management: Principles and Practices”, 1st Edition, Prentice Hall of India, New Delhi, 2003.
- <http://www.nptelvideos.in/2012/11/water-resources-engineering.html>- Lecture Series on Water Resources Engineering by Prof. Rajesh Srivastava.
- <http://www.nptelvideos.in/2012/11/water-resources-engineering.html> - Ground Water Hydrology by Dr. V.R. Desai & Dr. AnirbanDhar.
- <http://fullnetsolutions.com/mupytuxawo.pdf>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: assess the irrigation water requirement of different crops and seasons
- CO2: elaborate the components and functions of diversion head work and the causes of failures with failure theories
- CO3: summarize the forces acting on different types of dams
- CO4: draft the canal systems with necessary structures
- CO5: select the suitable cross drainage works and irrigation management practices for different farming conditions

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3	1				1	1	3	3
CO2	3	2	1			3	1				1	1	3	3
CO3	3	2	1			3	1				1	1	3	3
CO4	3	2	1			3	1				1	1	3	3
CO5	3	2	1			3	1				1	1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial



**14CEE04 URBAN AND REGIONAL PLANNING**

**3 0 0 3**

**UNIT – I**

**Basic Issues:** Urban planning and Development – Definition of terms, Explanation of concepts, National policies and strategies on issues related to urban development – Trends of Urbanisation – International, National and Regional level – Positive and Negative impacts of Urban development

**UNIT - II**

**Planning Process:** Principles of planning – Types and levels of Urban plans, Stages in the planning process – goals, objectives, delineation of planning areas, surveys and analysis, Planning principles of Ebenezer Howard (Garden city movement), Perry (The neighbourhood concept)

**UNIT - III**

**Development Plans, Plan Formulation and Evaluation:** Scope and content of Regional Plan, Master Plan, Detailed Development Plan, Structure Plan, Sub Regional Plan, DCR planning and developments of industrial estates, SEZ, Development strategies, formulation and evaluation.

**UNIT - IV**

**Plan Implementation:** Constraints for plan implementation – Industrial, Financial and Legal Constraints, Institutional Arrangements for Urban Development – Financing of Urban Developments - Legislation related to Urban Development, Public participation in Planning.

**UNIT - V**

**Urban Management:** Urban Management Information System, Development Control System, Decision Support System for Urban Management – Involvement of public, private, NGO, CBO & Beneficiaries. Development control regulations- Town and country planning act- Building Bye-laws.

**TOTAL: 45**

**TEXT BOOKS:**

- Hutchinson B.G., “Principles of Urban Transport Systems Planning, Scripts”, 1<sup>st</sup> Edition, McGraw-Hill, New York, 1974.
- Claire, “Hand Book of Urban Planning”, 1<sup>st</sup> Edition, Van Nostrand Book Company, 1974.

**REFERENCE BOOKS:**

- Gallian B. Arthur and Simon Eisner, “The Urban Pattern - City Planning and Design”, 5<sup>th</sup> Edition, Affiliated Press Pvt. Ltd., New Delhi, 1985.
- Margaret Roberts, “An Introduction to Town Planning Techniques”, 1<sup>st</sup> Edition, Hutchinson, London, 1980.
- Hiraskar G.K., “Fundamentals of Town Planning”, 17<sup>th</sup> Edition, Dhanpat Rai Publications, 2010.
- Directorate of Town and Country Planning – Official Website - (<http://www.tn.gov.in/tcp/>).

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: relate the impacts of Urbanization to the existing urban development
- CO2: categorize the different types of plans that suits Urban cities
- CO3: interpret the master and Structural Plan with their development strategies
- CO4: discriminate the plan without any industrial and legal constraints
- CO5: dramatize the public participation in planning urban cities

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			2							3	3
CO2	3	3	2			3	1					1	3	3
CO3	3	2	1			3	1					1	3	3
CO4	3	3	2			3	1					1	3	3
CO5	3	2	1			2							3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEE05 STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING**

(IS 1893:2002, IS13935:1995, IS 13920 :1993 &amp; IS 4326:1993 codes are permitted)

**3 0 0 3**  
**9****UNIT-I****Theory of Vibrations:** Introduction to structural dynamics - Concept of inertia and damping – types & effects of damping – Static forces and dynamic excitation – Degrees of freedom – SDOF idealization – equation of motion - Free and forced vibration of SDOF system (damped and un damped)– Response to harmonic excitation – Impulse and response to unit impulse.**UNIT– II****Two Degrees of Freedom System:** Equation of motion of two degree of freedom systems- Normal modes of vibration – Natural frequencies – Modal analysis - Response to support motion.**UNIT– III****Seismology:** Geological faults –Plate tectonic theory – Elastic rebound theory – Causes of Earthquakes-local site effects- Seismic waves – Seismogram – Magnitude and intensity of earthquakes – scales – Spectral Acceleration – case studies.**UNIT– IV****Earthquake Resistant Design: Response spectra -** Response and design spectra – concept of peak acceleration – Site specific response spectrum – Effects of soil properties and damping – Liquefaction of soils. **EQ Design** – Concepts and principles of EQ resistant design- Importance of ductility – Ductile detailing of RC structures.**UNIT– V****Vibration Control:** Codal provisions for the determination of lateral loads – Vibration control measures- Base isolation technique — Dampers & its types- Lessons learnt from past earthquakes – case studies.**TOTAL : 45****TEXT BOOKS:**

1. Pankaj Agarwal and Manish Shrikhande, “Earthquake Resistant Design of Structures”, PHI Learning Pvt. Ltd., 2006.
2. Chopra A.K., “Dynamics of Structures: Theory and Applications to Earthquake Engineering”, 2<sup>nd</sup> Edition, Pearson Education, 2007.

**REFERENCE BOOKS:**

1. Dowrick D.J., “Earthquake Resistant Design”, John Wiley & Sons, London, 1977.
2. Paz M., “Structural Dynamics: Theory & Computation”, CSB Publishers & Distributors, Shahdara, Delhi, 1985.
3. Murthy C.V.R., “Earthquake Tips”, NPEEE Publications, IIT, Kanpur.
4. <http://nptel.ac.in/courses/105101006/>
5. [https://onlinecourses.nptel.ac.in/noc16\\_ce08/preview](https://onlinecourses.nptel.ac.in/noc16_ce08/preview)

**COURSE OUTCOMES**

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

- CO1: carry out the vibration analysis for basic degrees of freedom  
 CO2: adopt the experimental techniques to determine the mode shapes  
 CO3: explain the causes and effects of earthquakes  
 CO4: interpret the spectral data obtained during the experiment  
 CO5: suggest suitable vibration control measures

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	2	1				2							3	2
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEE06 PAVEMENT DESIGN

(IRC 37:2012 & IRC 58:2002 Code of Practices are permitted)

3    0    0    3

### UNIT – I 9

**Types of Pavements:** Introduction - Pavement types - Comparison - Components and functions - Airport pavements - Comparison between highway and airport pavements - Factors affecting design and performance of pavements - Properties, functions and significance of Sub grade.

### UNIT – II 9

**Stresses in Pavements:** Pavement as layered structure - Resilient modulus - Stresses and Deflections in Homogeneous Masses - Burmister 2-layer, 3-layer theories - Wheel Load Stresses - ESWL - Repeated Loads - EWL factors - sustained loads and pavement behavior under traffic loads - Modified Westergaard approach for design of Cement Concrete pavements.

### UNIT – III 9

**Flexible Pavement Design:** Flexible pavement design factors - Design of flexible pavement by empirical, semi-empirical and theoretical methods - Design of highway pavement by IRC method - Design of airport pavement by AASHTO method.

### UNIT – IV 9

**Rigid Pavement Design:** Types of Stresses - Wheel Load Stresses, Warping Stresses, Friction Stresses, Combined Stresses - Types of Joints in Cement Concrete Pavements and their Functions, Joint Spacing - Design procedure as per IRC guidelines - Design of Slab Thickness, Design of Joints.

### UNIT – V 9

**Pavement Management:** Pavement Evaluation - causes of distress in rigid and flexible pavements - Evaluation based on Surface Appearance - Structural Evaluation by Deflection Measurements - Design of overlay for flexible pavements - Pavement Serviceability index - Pavement maintenance - Pavement management system.

**TOTAL: 45**

#### TEXT BOOKS:

1. Khanna S.K., Justo C.E.G. and Veeraragavan A., “Highway Engineering”, 10<sup>th</sup> Edition, Nem Chand and Brothers, Roorkee, 2013.
2. Wright P.H. and Paquette R.J., “Highway Engineers”, 7<sup>th</sup> Edition, John Wiley and Sons, Inc., New York, 1996.
3. Kadiyali L.R. and Lai N.B., “Highway Engineering (Including Expressways and Airport Engineering)”, 5<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2013.

#### REFERENCE BOOKS:

1. Yoder and Witezak, “Principles of Pavement Design”, 2<sup>nd</sup> Edition, John Wiley and Sons, 1975.
2. Yang H. Huang, “Pavement Analysis and Design”, 2<sup>nd</sup> Edition, Prentice Hall Inc., 2004.
3. Sharma S.K., “Principles, Practice and Design of Highway Engineering Including Airport Pavements”, 3<sup>rd</sup> Edition, S.Chand and Company, 2012.
4. <http://nptel.ac.in/courses/105101087>
5. <http://nptel.ac.in/courses/105105107>

#### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: discuss the factors affecting design and performance of pavements
- CO2: analyze and calculate the stresses in flexible and rigid pavements
- CO3: design the flexible pavement using empirical, semi-empirical and IRC methods
- CO4: design the rigid pavements using IRC method
- CO5: summarize the types of distress in pavements

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	2	1				3							1	3	2
CO2	3	3	2			3							1	3	3
CO3	3	2	1			3							1	3	3
CO4	3	2	1			3							1	3	3
CO5	2	1				3							1	3	2

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT-I**

**Hydrometeorology:** Hydrological cycle – Hydro meteorological factors – Cloud formation – Winds and their movement – Types of precipitation – Forms of precipitation – Density and adequacy of rain gauges – Recording and non-recording gauges.

**UNIT– II**

**Precipitation and Abstractions:** Spatial distribution – Consistency analysis – Frequency analysis – Intensity, duration and frequency relationships-Uses of hyetograph-Evaporation - Infiltration-Horton’s equation-Infiltration indices – Stage-discharge relationships- Flow measurements- Current meter method for velocity measurements.

**UNIT– III**

**Hydrograph Analysis:** Introduction - Factors - shape of hydrograph – Components of direct runoff hydrograph – Base flow – Unit hydrograph – S curve hydrograph – Synthetic unit hydrograph.

**UNIT– IV**

**Groundwater Hydrology:** Occurrence of ground water–Types of aquifer–Dupuit’s assumptions–Darcy’s law–Estimation of aquifer parameters–steady flow to wells for confined and unconfined aquifer.

**UNIT– V**

**Flood Analysis:** Flood estimation – Gumbel’s method – Log Pearson type III method – Reservoir flood routing – Channel routing – Other methods of routing.

**TOTAL: 45**

**TEXT BOOKS:**

- Jayarami Reddy P., “Hydrology”, 3<sup>rd</sup> Edition, Laxmi Publications Ltd., New Delhi, 2011.
- Subramanya K., “Engineering Hydrology”, 3<sup>rd</sup> Edition, Tata McGraw-Hill, New Delhi, 2007.

**REFERENCE BOOKS:**

- Raghunath H.M., “Hydrology”, 2<sup>nd</sup> Edition, New Age International (P) Ltd., Chennai, 2006.
- Singh Vijay P., “Elementary Hydrology”, 2<sup>nd</sup> Edition, Prentice Hall of India, New Delhi, 1998.
- Mutreja K.N., “Applied Hydrology”, 1<sup>st</sup> Edition, Tata McGraw Hill, New Delhi, 1998.
- <http://nptel.ac.in/downloads/105101002/>
- <http://pass-in-annauniversityexams.blogspot.in/2014/01/anna-university-CE2021-Hydrology-HYDRO-notes-pdf-download.html>
- <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-72-groundwater-hydrology-fall-2005/lecture-notes/>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1 explain hydro-meteorological factors and various rain gauges
- CO2 calculate rainfall frequency, infiltration and runoff
- CO3 analyze various types of hydrograph
- CO4 summarize the types of aquifer and parameters
- CO5 execute flood analysis and flood routing

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						1	3	3
CO3	3	3	2			3						1	3	3
CO4	2	1				3						1	3	2
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT – I**

**Sources and Types of Municipal Solid Wastes:** Sources and types of solid wastes - Quantity - factors affecting generation of solid wastes; characteristics - methods of sampling and characterization; Effects of improper disposal of solid wastes - public health effects. Principle of solid waste management - social & economic aspects; Public awareness; Role of NGOs; Legislation.

**UNIT – II**

**On-Site Storage and Processing:** On-site storage methods - materials used for containers –on site segregation of solid wastes -public health & economic aspects of storage - options under Indian conditions - Critical Evaluation of Options.

**UNIT- III**

**Collection and Transfer:** Methods of Collection - types of vehicles - Manpower requirement - collection routes; transfer stations - selection of location, operation & maintenance under Indian conditions.

**UNIT-IV**

**Off-Site Processing:** Processing techniques and Equipment; Resource recovery from solid wastes – composting –Factors affecting composting – Indore and Bangalore processes – Vermicomposting, Incineration, Pyrolysis - options under Indian conditions – case studies.

**UNIT- V**

**Disposal:** Sanitary landfills – site selection – merits and demerits - methods and operation of sanitary landfills - Leachate collection and control methods – Incinerators - types – hazardous wastes and its effects on environment - case studies.

**TOTAL: 45**

**TEXT BOOKS:**

- 1 Tchobanoglous George, et.al., “Integrated Solid Waste Management”, 1<sup>st</sup> Edition, McGraw-Hill, Publishers, New Delhi , 1993.
- 2 Bilitewski B., HardtleG., Weissbach K., Marek A. and Boeddicker H., “Waste Management”, Springer, New York, 1996.

**REFERENCE BOOKS:**

1. “Manual on Municipal Solid Waste Management”, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000.
2. Landreth R.E. and Rebers P.A., “Municipal Solid Wastes - Problems and Solutions”, 1<sup>st</sup> Edition, Lewis Publishers, Boca Raton, US, 1996.
3. Bhide A.D. and Sundaresan B.B., “Solid Waste Management in Developing Countries”, 1<sup>st</sup> Edition, INSDOC, New Delhi, 1983.
4. <http://www.indiaenvironmentportal.org.in/files/file/municipal%20solid%20waste%20management.pdf>
5. <http://www.encapafrika.org/EGSSAA/solidwaste.pdf>
6. [http://www.unep.or.jp/ietc/publications/spc/solid\\_waste\\_management/Vol\\_I/Binder1.pdf](http://www.unep.or.jp/ietc/publications/spc/solid_waste_management/Vol_I/Binder1.pdf)

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: predict the sources and types of municipal solid waste
- CO2: carry out the possible methods of on-site storage and processing of solid waste
- CO3: prepare the suitable methods of collecting and conveying of municipal solid waste
- CO4: use the possible methods of off-site storage and processing of solid waste
- CO5: demonstrate the proper method and procedure for better disposal of solid waste

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3	1	1				1	3	3
CO3	3	2	1			3	1	1				1	3	3
CO4	3	2	1			3	1	1				1	3	3
CO5	3	2	1			3	1	1				1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEE09 ADVANCED DESIGN OF STEEL STRUCTURES**

[IS 800, 802, 4091, 801, 811 &amp; SP-06 are permitted]

**3 0 0 3****UNIT – I**

**Planning and Design of Industrial Building:** Specific requirements of industries like textile-sugar –cement, chemical etc; site layout and external facilities – lighting and ventilation. Analysis and design of industrial buildings and bents - crane gantry girders and crane columns-bracing of industrial buildings and bents.

**UNIT – II**

**Analysis and Design of Micro Wave Towers:** Introduction -Types and uses of Micro Wave towers-Loads on towers-Analysis of towers-Design of member in towers-Design of tower foundations.

**UNIT – III**

**Analysis and Design of Transmission Line Towers:** Introduction-Types and uses of Transmission line towers-Loads on towers-Shape sag and Tension in uniformly loaded conductors-Analysis of towers-Design Principles of member in towers

**UNIT – IV**

**Plastic Analysis of Structures:** Introduction – Shape factors - Moment Redistribution - Static, kinematic and uniqueness theorem -combined mechanisms - Analysis of single bay and two bay portal frames - Method of plastic moment distribution – Effect of axial force and shear force on Plastic Moment

**UNIT – V**

**Design of Light Gauge Steel Structures:** Types of cross sections-Local buckling and lateral buckling –Design of Compression and Tension members –Deflection of beams.

**TOTAL: 45****TEXT BOOKS:**

1. Subramanian N., “Design of Steel Structures”, 1<sup>st</sup> Edition, Oxford University Press, New Delhi, 2011.
2. Dayaratnam P., “Design of Steel Structures”, 2<sup>nd</sup> Edition, S. Chand & Company, New Delhi, 2003.

**REFERENCE BOOKS:**

1. Ramachandra S. and Virendra Gehlot, “Limit State Design of Steel Structures”, 12<sup>th</sup> Edition, Standard Publication, New Delhi, 2009.
2. “Teaching Resources for Structural Steel Design” – Volume I, II & III, INSDAG, Kolkatta, 2003.
3. Gaylord E.H., Gaylord N.C. and Stallmeyer J.E., “Design of Steel Structures”, 3<sup>rd</sup> Edition, McGraw-Hill Publications, London, 2001.
4. Duggal S.K., “Limit state Design of Steel Structures”, 2<sup>nd</sup> Edition, Tata McGraw-Hill Education Pvt.Ltd., New Delhi, 2010.
5. <http://nptel.ac.in/courses/105106112>
6. <http://nptel.ac.in/courses/105106113>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: design gantry girders and crane columns  
 CO2: analysis and design of microwave steel towers  
 CO3: analysis and design of transmission line steel towers  
 CO4: analysis portal frames as per plastic method  
 CO5: design light gauge steel structures

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3						1	3	3
CO2	3	3	2			3						1	3	3
CO3	3	3	2			3						1	3	3
CO4	3	3	2			3						1	3	3
CO5	3	3	2			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEE10 TRAFFIC ENGINEERING AND TRANSPORTATION PLANNING**

**3 0 0 3**

**UNIT – I**

**Traffic Characteristics and Traffic Surveys:** Significance and scope - Road user characteristics - Vehicle characteristics - Fundamentals of Traffic Flow - Surveys and analysis - volume, capacity, speed and delays, origin and destination, parking - Level of service - concept, application and significance. **9**

**UNIT – II**

**Traffic Intersections:** Conflicts at intersection - At-grade intersection - Uncontrolled, Channelization - Rotary intersection - Capacity and Design - Grade separated intersections - Types and Design. **9**

**UNIT – III**

**Traffic Controls:** Traffic signals - Design of 2-phase traffic signal (Webster’s method) – Signal co-ordination - Traffic signs - Road markings - Traffic control aids - Street furniture - Street lighting. **9**

**UNIT – IV**

**Traffic Safety and Management:** Road accidents - Causes and prevention - Cost of Road Accidents - Road Safety Audit - Travel Demand Management - Traffic Management measures - Bus bays - Pedestrian studies. **9**

**UNIT – V**

**Introduction to Transportation Planning:** Concepts - Transport planning process - Travel demand modelling - Data Collection - Transportation survey - Trip generation - Trip distribution - Modal split - Trip assignment. **9**

**TOTAL: 45**

**TEXT BOOKS:**

1. Kadiyali L.R., “Traffic Engineering and Transport Planning”, 7<sup>th</sup> Edition, Khanna Publications, 2013.
2. Khanna S.K., Justo C.E.G. and Veeraragavan A., “Highway Engineering”, 10<sup>th</sup> Edition, Nem Chand and Brothers, Roorkee, 2013.

**REFERENCE BOOKS:**

1. CA Nash and GR Leake, “Transport Planning and Traffic Engineering”, Elsevier, 2005.
2. Coleman O’Flaherty, “Transport Planning and Traffic Engineering”, 4th Revised Edition, A Butterworth-Heinemann Title, 2002.
3. <http://nptel.ac.in/courses/105101087/downloads/Lec-41.pdf>
4. [http://nptel.ac.in/courses/105101008/downloads/cete\\_42.pdf](http://nptel.ac.in/courses/105101008/downloads/cete_42.pdf)
5. [http://nptel.ac.in/courses/105101008/downloads/cete\\_47.pdf](http://nptel.ac.in/courses/105101008/downloads/cete_47.pdf)
6. [http://nptel.ac.in/courses/105101008/downloads/cete\\_41.pdf](http://nptel.ac.in/courses/105101008/downloads/cete_41.pdf)

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: Describe road user and vehicle characteristics and infer traffic surveys
- CO2: Design at-grade and grade separated intersections
- CO3: Design traffic signals, road markings and traffic control aids
- CO4: Summarize the traffic management measures
- CO5: Illustrate the process of transportation planning

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	2	1				3						1	3	2
CO5	2	1				3						1	3	2

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT – I** **9**

**Introduction:** Boundary value problem - Approximate solution - Variation and weighted residual methods - Ritz and Galerkin’s formulations - Concepts of piecewise approximation and finite elements - Displacement and Shape functions - Minimum potential energy - Generation of Stiffness Matrix and Load vector.

**UNIT – II** **9**

**Two Dimensional Stress Analysis:** Two Dimensional problems - Plane stress and strain - Axisymmetric problems - Triangular and quadrilateral elements - Natural coordinates – Iso-parametric formulation - Numerical integration

**UNIT – III** **9**

**Meshing Techniques:** Brick elements - Elements for fracture analysis - Higher order elements -P and H methods of refinement – Ill-conditioned elements – Discretization errors - Auto and adaptive mesh generation techniques - Error evaluation.

**UNIT – IV** **9**

**Nonlinear and Vibration Problems:** Material and Geometric nonlinearity - Methods of treatment - Consistent system matrices – Dynamic condensation - Eigen value extraction

**UNIT – V** **9**

**Applications of FEM:** Application to displacement analysis problems - Application of Finite element method based on commercial software packages.

**TOTAL: 45**

**TEXT BOOKS:**

1. Rajasekaran S., “Finite Element Analysis in Engineering Design”, 1<sup>st</sup> Edition, S. Chand & Co., 2003.
2. Krishnamoorthy C.S., “Finite Element Analysis”, 2<sup>nd</sup> Edition, Tata McGraw-Hill Education, 1995.

**REFERENCE BOOKS:**

1. Bathe K.J., “Finite Elements Procedures in Engineering Analysis”, 2<sup>nd</sup> Edition, Prentice Hall Inc., 1995.
2. Zienkiewicz O.C. and Taylor R.L., “The Finite Elements Methods”, 7<sup>th</sup> Edition, McGraw Hill, 1987.
3. Chandruputla R.T. and Belegundu A.D., “Introduction to Finite Elements in Engineering”, 2<sup>nd</sup> Edition, Prentice Hall of India, 1997.
4. Moaveni S., “Finite Element Analysis: Theory and Application with ANSYS”, 3<sup>rd</sup> Edition, Prentice Hall Inc., 1999.
5. <http://freevideolectures.com/Course/3119/Finite-Element-Analysis-I>
6. [http://www.colorado.edu/MCEN/MCEN4173/chap\\_01.pdf](http://www.colorado.edu/MCEN/MCEN4173/chap_01.pdf)
7. <http://www.iitg.ernet.in/engfac/rtiwari/resume/usdixit.pdf>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: develop stiffness matrix and load vector
- CO2: analyze two-dimensional stress
- CO3: divide the elements using meshing techniques
- CO4: analyze nonlinear and dynamic problems
- CO5: compute the displacement by using FEM

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	3	2			3						1	3	3
CO3	3	3	2			3						1	3	3
CO4	3	3	2			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial



**14CEE12 INDUSTRIAL STRUCTURES**

**3 0 0 3**

**UNIT – I**

**9**

**Planning and Layout:** Planning and layout of Industrial Buildings – Concept of Engineering Buildings. **Steel Mill Buildings:** Planning the general framing scheme- Planning the Trusses –Bracing of roofs – Vertical bracing of buildings – Design of trusses and lattice girders.

**UNIT – II**

**9**

**Design of Frames:** Design of simple and rigid frames –Gable frames –Knee bents.

**UNIT – III**

**9**

**Design of Chimneys:** Self –supporting-Guyed chimneys-Design of towers.

**UNIT – IV**

**9**

**Industrial Roofing Structures:** Design of lattice girders – Design of arches-Plate girders- Design of industrial sheds- Design of over head and under slung girders-gantry girders - Design of gantry columns-Heavy duty plate girders.

**UNIT – V**

**9**

**Towers:** Design of lattice towers – Design of masts – Design principles of transmission line towers

**TOTAL : 45**

**TEXT BOOKS:**

- Dunham C.W., “Planning Industrial Structures”, 3<sup>rd</sup> Edition, McGraw Hill Book Company Inc., 1980.
- Subramanaian N., “Design of Steel Structures”, 1<sup>st</sup> Edition, Oxford University Press, New Delhi, 2008.

**REFERENCE BOOKS:**

- Jayagopal L.S., ”Structural Steel Design”, 5<sup>th</sup> Edition, Vikas Publications, 2012.
- Gaylord and Gaylord, “Structural Engineering Hand Book”, 4<sup>th</sup> Edition, McGraw Hill Company, 1990.
- Ram Chandra, “Design of Steel Structures”, 8<sup>th</sup> Edition, Scientific Publication (India), Jodhpur, 2007.
- [http://tycnw01.vtc.edu.hk/cbe2027/SA1\\_FRAME.pdf](http://tycnw01.vtc.edu.hk/cbe2027/SA1_FRAME.pdf)
- <https://youtu.be/h2VnvhGRYws>
- [web.iitd.ac.in/~pmvs/courses/mel709/mel709-41.ppt](http://web.iitd.ac.in/~pmvs/courses/mel709/mel709-41.ppt)

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: prepare plan industrial structures based on its functional requirements  
 CO2: analyze and design simple and rigid frames  
 CO3: design chimneys and towers  
 CO4: design different industrial roofing  
 CO5: analysis and design towers and masts

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	3	2			3						1	3	3
CO3	3	3	2			3						1	3	3
CO4	3	3	2			3						1	3	3
CO5	3	3	2			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEE13 REHABILITATION OF STRUCTURES**

**3 0 0 3**

**UNIT – I**

**Introduction:** General consideration – Distress monitoring- Causes of distress – Defects due to climate, chemicals, wear and erosion – Inspection – Structural appraisal – Economic appraisal.**Building Cracks:** Causes – Diagnosis – Remedial measures – Thermal and Shrinkage cracks – Unequal loading – Vegetation and trees – Chemical action – Foundation movements – Techniques for repair - Repair materials – Epoxy injection.

**UNIT – II**

**Moisture Penetration:** Sources of dampness – Moisture movement from ground – Reasons for ineffective DPC – Roof leakage –Dampness in solid walls – Condensation – Hygroscopic salts- Remedial treatments – Ferro cement overlay – Chemical coatings – Flexible and rigid coatings.

**UNIT – III**

**Concrete Structures:** Introduction – Causes of deterioration – Diagnosis of causes – Flow charts for diagnosis – Methods of repair – Repairing spalling and disintegration – Repairing of concrete floors and pavements. **Steel Structures:** Types and causes for deterioration – Preventive measures – Repair procedure – Brittle fracture – Lamellar tearing – Defects in welded joints – Mechanism of corrosion – Design to protect against corrosion – Design and fabrication errors – Distress during erection.

**UNIT – IV**

**Seismic Retrofitting of Reinforced Concrete Buildings:** Introduction - Source of weakness in RC frame building – Structural damage due to the discontinuous load path and lack of deformation; Quality of workmanship and materials; Classification of retrofitting techniques; Retrofitting strategies for RC buildings – Structural level retrofits methods; Member level retrofit methods; Comparative analysis of methods of retrofitting.

**UNIT – V**

**Strengthening of Existing Structures:** General principles – Relieving loads – Strengthening super structures – Plating – Conversion to composite construction – Post stressing – Jacketing – Bonded overlays - Reinforcement addition – Strengthening substructures – Under pinning – Increasing load capacity of footing – Design for rehabilitation.

**TOTAL: 45**

**TEXT BOOKS:**

1. Guha P.K., “Maintenance and Repairs of Buildings”, 1<sup>st</sup> Edition, New Central Book Agency Pvt. Ltd., Calcutta, 2011.
2. Johnson S.M., “Deterioration, Maintenance and Repair of Structures”, 1<sup>st</sup> Edition, Krieger Publishing Company, Melbourne, 1981.
3. SP: 25 -1984 – Hand Book on “Causes and Prevention of Cracks in Buildings”, Bureau of Indian Standards, New Delhi, 1999.

**REFERENCE BOOKS:**

1. Macdonald S., “Concrete - Building Pathology”, 1<sup>st</sup> Edition, Blackwell Science Ltd., Oxford, 2008.
2. Shetty M.S., “Concrete Technology – Theory and Practice”, 7<sup>th</sup> Edition, S.Chand and Company Ltd., New Delhi, 2014.
3. Chudley R., “The Maintenance and Adaptation of Buildings”, 1<sup>st</sup> Edition, Longman Group Ltd., New York, 1983.
4. [http://www.rdso.indianrailways.gov.in/uploads/files/1296818449011-page\\_3.pdf](http://www.rdso.indianrailways.gov.in/uploads/files/1296818449011-page_3.pdf)
5. <https://youtu.be/IPM8OR6W6WE>
6. <https://youtu.be/74ZmqOh63v4>
7. [http://www.nra.co.za/content/Chapter\\_19.pdf](http://www.nra.co.za/content/Chapter_19.pdf)

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: distinguish various types of distress and cracks in concrete structures
- CO2: illustrate the effects due to moisture penetration and their remedial treatments
- CO3: employ the best Materials and Techniques for Repair
- CO4: make use of the retrofitting techniques for RC buildings
- CO5: apply the suitable strengthening methods to Strengthen the existing structures

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	2	1				2							3	2
CO3	3	2	1			3	1					1	3	3
CO4:	3	2	1			3	1					1	3	3
CO5:	3	2	1			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEE14 GROUND IMPROVEMENT TECHNIQUES

3    0    0    3

### UNIT – I

9

**Introduction:** Need of ground improvement- Geotechnical problems in lateritic, alluvial and black cotton soils – In-situ ground improvement methods - selection of Ground improvement techniques based on soil conditions- Soil stabilization (Lime, Fly ash, Cement, Chemicals and Bitumen).

### UNIT – II

9

**Drainage and Dewatering:** Gravity drain- lowering of water table- single and multi stage well point- vacuum and electro osmotic dewatering- discharge equation- Preloading- vertical drains- sand drains- stone column- drainage of slopes- thermal treatment- ground freezing.

### UNIT – III

9

**Compaction Techniques:** Field compaction- Static and Dynamic - specification of compaction- shallow and deep compaction- Sand piles - vibroflotation in sand and clay –explosions in sand- Terra probe method- replacement process - limitations of various techniques.

### UNIT – IV

9

**Grouting:** Grouting – types, characteristics and methods-grouting pressure - grouting materials (cement, lime, flyash & chemical) - permeation grouting, compaction grouting, soil fracture grouting and jet grouting - application and limitations - slab jacking and grouted columns - application to dams.

### UNIT – V

9

**Soil Reinforcement:** Introduction to reinforced earth - reinforcing materials - Reinforced earth retaining walls- reinforced embankments-soil nailing.**Geosynthetics:** Types- general applications - properties of geotextiles and geogrids - behavior of soils reinforced with geotextiles and geogrids - design aspects of geotextiles and geogrids.

**TOTAL: 45**

### TEXT BOOKS:

1. Purushothama Raj P., “Ground Improvement Technique”, 1<sup>st</sup> Edition, Laxmi Publications, 2012.
2. Korener R.M., “Construction and Geotechnical Methods in Foundation”, 1<sup>st</sup> Edition, McGrawHill, New Jersey, 1994.

### REFERENCE BOOKS:

1. Moseley, “Text Book on Ground Improvement”, Blackie Academic Professional, Chapman & Hall, 2<sup>nd</sup> Edition, 1994.
2. Jewell R.A., “Soil Reinforcement with Geotextiles – Special Publication 123”, 1<sup>st</sup> Edition, CIRIA Special Publication, Thomas Telford, 1996.
3. Jones J.E.P., “Earth Reinforcement and Soil Structure”, 3<sup>rd</sup> Edition, Advanced Series in Geotechnical Engineering, Butterworths, London, 1995.
4. Shashi K. Gulhati and Manoj Dutta, “Geotechnical Engineering”, 2<sup>nd</sup> Edition, Tata McGraw-Hill, 2005.
5. <http://nptel.ac.in/downloads/105104034>
6. <https://theconstructor.org/geotechnical/ground-improvement-techniques-soil-stabilization/1836>
7. <http://nptel.ac.in/downloads/105106052>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: explain the geotechnical problems of various soil deposits
- CO2: elaborate the techniques of drainage and dewatering
- CO3: summarize various compaction methods
- CO4: describe the different types of grouting
- CO5: design reinforced soil structures

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	2	1				2							3	2
CO3	2	1				2							3	2
CO4	2	1				2							3	2
CO5	3	2	1			3						1	3	1

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEE15 DESIGN OF COMPOSITE STRUCTURES**  
(IS 801,807,811,875, 1024,3370,6533 part 2 codes are permitted)

**3    0    0    3**  
**9**

**UNIT – I**

**Design of Truss:** Analysis and design of truss - Crane gantry girders and crane columns

**UNIT – II**

**Design of Connections:** Types of connections, Design of Seated beam connection-Un-stiffened, Stiffened seat connections, Continuous beam - to - beam connections and continuous beam-to-column connection both welded and bolted.

**UNIT - III**

**Cold Formed Steel Sections:** Cold formed Steel sections - Types of cross sections - Local buckling and post buckling - Design of compression and tension members - Beams - Deflection of beams

**UNIT – IV**

**Connectors and Composite Sections:** Shear connectors - types of shear connectors - degrees of shear connections - partial and full shear connections - composite sections under positive bending - negative bending - deflection of composite beams.

**UNIT - V**

**Composite Slabs and Composite Columns:** Introduction - Composite slabs - profiled sheeting - sheeting parallel to span – sheeting perpendicular to span - Types of composite columns - design of encased columns - design of in-filled columns - axial, uni-axial and bi-axially loaded columns. Composite shear wall - composite frames – composite plate girders.

**TOTAL: 45**

**TEXT BOOKS:**

1. Dayarathnam P., “Design of Steel Structure”, 2<sup>nd</sup> Edition, A.H.Wheeler, 1990.
2. Subramaniam N., “Design of Steel Structures: Theory and Practice”, 1<sup>st</sup> Edition, Oxford University Press, 2011.

**REFERENCE BOOKS:**

1. Horne M.R. and Morris L.J., “Plastic Design of Low -Rise Frames”, 1<sup>st</sup> Edition, Granada Publishing Ltd., 1981.
2. Salmon C.G. and Johnson J.E., “Steel Structure -Design and Behavior”, 5<sup>th</sup> Edition, Harper and Row, 1980.
3. nptel.ac.in/courses/105108124

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: design the truss and crane gantry girders
- CO2: design the partial and full shear connections
- CO3: design the compression and tension members
- CO4: design the composite slabs, encased columns and in-filled columns
- CO5: design Composite shear wall, composite frames & composite plate girders

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3					1	1	3	3
CO2	3	3	2			3					1	1	3	3
CO3	3	3	2			3					1	1	3	3
CO4	3	3	2			3					1	1	3	3
CO5	3	3	2			3					1	1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEE16 DESIGN OF BRIDGES

(IRC 5 - 1998, IRC 6 -2010 , IRC 18 - 2000, IRC 21-2000, IRC 22 - 1986, IRC 24 – 2001 & IRC 83 part I, II & III – 2002 codes are permitted)

3    0    0    3

### UNIT – I

**Introduction:** Classification, Investigation and preliminary survey, structural arrangement for various bridge deck, choice of types, I.R.C Specifications for road bridges, standard live loads, other forces acting on bridges, permissible stress- linear waterway-scour depth- depth of foundation. 9

### UNIT – II

**Short span bridges and Culvert:** Load distribution theory - General design principles for bridge deck, slab culverts, T-beam and slab bridges. 9

### UNIT – III

**Long span bridges:** General design principles for deck slab, girder, wing wall, return wall – Detailing of slab and girder bridges, Analysis of abutments 9

### UNIT – IV

**Piers and Pier Caps:** Reaction at support, types of bearings– Design procedure for pedestal and pier caps - Jacking effect on pier cap. Layout of bearings, expansion joints - Detailing of skew slab and curved bridges, Analysis of Piers. 9

### UNIT – V

**Balanced cantilever:** Types of Superstructure –proportioning of members - Design consideration –Design procedure.**Rigid frame bridges:** General-Method of analysis and design considerations –temperature effect- effect of shrinkage, wind and water current. 9

**TOTAL: 45**

### TEXT BOOKS:

1. Krishna Raju N., “Design of Bridges”, 4<sup>th</sup>Edition, Oxford and IBH Publishing Company, New Delhi, 2009.
2. Jagadeesh T.R., “Design of Bridge Structures”, 2<sup>nd</sup>Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2009.

### REFERENCE BOOKS:

1. Johnson Victor D., “Essentials of Bridge Engineering”, 6<sup>th</sup>Edition, Oxford and IBH Publishing Company, New Delhi, 2009.
2. Alagia J.S., “Elements of Bridge Engineering”, 5<sup>th</sup>Edition, Charotar Publishing House, Mumbai, 2004.
3. Phatak D.R., “Bridge Engineering”, 7<sup>th</sup>Edition, Satya Prakasan, New Delhi, 2012.
4. Krishna Raju N., “Structural Design and Drawing”, 3<sup>rd</sup>Edition, University Press (India) Pvt. Ltd., New Delhi, 2009.
5. Ponnuswamy S., “Bridge Engineering”, 2<sup>nd</sup> Edition, Tata McGraw-Hill Publishing Company Ltd., 2008.
6. <http://nptel.ac.in/courses/105105165/1>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: analyse the forces acting on bridges as per IRC loading standards
- CO2: design short span bridges
- CO3: design long span bridges
- CO4: analysis and check the stability requirements of piers and abutments
- CO5: design balanced cantilever and rigid frame bridges

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3						1	3	3
CO2	3	3	2			3						1	3	3
CO3	3	3	2			3						1	3	3
CO4	3	3	2			3						1	3	3
CO5	3	3	2			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEE17 WATER POWER ENGINEERING

3    0    0    3  
9

### UNIT – I

**Water Power:** Introduction - Sources of energy– Water Power - development and use - Statistics of power - estimation of hydro power potential - mini and pumped storage plant - cost and value of water power - Relation of water power and hydrology- Collection and analysis of stream flow data, mass curve and flow duration curves.

### UNIT - II

**Hydro Power Plants:** Classification of hydro power plants - General arrangements - Valley dam plants - Diversion canal plants - High head diversion plants - Storage and poundage. Pumped storage plants - Types - Advantages - Two unit arrangement, Three unit arrangement -Reversible pump turbines - Problems in operation - Efficiency of pumped storage plants.

### UNIT- III

**Water Conveyance:** Penstock - Types - Design criteria - Anchor Blocks - Valves, Bends and Manifolds. Intakes -Types - Losses - Aeration - Fore bays - Canals - Tunnels. Water Hammer - Surge tanks.

### UNIT-IV

**Tidal Power:** Tidal Phenomenon - Tidal power - Basic principle - Location - Difficulties - Components -Modes of generation - Constructional aspects - Estimate of energy and power - Regulation of power output - - Economic feasibility - Promising sites.

### UNIT- V

**Power House and Equipment:** Surface power stations - Power House structure - Dimensions - Lighting and ventilations -Design variations. Underground power stations - Location - Types - Advantages -Components - Layout types - Limitations. Environmental impact of Hydel power projects -Introduction to economic analysis of Hydro power projects.

**TOTAL: 45**

### TEXT BOOKS:

- Dandekar M.M. and Sharma K.N., “Water Power Engineering”, 2<sup>nd</sup> Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2009.
- Sharma R.K. and Sharma T.K., “A Text Book of Water Power Engineering”, 2<sup>nd</sup> Edition, S.Chand&Co. Ltd., New Delhi, 2012.

### REFERENCE BOOKS:

- Creager and Justin, “Hydro Electric Hand Book”, John Wiley Sons, London, 1989.
- Douglas J.L. and Lee R.R., “Economics of Water Resources Planning”, 2<sup>nd</sup> Edition, Tata McGraw-Hill, New Delhi, 2000.
- DuggalK.N. and Soni J.P., “Elements of Water Resources Engineering”, 1<sup>st</sup> Edition, New Age International Publishers, Chennai, 2001.
- [http://npdp.stanford.edu/sites/default/files/other\\_materials/water\\_power\\_engineering\\_0.pdf](http://npdp.stanford.edu/sites/default/files/other_materials/water_power_engineering_0.pdf)
- <http://nptel.ac.in/courses/105105110/pdf/m5103.pdf>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: estimate the hydro power potential and analyze stream flow data by relating the hydrological factors
- CO2: categorize and compute the efficiency of hydro plants with their operation difficulties
- CO3: associate and draw the various water conveyance systems of Hydro power plant
- CO4: quantify the tidal energy and power with the economic and site feasibility factors
- CO5: sketch and locate the power house stations by considering their economic viability and Environmental impacts

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3	1					1	3	3
CO2	3	3	2			3	1					1	3	3
CO3	3	2	1			3	2			1		1	3	3
CO4	3	2	1			3	1					1	3	3
CO5	3	3	2			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEE18 INDUSTRIAL WASTE MANAGEMENT

3    0    0    3  
9

### UNIT – I

**Introduction:** Types of industries and industrial pollution - Characteristics of industrial wastes - Population equivalent - Bioassay studies - effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health - Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

### UNIT - II

**Cleaner Production:** Waste Management approach - Waste Audit - Volume and strength reduction - Material and process modifications - Recycle, reuse and byproduct recovery - Applications.

### UNIT- III

**Pollution from Major Industries:** Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants - Wastewater reclamation concepts.

### UNIT-IV

**Treatment Technologies:** Equalisation - Neutralisation - Removal of suspended and dissolved organic solids - Chemical oxidation - Adsorption - Removal of dissolved inorganics - Combined treatment of industrial and municipal wastes - Residue management - Dewatering - Disposal.

### UNIT- V

**Hazardous Waste Management:** Hazardous wastes - Physico chemical treatment - solidification - incineration - Secured landfills – case studies of hazardous waste management in Indian cities.

**TOTAL: 45**

### TEXT BOOKS:

- Rao M.N. and Dutta A.K., “Wastewater Treatment”, 2<sup>nd</sup> Edition, Oxford - IBH Publication, Singapore, 2008.
- Eckenfelder W.W., “Industrial Water Pollution Control”, 3<sup>rd</sup> Edition, McGraw-Hill Book Company, New Delhi, 2000.

### REFERENCE BOOKS:

- Stephenson R.L. and Blackburn J.B., “Industrial Wastewater Systems Hand Book”, Lewis Publisher, New York, 1997.
- Freeman H.M., “Industrial Pollution Prevention Hand Book”, McGraw-Hill Inc., New Delhi, 1995.
- Bishop P.L., “Pollution Prevention: Fundamental and Practice”, 1<sup>st</sup> Edition, McGraw-Hill, New Delhi, 2000.
- Characteristics of Industrial Waste - <https://www.slideshare.net/gauravhtandon1/characteristics-of-wastewater>
- Industrial Waste Water - <https://www.slideshare.net/mohamedramzy2013/industrial-wastewater-treatment>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: explain the sources and characteristics of industrial wastes  
 CO2: apply suitable waste minimization method  
 CO3: carry out the causes and effects of pollution from various industries  
 CO4: adapt different treatment techniques for industrial and municipal wastes  
 CO5: determine the impact and effects of hazardous waste

### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3	1					1	3	2
CO2	3	2	1			3	1					1	3	3
CO3	3	2	1			3	1					1	3	3
CO4	3	2	1			3	1					1	3	3
CO5	3	2	1			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEE19 PREFABRICATED STRUCTURES

3    0    0    3

### UNIT – I

9

**Introduction:** Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

### UNIT – II

9

**Prefabricated Components:** Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

### UNIT – III

9

**Design Principles:** Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation

### UNIT – IV

9

**Joints in Structural Members:** Joints for different structural connections – Dimensions and detailing – Design of expansion joints

### UNIT – V

9

**Design for Abnormal Loads:** Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

**TOTAL: 45**

#### TEXT BOOKS:

1. CBRI, “Building Materials and Components”, India, 1990.
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., “Knowledge based Process Planning for Construction and Manufacturing”, Academic Press Inc., 1994.

#### REFERENCE BOOKS:

1. Koncz T., “Manual of Precast Concrete Construction”, Vol. I, II and III, Bauverlag, GMBH, 1976.
2. “Structural Design Manual, Precast concrete connection details”, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.
3. <https://www.youtube.com/watch?v=4rQVLcL5Nfs>
4. [https://www.youtube.com/watch?v=\\_nHVTdkItM4](https://www.youtube.com/watch?v=_nHVTdkItM4)
5. <https://www.youtube.com/watch?v=C9LM7ELVKMo>
6. <https://www.youtube.com/watch?v=EhxEUAVmSE4>

#### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: identify suitable system of prefabrication
- CO2: predict the behaviour of the components of prefabricated structures
- CO3: design prefabricated structural elements
- CO4: design the joints in structural members and sketch the detailing
- CO5: design the prefabricated structures for abnormal loads

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2						1	3	2
CO2	2	1				3						1	3	2
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3				1		2	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial



**14CEE20 CONSTRUCTION MANAGEMENT**

**3 0 0 3**

**UNIT – I**

**Planning, Scheduling and Organising:** Planning for Construction projects – objectives - principles – stages of planning, Scheduling - Methods - project management through networks – CPM & PERT. Project updating - Job layout-Work Breakdown Structure –Types of Construction organization.

**UNIT – II**

**Resource Management:** Types of resources- Estimating resource requirements-Material management-Effective utilization of machineries and equipments-Manpower planning.

**UNIT – III**

**Quality Control:** Quality control in construction-importance-elements-quality control methods- statistical methods-Sampling by attributes-Sampling by variables.

**UNIT – IV**

**Cost Control:** Cost control in construction-objectives-cost control systems-direct and indirect cost control - project budgetary control--risk cost management.

**UNIT – V**

**Safety Management:** Safety in construction projects-Accidents-Causes-classification-safety measures-approaches to improve safety in construction -Safety Codes and Standards- Case studies.

**TOTAL: 45**

**TEXT BOOKS:**

- Chitkara K.K., “Construction Project Management: Planning, Scheduling and Control”, 3<sup>rd</sup> Edition, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
- Seetharaman S., “Construction Engineering and Management”, 2<sup>nd</sup> Edition, Umesh Publications, Delhi, 2005.

**REFERENCE BOOKS:**

- Halpin D.W., “Financial and Cost Concepts for Construction Management”, 1<sup>st</sup> Edition, John Wiley and Sons, New York, 1985.
- Modar J., Phillips C. and Davis, “Project Management with CPM, PERT and Precedence Diagramming”, 3<sup>rd</sup> Edition, Van Nostrand Reinhold Co., 1983.
- <https://www.southampton.ac.uk/courses/modules/cenv1023.page>
- <https://books.google.co.in/books?isbn=1259000710>
- <https://cvt.eku.edu/sites/cvt.eku.edu/files/files/programs/Const.pdf>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: schedule the projects using network techniques
- CO2: estimate the resources required for construction projects
- CO3: plan and effectively utilize the resources
- CO4: execute quality control in construction projects
- CO5: implement cost control measures
- CO6: carry out construction projects with safety

**Mapping of COs with POs and PSOs**

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3				2	3	3	3	3
CO2	2	1				3				1	2	2	3	2
CO3	3	2	1			3				1	2	2	3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3
CO6	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CEO01 DISASTER MANAGEMENT

3    0    0    3

### UNIT – I

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

### UNIT – II

**Approaches to Disaster Risk Reduction (DRR):** Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of community, Panchayat Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

### UNIT – III

**Inter-Relationship between Disasters and Development:** Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. - Climate Change Adaptation - IPCC Scenario and Scenarios in the context of India -Relevance of indigenous knowledge, appropriate technology and local resources.

### UNIT – IV

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

### UNIT – V

**Disaster Management:** Applications, case studies and field works, Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

**TOTAL: 45**

### TEXT BOOKS:

1. Singhal J.P. “Disaster Management”, 1<sup>st</sup> Edition, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, 1<sup>st</sup> Edition, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10:1259007367, ISBN-13:978-1259007361

### REFERENCE BOOKS:

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005 .
2. Government of India, National Disaster Management Policy, 2009.
3. <http://www.ndma.gov.in/en/>
4. <https://www.slideshare.net/NcDas/disaster-management-11960149>
5. <http://www.ndmindia.nic.in/>

### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: outline the different causes of hazards
- CO2: construct a disaster management cycle with disaster risk reduction measures
- CO3: interpret the various effects of development projects
- CO4: summarize the components of disaster relief and role of technology in disaster
- CO5: organize the field work during disasters from past experience

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3	1					1	3	2
CO2	3	2	1			3	1					1	3	3
CO3	2	1				3	1					1	3	2
CO4	2	1				3	1					1	3	2
CO5	3	2	1			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT – I**

**Remote Sensing, EMR and its Interaction:** Definition and its components - Electromagnetic spectrum – Wave theory and Particle theory - Stefan-Boltzman and Wein’s Displacement Law – Atmospheric scattering - absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of earth surface, water, vegetation and soil.

**UNIT - II**

**Remote Sensing and Analysis:** Platforms-Sensors-Types of Data Products– Basic elements of image interpretation –Visual interpretation keys – Digital Image Processing – Pre-processing – Image enhancement techniques – Multispectral Image classification – Supervised and unsupervised.

**UNIT- III**

**Geographic Information System:** Maps –Map projections – Types of map projections– Basic components of GIS – Data type – Spatial and non-spatial data – Database concepts – Files and data formats – Vector and Raster data structures- Data compression - Edge matching and Data stream – Input methods –GPS for data capture.

**UNIT-IV**

**Data Editing and Analysis:** Data Retrieval – Query – Simple Analysis – Spatial Analysis – Overlay - Buffering – Modeling in GIS– Raster Data Analysis – Vector Data Analysis – Topological analysis–Modeling surfaces – DEM –DTM – Slope Model.

**UNIT- V**

**Applications of Remote Sensing and GIS:** Fields of Applications - Land Information System -Land use and Land cover classification – Regional and urban planning – Natural Resources – Agriculture – Soil – Water Resources (Groundwater, Runoff modeling and Flood monitoring) – Wetland management – Wasteland Management - Social utilities - Cadastral Records – Highway alignment - Resource mapping – Forest management.

**TOTAL: 45**

**TEXT BOOKS:**

- Lillesand T.M., Kiefer R.W. and Chipman J.W., “Remote Sensing and Image Interpretation”, 5<sup>th</sup> Edition, John Willey and Sons (Asia) Pvt. Ltd., New Delhi, 2013.
- Anji Reddy M., “ Textbook of Remote Sensing and Geographical Information System”, 2<sup>nd</sup> Edition, BS Publications, Hyderabad.
- Chestern, “Geo Informational Systems – 2006 Application of GIS and Related Spatial Information Technologies”, ASTER Publication Co., 1992.

**REFERENCE BOOKS:**

- Lo. C.P.and A.K.W.Yeung, “Concepts and Techniques of Geographic Information Systems”, Prentice-Hall of India Pvt. Ltd., New Delhi, 2002.
- Peter A.Burrough, Rachael A.McDonnell, “Principles of GIS”, Oxford University Press, 2003.
- Ian Heywood, “An Introduction to GIS”, Pearson Education Asia, 2000.
- Lillesand T.M. and Kicter R.W., “Remote Sensing and Image interpretation”, John Willey and Sons Inc., New York, 2002.
- Burrough P.A. and McDonnell R.A., “Principles of Geographic Information for Land Resources Assessment”, Oxford University Press, 1998.
- <http://www.wamis.org/agm/pubs/agm8/Paper-2.pdf>
- <http://nptel.ac.in/courses/105108077/>
- [https://onlinecourses.nptel.ac.in/noc17\\_ce15/preview](https://onlinecourses.nptel.ac.in/noc17_ce15/preview)

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: make use of the concepts of EM spectrum and its interaction with earth surface features to characterize the different earth features in an image
- CO2: use image interpretation keys and techniques for understanding and interpreting the remote sensing images
- CO3: apply the data preprocessing techniques to remove the errors and recommend suitable GIS database for different remote sensing imageries
- CO4: describe raster and vector data analyses on different remote sensing images
- CO5: familiarize and maximize the fields of applications of remote sensing and GIS concepts in various fields of civil engineering

**Mapping of COs with POs and PSO2s**

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3				1		1	3	3
CO3	3	2	1			3				1		1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

## 14CE003 ROAD SAFETY MANAGEMENT

3    0    0    3

### UNIT – I 9

**Introduction:** Road safety – Road safety demographics – 4E’s of road safety – Road users decisions – Causes of accidents - Human factors – Road and its condition – Environmental studies – Safety management - roles and responsibilities.

### UNIT – II 9

**Accident Data Collection:** Accident data collection – accident investigation and reduction – Crash factors and interaction – accident costs and prevention – Types of statistics – Crash reconstruction – Computer record systems – RADMS – Case studies.

### UNIT – III 9

**Accident Analysis Techniques:** Principles for effective road safety analysis – Collision diagram – Preparation, spatial analysis of accidents – Methods and GIS in accident analysis – Black spot, Black route and area identification – Area prediction models – Development – Empirical Bayes approach – Before and after evaluation – Case studies.

### UNIT – IV 9

**Road Safety Audit:** Need for road safety audit – Concept and elements of safety audit – Steps in road safety audit – Safety audit for existing roads – Road safety legislation – Legal requirements – Provisions of Motor Vehicle Act and NGO’s in prevention of accidents.

### UNIT – V 9

**Accident Studies and Investigation:** Accident data – Identification of accident prone location – Prioritization – Investigation safety considerations on completed roads and in work zone – Mitigation measures.

**TOTAL: 45**

#### TEXT BOOKS:

1. Evans L., “Traffic Safety”, Science Serving Society, 2004.
2. Odgen K.W., “Safer Roads: A Guide to Road Safety Engineering”, Avebury Technical, 1996.

#### REFERENCE BOOKS:

1. Elvik R. and Vaa T., “The Handbook of Road Safety Measures”, Elsevier, 2004.
2. Rober F. Baker, “The Highway Risk Problem – Policy Issues in Highway Safety”, 2<sup>nd</sup> Edition, John Wiley and Sons, 2012.
3. Ministry of Surface Transport, “Accident Investigation and Prevention Manual for Highway Engineers in India and other Developed Countries”, 2011.
4. <http://www.roadsafetymayo.ie/CausesofAccidents/> (Road Safety causes)
5. <http://www.slideshare.net/AymeryConstant/cours-ehesp-road-safety-2014> (Road safety factors)
6. <http://www.slideshare.net/AymeryConstant/cours-ehesp-road-safety-2014>
7. [http://www.ifsttar.fr/fileadmin/user\\_upload/editions/inrets/Syntheses/Syntheses\\_INRETS\\_S59.pdf](http://www.ifsttar.fr/fileadmin/user_upload/editions/inrets/Syntheses/Syntheses_INRETS_S59.pdf)

#### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: discuss the cause of accidents and the factors affecting the road safety
- CO2: summarize accident data and accident-prone locations
- CO3: analyze the accident data using GIS and collision and condition diagrams
- CO4: demonstrate the road safety audit
- CO5: infer the mitigation measures for the accident zones

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3						1	3	2
CO2	2	1				3						1	3	2
CO3	3	3	2			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	2	1				3						1	3	2

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT - I**

9

**Machineries:** Hot water boilers – Lifts and escalators – Special features required for alternatively challenged and elderly people – Conveyors – Vibrators – Concrete mixers-DC/AC motors– Generators – Laboratory services – Gas, water, air and electricity.

**UNIT - II**

9

Electrical Systems in Buildings: Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards.

**UNIT - III**

9

Principles of Illumination and Design: Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Laws of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature –rendering. Design of modern lighting - Minimum level of illumination for elderly people.

**UNIT - IV**

9

**Refrigeration Principles and Applications:**Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type 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 AC Systems.

**UNIT - V**

9

**Fire Safety Installation:** Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers.

**TOTAL:45****TEXT BOOKS:**

1. Ambrose E.R., “Heat Pumps and Electric Heating”, 1<sup>st</sup> Edition, John Wiley and Sons, Inc., New York, 1968.
2. “Handbook for Building Engineers in Metric Systems”, NBC, New Delhi, 1968.

**REFERENCE BOOKS:**

1. “Philips Lighting in Architectural Design”, McGraw-Hill, New York, 1964.
2. Hopkinson R.G. and Kay J.D., “The Lighting of Buildings”, 2<sup>nd</sup> Edition, Faber and Faber, London, 1969.
3. Severns William H. and Fellows Julian R., “Air-Conditioning and Refrigeration”, 1<sup>st</sup> Edition, John Wiley and Sons, London, 1988.
4. Sherratt A.F.C., “Air-Conditioning and Energy Conservation”, 1<sup>st</sup> Edition, The Architectural Press, London, 1980.
5. <https://evrosoriou.files.wordpress.com/2011/06/construction-handbook-chudley.pdf>
6. <http://moud.gov.in/upload/uploadfiles/files/Chap-7.pdf>
7. <http://www.iar.unicamp.br/lab/luz/ld/Arquitetural/Handbooks/Lighting%20Design%20Basics.pdf>
8. [http://s1.nonlinear.ir/epublish/book/Design\\_of\\_Electrical\\_Services\\_for\\_Buildings\\_0415310830.pdf](http://s1.nonlinear.ir/epublish/book/Design_of_Electrical_Services_for_Buildings_0415310830.pdf)

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: plan the installation of services based on the requirements of buildings  
 CO2: execute electrical systems for a building  
 CO3: implement the suitable illumination system for a building  
 CO4: adapt the better air conditioning system  
 CO5: execute fire safety systems in building

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	3	1			3						1	3	3
CO6	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT - I**

9

**Sources and Effects of Air Pollutants:** Classification of air pollutants-Particulates and gaseous pollutants-Sources of air pollution -Effects of air pollution on human beings, materials, vegetation, animals-global warming-ozone layer depletion, sampling and analysis-Basic Principles of Sampling-Source and ambient sampling-Analysis of pollutants.

**UNIT - II**

9

**Dispersion of Pollutants:** Elements of atmosphere - Meteorological factors - Wind rose diagram - Lapse rate - Atmospheric stability and turbulence - Plume rise - Dispersion of pollutants - Dispersion models -Applications.

**UNIT - III**

9

**Air Pollution Control:** Concepts of control - Principles and design of control measures - Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation - Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion -Pollution control for specific major industries.

**UNIT-IV**

9

**Air Quality Management:** Air quality standards - Air quality monitoring - Preventive measures - Air pollution control efforts - Zoning - Town planning regulation of new industries - Legislation and enforcement -Environmental Impact Assessment on Air quality

**UNIT - V**

9

**Noise Pollution:** Sources of noise pollution-Effects-Assessment-Standards-Control methods-Prevention-Case Studies

**TOTAL: 45**

**TEXT BOOKS:**

1. Anjaneyulu D., “Textbook of Air Pollution and Control Technologies”, 4<sup>th</sup> Edition, Allied Publishers, Mumbai, 2002.
2. Rao C.S., “Environmental Pollution Control Engineering”, 2<sup>nd</sup> Edition, New Age International, New Delhi, 2006.

**REFERENCE BOOKS:**

1. Heumann W.L., “Industrial Air Pollution Control Systems”, 1<sup>st</sup> Edition, McGraw-Hill, New York, 1997.
2. Howard Peavy, Donald Rowe and George Tchobanoglous, “Environmental Engineering”, 6<sup>th</sup> Edition, McGraw Hill, New Delhi, 2013.
3. Rao M and Rao H.V.N., “Air Pollution Control”, 4<sup>th</sup> Edition, Tata-McGraw-Hill, New Delhi, 2004.
4. Environmental Impact of Air Pollution by Dr. Peter Bellin (<http://www.csun.edu/~vchsc00b/468/468WK8.pdf>)
5. Environmental pollution - control measures - ([http://www.idconline.com/technical\\_references/pdfs/civil\\_engineering/Environmental\\_Pollution\\_Control\\_Measures.pdf](http://www.idconline.com/technical_references/pdfs/civil_engineering/Environmental_Pollution_Control_Measures.pdf)).
6. Handbook of Environmental Engineering Vol. 1, Air and Noise Pollution Control by Lawrence K Wang and Norman C Pereira.

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: classify the sources and analyze the effects due to air pollutants
- CO2: carryout the air dispersion for different atmospheric conditions
- CO3: apply the best suitable control mechanisms for industries
- CO4: adapt the necessity of rules, legislations and their impacts on environment
- CO5: determine and verify noise pollution levels in different areas

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3	1	1				1	3	2
CO2	3	2	1			3	1	1				1	3	3
CO3	3	2	1			3	1	1				1	3	3
CO4	3	2	1			3	1	1				1	3	3
CO5	3	3	2			3	1	1				1	1	2

1 – Slight, 2 – Moderate, 3 – Substantial

**UNIT – I****9**

**Sustainable Construction and Green Building Requirements:** Ethics and sustainability – Increased CO<sub>2</sub> trade – Sustainable construction – Major environmental and resource concerns – Green building movement and obstacles – Green building requirements – Perceived use – Relationship between comfort level and performance ability

**UNIT – II****9**

**Green Building Process and Assessment:** Conventional versus green building delivery systems – Execution of green building process – Integrated design process – Ecological design – Merits and demerits – Historical perspective – Contemporary and future ecological designs – LEED building assessment standard – LEED certification process – International building assessment standards – Building rating system and its future – Case study of a green building

**UNIT – III****9**

**Sustainable landscaping, Energy and Atmosphere:** Land and landscape approaches for green buildings – sustainable landscapes – Enhancing ecosystems – Storm water management – Heat island mitigation – Building energy issues – Building energy design strategies – Building envelope – Active mechanical systems – Electrical power systems – Innovative energy optimization strategies – Smart buildings and energy management systems – Ozone depleting chemicals in HVAC&R and fire suppression

**UNIT – IV****9**

**Building Hydrologic System and Material Loops:** Energy policy act of 1992 – High performance building hydrologic strategy – High performance building water supply strategy – High performance building wastewater strategy – Landscaping water efficiency – Green building materials issues and priorities – LCA of building materials and products - Emerging construction materials and products – Design for deconstruction and disassembly – Closing material loops in practice

**UNIT – V****9**

**Green Building Implementation:** Site protection planning – Health and safety planning – Construction and demolition waste management – Reducing the footprint of construction operations – Essentials of building commissioning – Costs and benefits of building commissioning – Case for high performance green buildings – The economics of green buildings – Quantifying green building costs – Future directions in green buildings

**TOTAL: 45****TEXT BOOKS:**

1. Charles J. Kibert, “Sustainable Construction: Green Building Design and Delivery”, 2<sup>nd</sup> Edition, John Wiley & Sons, Inc., New Jersey, 2012.
2. Bauer M., Mosle P. and Schwarz M., “Green Building: Guidebook for Sustainable Architecture”, Springer - Verlag Berlin Heidelberg, 2010.

**REFERENCE BOOKS:**

1. Jerry Yudelson, “Marketing Green Building Services: Strategies for Success”, Elsevier, 2008.
2. Jerry Yudelson, “Marketing Green Buildings: Guide for Engineering, Construction and Architecture”, The Fairmont Press Inc., 2006.
3. Angela M. Dean, “Green by Design: Creating a Home for Sustainable Living”, Gibbs Smith Publication, 2003.
4. <http://nptel.ac.in/courses/120108004/module9/>
5. <https://www.slideshare.net/sanjayr.kashyap/green-building-introduction>

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: express the requirements of green buildings
- CO2: assess the building for building assessment standard
- CO3: execute energy optimization strategies
- CO4: categorize the energy efficient building materials
- CO5: organize the benefits of building commissioning

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3						1	3	2
CO2	3	2	1			3	1					1	3	3
CO3	3	2	1			3	1					1	3	3
CO4	3	3	2			3	1					1	3	3
CO5	3	2	1			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial

**14CEO07 ENVIRONMENTAL IMPACT ASSESSMENT**

**3            0            0            3**

**UNIT – I**

**9**

**Introduction:** Impact of development projects on environment - Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations - Legal provisions on EIA.

**UNIT – II**

**9**

**Methodologies:** Methods of EIA - Check lists - Matrices - Networks - Cost-benefit analysis - Analysis of alternatives - Case studies.

**UNIT- III**

**9**

**Assessment and Prediction:** Assessment of Impact on land, water, air, noise, social, cultural, flora and fauna – Predictive measures - Mathematical models - Public participation - Rapid EIA.

**UNIT-IV**

**9**

**Environmental Management Plan:** Plan for mitigation of adverse impact on environment - Options for mitigation of impact on water, air, land, flora and fauna - Addressing the issues related to Project - Environmental management plan - ISO 14000.

**UNIT- V**

**9**

**Case Studies:** EIA for infrastructure projects - Bridges - Stadium - Highways - Dams - Multi-storey Buildings -Water Supply and Drainage Projects.

**TOTAL: 45**

**TEXT BOOKS:**

- 1 Canter R.L., “Environmental Impact Assessment”, 2<sup>nd</sup> Edition, McGraw-Hill Inc., New Delhi, 1995.
- 2 Shukla S.K. and Srivastava P.R., “Concepts in Environmental Impact Analysis”, 1<sup>st</sup> Edition, Common Wealth Publishers, New Delhi, 1992.

**REFERENCE BOOKS:**

- 1 Rau John G. and Hooten David C., “Environmental Impact Analysis Handbook”, McGraw-Hill Book Company, New Delhi, 1990.
- 2 “Environmental Assessment Source Book”, Vol. I, II & III, The World Bank, Washington, D.C., 1991.
- 3 Petts Judith, “Handbook of Environmental Impact Assessment”, Vol. I & II, Blackwell Science, Berlin, 1999.
- 4 <https://www.bing.com/videos/search?q=environmental+impact+assessment+vedios&view=detail&mid=B742CBBABE85496145CFB742CBBABE85496145CF&FORM=VIRE>.
- 5 <https://www.bing.com/videos/search?q=environmental+impact+assessment+vedios&view=detail&mid=55E81EDD702CE8AA3E0E55E81EDD702CE8AA3E0E&FORM=VIRE>.
- 6 <http://www.epa.ie/monitoringassessment/assessment/eia/>
- 7 [https://www.foe.co.uk/sites/default/files/downloads/environmental\\_impact\\_asses1.pdf](https://www.foe.co.uk/sites/default/files/downloads/environmental_impact_asses1.pdf)

**COURSE OUTCOMES**

On completion of the course the students will be able to

- CO1: generalize the types, parameters, capabilities and constraints of EIA
- CO2: adapt the significance of public participation in EIA methods
- CO3: plan and assess the impact on land, water, noise, air, social, cultural flora and fauna in EIA
- CO4: prepare the management plan in accordance with environmental issues
- CO5: develop an EIA Report with specified projects

**Mapping of COs with POs and PSOs**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3	1					1	3	2
CO2	3	2	1			3	2	1				1	3	3
CO3	3	2	1			3	2	1				1	3	3
CO4	3	2	1			3	2	1				1	3	3
CO5	3	2	1			3	2	1				1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial



## 14CEO08 ARCHITECTURE AND TOWN PLANNING

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### UNIT – I

**Architectural Design:** Architectural Design – an analysis – integration of function and aesthetics – Introduction to basic elements and principles of design. 9

### UNIT – II

**Site Planning:** Surveys – Site analysis – Development Control – Layout regulations- Layout design concepts. 9

### UNIT – III

**Building Types:** 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 9

### UNIT – IV

**Climate and Environmental Responsive Design:** 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 9

### UNIT – V

**Town Planning:** Planning – Definition, concepts and processes- Urban planning standards and zoning regulations- Urban renewal – Conservation – Principles of Landscape design. 9

**TOTAL: 45**

#### TEXT BOOKS:

1. Pramara V.S., “Design Fundamental in Architecture”, 1<sup>st</sup> Edition, Somaiya Publications Pvt. Ltd., New Delhi, 1997.
2. Muthu Shoba Mohan G., “Principles of Architecture”, 1<sup>st</sup> Edition, Oxford University Press., New Delhi, 2006.

#### REFERENCE BOOKS:

1. Rangwala S.C., “Town Planning”, 25<sup>th</sup> Edition, Charotar Publishing House, Anand, 2005.
2. De Chiara J., Michael J. Crosbie, “Time Saver Standards for Building Types”, 12<sup>th</sup> Edition, McGraw Hill Publishing Company, New York, 2001.
3. Overview of works and concepts of various architects  
(<http://www.archdaily.com/448774/heydar-aliyev-center-zaha-hadid-architects>)
4. Directorate of Town and Country Planning – Official Website  
(<http://www.tn.gov.in/tcp/>)

#### COURSE OUTCOMES

On completion of the course the students will be able to

- CO1: analyze the architectural elements in buildings  
 CO2: survey on site analysis  
 CO3: categorize the interior design of the buildings  
 CO4: take part in green building concept during planning  
 CO5: structure the buildings as per standards and zoning regulations

#### Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3	1					1	3	3
CO2	3	3	2			3	1					1	3	3
CO3	3	3	2			3	1					1	3	3
CO4	3	3	2			3	1					1	3	3
CO5	3	3	2			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial