

# DEPARTMENT OF CIVIL ENGINEERING

**2<sup>nd</sup> BOARD OF STUDIES**

*CE BOS – 2.5*

***B.Tech Course Structure***



**ACE**

**Engineering College**

**Ankushapur (V), Ghatkesar (M), Medchal.Dist - 501 301**

***(An Autonomous Institution, Affiliated to JNTUH, Hyderabad)***



**ACE**  
**Engineering College**  
 Ankushapur(V), Ghatkesar(M), Medchal Dist - 501 301  
 (Autonomous)

**B.TECH. FOUR YEAR DEGREE COURSE**  
**CIVIL ENGINEERING**  
**COURSE STRUCTURE**

III Year							I Semester
S.No	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	PCC	CE501PC	Structural Analysis-II	3	0	0	3
2	PCC	CE505PC	Geotechnical Engineering	3	0	0	3
3	PCC	CE503PC	Structural Engineering –I (RCC)	3	1	0	4
4	PCC	CE504PC	Transportation Engineering	3	0	0	3
5	PEC		Professional Elective-I	3	0	0	3
6	HSMC	SM505MS	Engineering Economics and Accountancy	2	0	0	2
7	PCC	CE506PC	Highway Engineering and Concrete Technology Lab	0	0	3	1.5
8	PCC	CE507PC	Geotechnical Engineering Lab	0	0	3	1.5
9	HSMC	EN508HS	Advanced English Communication Skills Lab	0	0	2	1
10	MC	*MC509	Intellectual Property Rights	1	0	0	0
11	MC	MC510	Cyber Security	1	0	0	0
<b>Total</b>				<b>19</b>	<b>1</b>	<b>8</b>	<b>22</b>

III Year							II Semester
S.No.	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	BSC	CE601PC	Hydrology & Water Resources Engineering	3	1	0	4
2	BSC	CE602PC	Environmental Engineering	3	0	0	3
3	ESC	CE603PC	Foundation Engineering	3	0	0	3
4	ESC	CE604PC	Structural Engineering –II (Steel)	3	1	0	4
5	HSMC		Professional Elective –II	3	0	0	3
6	BSC		Open Elective –I	3	0	0	3
7	HSMC	CE605PC	Environmental Engineering Lab	0	0	2	1
8	MC	CE606PC	Computer Aided Design Lab	0	0	2	1
9	MC	*MC609	Environmental Science	3	0	0	0
10	MC	MC602	Artificial Intelligence	3	0	0	0
<b>Total</b>				<b>24</b>	<b>2</b>	<b>4</b>	<b>22</b>

**\*MC609 - Environmental Science – Should be Registered by Lateral Entry Students Only.**



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**COURSE STRUCTURE**

IV Year				I Semester			
S.No	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	PCC	CE701PC	Estimation, Costing and Project Management	3	1	0	4
2	PCC		Professional Elective –III	3	0	0	3
3	PCC		Professional Elective –IV	3	0	0	3
4	BSC		Open Elective –II	3	0	0	3
5	PCC	SM702MS	Professional Practice law & Ethics	2	0	0	2
6	PCC	CE703PC	Industrial Oriented Mini Project/ Summer Internship	0	0	4	2*
7	PCC	CE704PC	Seminar	0	0	3	1
8	PCC	CE705PC	Project Stage - I	0	0	7	3
<b>Total</b>				<b>14</b>	<b>1</b>	<b>14</b>	<b>21</b>

IV Year				II Semester			
S.No.	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	PEC		Professional Elective –V	3	0	0	3
2	PEC		Professional Elective –VI	3	0	0	3
3	OEC		Open Elective –III	3	0	0	3
4	PROJ	CE801PC	Project Stage-II	0	0	14	7
<b>Total</b>				<b>9</b>	<b>0</b>	<b>14</b>	<b>16</b>

**\*MC – Satisfactory/Unsatisfactory**

**Note:** Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.



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**B.TECH. FOUR YEAR DEGREE COURSE**  
**CIVIL ENGINEERING**  
**COURSE STRUCTURE**

**Professional Elective – I**

CE511PE	Concrete Technology
CE512PE	Theory of Elasticity
CE513PE	Rock Mechanics

**Professional Elective – II**

CE611PE	Prestressed Concrete
CE612PE	Elements of Earth Quake Engineering
CE613PE	Advanced Structural Analysis

**Professional Elective-III**

CE711PE	Remote Sensing & GIS
CE712PE	Ground Improvement Techniques
CE713PE	Advanced Structural Design

**Professional Elective -IV**

CE721PE	Irrigation and Hydraulic Structures
CE722PE	Pipeline Engineering
CE723PE	Ground Water Hydrology

**Professional Elective –V**

CE811PE	Solid Waste Management
CE812PE	Environmental Impact Assessment
CE813PE	Air pollution

**Professional Elective -VI**

CE821PE	Airports, Railways and Waterways
CE822PE	Urban Transportation Planning
CE823PE	Finite Element Methods for Civil Engineering

**Open Elective – I**

CE600OE	Disaster Preparedness & Planning Management
CE601OE	<b>FUNDAMENTALS OF MANAGEMENT FOR ENGINEERS (Open Elective – I) (H&amp;S to CE)</b>

**Open Elective – II**

CE700OE	Remote Sensing & GIS (Civil to Other Branches)
CE700OE	Data Structures (CSE to Civil)

**Open Elective – III**

CE800OE	Environmental Impact Assessment
CE800OE	<b>BASICS OF POWER PLANT ENGINEERING (Open Elective - III)</b>

# DEPARTMENT OF CIVIL ENGINEERING

**2nd BOARD OF STUDIES**

*CE BOS – 1.5 & 1.6*

***Syllabi Approved By Civil BOS***



**ACE**

**Engineering College**

**Ankushapur (V), Ghatkesar (M), Medchal.Dist - 501 301**  
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## CE501PC: STRUCTURAL ANALYSIS – II

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE501PC	PCC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Structural Analysis - I								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>Identify the various actions in arches.</li> <li>Understand classical methods of analysis for statically indeterminate structures.</li> <li>Differentiate the approximate and numerical methods of analysis for indeterminate structures.</li> <li>Find the degree of static and kinematic indeterminacies of the structures.</li> <li>Plot the variation of S.F and B.M when a moving load passes on indeterminate structure.</li> </ul>								
<p>Course Outcomes: After the completion of the course student should be able to:</p> <ul style="list-style-type: none"> <li><b>Analyze</b> the two hinged arches.</li> <li><b>Solve</b> statically indeterminate beams and portal frames using classical methods</li> <li><b>Sketch</b> the shear force and bending moment diagrams for indeterminate structures.</li> <li><b>Formulate</b> the stiffness matrix and analyze the beams by matrix methods.</li> </ul>								
Unit: I	<b>Two Hinged Arches, Moment Distribution Method</b>					No. of Classes:9		
<p>Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.</p> <p>Analysis of continuous beams with and without settlement of supports using - Analysis of Single Bay Single Storey Portal Frames including side Sway - Analysis of inclined frames - Shear force and Bending moment diagrams, Elastic curve.</p>								
Unit: II	<b>Kani's Method, Cables and suspension bridges</b>					No. of Classes: 9		
<p><b>Kani's Method:</b> Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two Storey Frames including Side Sway using Kani's Method - Shear force and bending moment diagrams - Elastic curve.</p> <p><b>Cables and suspension bridges:</b> Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.</p>								
Unit: III	<b>Approximate Methods Of Analysis</b>					No. of Classes: 9		

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

Unit: IV	<b>Matrix Methods Of Analysis</b>	No. of Classes: 9
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Introduction to Flexibility and Stiffness matrix methods of analyses using ‘system approach’ upto three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods -Analysis of pin-jointed determinate plane frames using flexibility and stiffness methods- Analysis of single bay single storey portal frames using stiffness method - Shear force and bending moment diagrams - Elastic curve.

Unit: V	<b>Influence Lines For Indeterminate Beams</b>	No.of Classes: 9
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Introduction – influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

**Text Books:**

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

**Reference Books:**

1. Structural analysis T. S Thandavamoorthy, Oxford university Press
2. Mechanics of Structures Vol –II by H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd.
3. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.
4. Examples in Structural Analysis by William M.C. McKenzie, Taylor & Francis.
5. Structural Analysis by R. C. Hibbeler, Pearson Education
6. Structural Analysis by Devdas Menon, Narosa Publishing House.
7. Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros.

**Web References:**

<https://nptel.ac.in/courses/105/105/105105109/>

**E-Text Books:**



**CE505PC: GEOTECHNICAL ENGINEERING**

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE505PC	PCC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes:0			Total Classes: 45			
Prerequisite: Fluid Mechanics and Strength of Materials								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>• understand the formation of soil and classification of the soils</li> <li>• determine the Index &amp; Engineering Properties of Soils</li> <li>• determine the flow characteristics &amp; stresses due to externally applied loads</li> <li>• estimate the consolidation properties of soils</li> <li>• estimate the shear strength and seepage loss</li> </ul>								
<p>Course Outcomes: At the end of the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Characterize and classify the soils</li> <li>• Able to estimate seepage, stresses under various loading conditions and compaction characteristics</li> <li>• Able to analyse the compressibility of the soils</li> <li>• Able to understand the strength of soils under various drainage conditions.</li> </ul>								
Unit: I	Introduction and Index Properties of Soils				No. of Classes: 9			
<p>Introduction: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity-Field density by core cutter and sand replacement methods-Relative density</p> <p>Index Properties of Soils: Grain size analysis – consistency limits and indices – I.S. Classification of soils.</p>								
Unit: II	Permeability, Effective Stress & Seepage Through Soils				No. of Classes: 9			
<p>Permeability: Soil water – capillary rise – flow of water through soils – Darcy’s law-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils.</p> <p>Effective Stress &amp; Seepage Through Soils: Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.</p>								
Unit: III	Stress Distribution in Soils, Compaction				No. of Classes: 9			
<p>Stress Distribution in Soils: Boussinesq’s and Westergaard’s theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark’s influence chart for irregular areas.</p> <p>COMPACTION: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.</p>								

Unit: IV	Consolidation	No. of Classes: 9
<p>Consolidation: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.</p>		
Unit: V	Shear Strength of Soils	No.of Classes: 9
<p>Shear Strength of Soils: Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelopes – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Basic and Applied Soil Mechanics by Gopal Ranjan &amp; ASR Rao, New age International Pvt Ltd,</li> <li>2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.</li> <li>3. Foundation Engineering by P.C. Varghese, PHI</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.</li> <li>2. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.</li> <li>3. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).</li> <li>4. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.</li> <li>5. Geotechnical Engineering by Manoj Dutta &amp; Gulati S.K – Tata McGraw-Hill Publishers New Delhi.</li> <li>6. Soil Mechanics and Foundation by by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi</li> </ol>		
<p>Web References:</p> <p><a href="https://nptel.ac.in/courses/105/103/105103097/">https://nptel.ac.in/courses/105/103/105103097/</a></p>		
<p>E-Text Books:</p> <p><a href="https://www.hzu.edu.in/engineering/Geotechnical_Engineering.pdf">https://www.hzu.edu.in/engineering/Geotechnical_Engineering.pdf</a></p>		

**CE503PC: STRUCTURAL ENGINEERING – I (RCC)**

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE503PC	PCC	L	T	P	C	CIA	SEE	Total
		3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: 0			Total Classes: 60			
Prerequisite: Basic knowledge of Engineering Mechanics and strength of materials.								
<p>Course Objectives: The objective of this Course is:</p> <ul style="list-style-type: none"> <li>Identify the basic components of any structural system and the standard loading for the RCstructure</li> <li>Identify and tell the various codal provisions given in IS. 456</li> <li>Describe the salient feature of limit state method, compare with other methods and the concepts of limit state of collapse and limit state of serviceability</li> <li>Evaluate the behaviour of RC member under flexure, shear and compression, torsion and bond.</li> </ul>								
<p>Course Outcome: On completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>Compare and Design the singly reinforced, doubly reinforced and flanged sections.</li> <li>Design the axially loaded, uniaxial and biaxial bending columns.</li> <li>Classify the footings and Design the isolated square, rectangular and circular footings</li> <li>Distinguish and Design the one-way and two-way slabs.</li> </ul>								
Unit: I							No. of Classes: 12	
<p>Introduction- Structure - Components of structure - Different types of structures - Equilibrium and compatibility- Safety and Stability - Loads – Different types of Loads – Dead Load, Live Load, Earthquake Load and Wind Load- Forces – What is meant by Design? – Different types of materials –RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method – Load combinations as per Limit state method - Materials - Characteristic Values – Partial safety factors – Behaviour and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 -2000.</p> <p>Limit state Analysis and design of sections in Flexure – Behaviour of RC section under flexure - Rectangular, T and L-sections, singly reinforced and doubly reinforced Beams – Detailing of reinforcement.</p>								
Unit: II							No. of Classes: 12	
<p>Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond –Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement.</p>								

Unit: III	No. of Classes: 12
Design of Two-way slabs with different end conditions, one-way slab, and continuous slab Using I S Coefficients - Design of dog-legged staircase – Limit state design for serviceability for deflection, cracking and codal provisions.	
Unit: IV	No. of Classes: 12
Design of compression members - Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - I S Code provisions	
Unit: V	No. of Classes: 12
Design of foundation - Different types of footings – Design of wall footing – Design of flat isolated square, rectangular, circular footings and combined footings for two columns.	
Text Books:	
<ol style="list-style-type: none"> <li>1. Limit state designed of reinforced concrete – P.C. Varghese, PHI Learning Pvt. Ltd.</li> <li>2. Reinforced concrete design by S. Unnikrishna Pillai &amp; Devdas Menon, Tata McGraw Hill.</li> <li>3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers</li> </ol>	
Reference Books:	
<ol style="list-style-type: none"> <li>1. Reinforced concrete structures, Vol. 1, by B.C. Punmia, Ashok Kumar Jain and Arun KumarJain, Laxmi, publications Pvt. Ltd.</li> <li>2. Fundamentals of Reinforced concrete design by M. L. Gambhir, Prentice Hall of IndiaPvt.Ltd.,</li> <li>3. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press</li> <li>4. Design of concrete structures by J.N. Bandhyopadhyay PHI Learning Private Limited.</li> <li>5. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand &amp; company.</li> <li>6. Design of Reinforced Concrete Foundations – P.C. Varghese Prentice Hall of India.</li> </ol>	
Web References:	
<a href="http://nptel.ac.in/courses/105105105/">http://nptel.ac.in/courses/105105105/</a>	
E-Text Books:	
<a href="https://books.google.co.in/books?id=o_mKzwhbeHkC&amp;printsec=frontcover&amp;redir_esc=y#v=onepage&amp;q&amp;f=false">https://books.google.co.in/books?id=o_mKzwhbeHkC&amp;printsec=frontcover&amp;redir_esc=y#v=onepage&amp;q&amp;f=false</a>	
<a href="https://kupdf.net/download/rcc-design-n-krishna-raju-pdf_5910a44adc0d60d10f959e7f_pdf">https://kupdf.net/download/rcc-design-n-krishna-raju-pdf_5910a44adc0d60d10f959e7f_pdf</a>	

**CE504PC: TRANSPORTATION ENGINEERING**

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE504PC	PCC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Surveying								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>This course aims at providing a comprehensive insight of various elements of Highway transportation engineering. Topics related to the highway development, characterisation of different materials needed for highway construction, structural and geometric design of highway pavements along with the challenges and possible solutions to the traffic related issues will be covered as a part of this course</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance</li> <li>An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates and a variety of bituminous mixtures. Also the students will develop the ability to interpret the results and assess the suitability of these materials for construction of highways.</li> <li>An ability to design flexible and rigid highway pavements for varying traffic compositions as well as soil subgrade and environmental conditions using the standards stipulated by Indian Roads Congress.</li> <li>An ability to evaluate the structural and functional conditions of in-service highway pavements and provide solution in the form of routine maintenance measures or designed overlays using Indian Roads congress guidelines.</li> <li>An ability to assess the issues related to road traffic and provide engineering solutions supported with an understanding of road user psychological and behavioural patterns.</li> </ul>								
Unit: I	Introduction					No. of Classes: 9		
Introduction, History and Importance of Highways, Characteristics of road transport, Current road development plans in India, Highway development in India, Highway planning, Highway alignment, Engineering surveys for Highway alignment, Highway projects, Highway drawings and reports, Detailed Project Report preparation, PPP schemes of Highway Development in India, Government of India initiatives in developing the highways and expressways in improving the mobility and village road development in improving the accessibility.								
Unit: II	Introduction to Highway Geometric Design					No. of Classes: 9		
Introduction to Highway Geometric Design; Width of Pavement, Formation and Land, Cross Slopes etc; Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontal alignment: Design of horizontal curves, super elevation, extra widening of pavement at curves; Vertical Alignment: Gradients, Compensation in Gradient, Design of summit curves and valley curves using different criteria; Integration of Horizontal and Vertical Curves.								

Unit: III	Basic traffic characteristics	No. of Classes: 9
<p>Basic traffic characteristics: Speed, volume and concentration, relationship between flow, speed and concentration; Highway capacity and Level of service (LOS) concepts: Factors affecting capacity and LOS, relationship between V/C ratio and LOS; Traffic volume and spot speed studies: Methods; Road Safety; Traffic Signals: Types, warrants for signalization, design of isolated traffic signal by IRC method; Parking and road accidents: Types of parking facilities – on-street and off street, introduction to parking studies; Accident studies, road safety auditing; Introduction to street lighting; Road Intersections: Design considerations of at-grade intersections, introduction to interchanges.</p>		
Unit: IV	Tests on soils	No. of Classes: 9
<p>Tests on soils: CBR, Field CBR, modulus of sub-grade reaction, Tests on Aggregates: specific gravity, shape (flakiness and elongation indices), angularity number, water absorption, impact, abrasion, attrition, crushing resistance, durability (weathering resistance), stone polishing value of aggregates; Tests on bitumen: spot, penetration, softening point, viscosity, ductility, elastic recovery, flash and fire points, Introduction to modified bituminous binders like crumb rubber modified, natural rubber modified and polymer modified bitumen binders; Bituminous Concrete: Critical parameters controlling bituminous concrete mixture design, aggregate blending concepts viz. Rothfuch’s method, trial and error procedure. Introduction to advanced concretes for road applications.</p>		
Unit: V	Introduction to Pavement Design	No. of Classes: 9
<p>Introduction to Pavement Design: Types of pavements and their typical cross sections: flexible, rigid and composite; Flexible Pavement analysis and design: Introduction to multi layered analysis, IRC 37-2012 method of flexible pavement design; Rigid pavement analysis and design: Factors controlling rigid pavement design, types of stresses in rigid pavements, critical load positions, load stresses and temperature stresses in interior, corner and edge locations of jointed plain cement concrete pavements labs, IRC 58-2015 method of rigid pavement design; Overlay Designs: Types of overlays on flexible and rigid pavements.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Fluid Mechanics by Modi and Seth, Standard Book House.</li> <li>2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015.</li> <li>3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.</li> <li>2. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited.</li> <li>3. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.</li> <li>4. Fluid mechanics &amp; Hydraulic Machines, Domkundwar &amp; Domkundwar Dhanpat Rai &amp; Co.</li> <li>5. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publication Pvt. Ltd.</li> </ol>		
<p>Web References:</p> <p><a href="https://nptel.ac.in/courses/105/101/105101087/">https://nptel.ac.in/courses/105/101/105101087/</a></p>		
<p>E-Text Books:</p> <p><a href="https://drive.google.com/file/d/1YdiaC8GW_qhm6wv_L4nlzv7Jex1ju2T_/view">https://drive.google.com/file/d/1YdiaC8GW_qhm6wv_L4nlzv7Jex1ju2T_/view</a></p>		

## CE511PE: CONCRETE TECHNOLOGY (Professional Elective – I)

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE511PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Building materials and construction								
Course Objectives: The objectives of the course are to: <ul style="list-style-type: none"> <li>Know different types of cement as per their properties for different field applications.</li> <li>Understand Design economic concrete mix proportion for different exposure conditions and intended purposes.</li> <li>Know field and laboratory tests on concrete in plastic and hardened stage.</li> </ul>								
Course Outcomes: Upon completion of this course, students should be able to: <ul style="list-style-type: none"> <li>Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.</li> <li>Apply the use of various chemical admixtures and mineral additives to design cement-based materials with tailor-made properties</li> <li>Use advanced laboratory techniques to characterize cement-based materials.</li> <li>Perform mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete.</li> </ul>								
Unit: I	<b>Cement</b>					No. of Classes: <span style="color: red;">9</span>		
<b>Cement:</b> Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.								
Unit: II	<b>Aggregates</b>					No. of Classes: <span style="color: red;">9</span>		
<b>Aggregates:</b> Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.								

Unit: III	<b>Fresh Concrete</b>	No. of Classes: 9
<p><b>Fresh Concrete:</b> Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation &amp; bleeding – Mixing, vibration and revibration of concrete – Steps in manufacture of concrete – Quality of mixing water.</p>		
Unit: IV	<b>Hardened Concrete, Testing of Hardened Concrete</b>	No. of Classes: 9
<p><b>Hardened Concrete:</b> Water / Cement ratio – Abram’s Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.</p> <p><b>Testing of Hardened Concrete:</b> Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT. ELASTICITY, CREEP &amp; SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson’s ratio – Creep of concrete – Factors influencing creep – Relation between creep &amp; time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.</p>		
Unit: V	<b>Mix Design, Special Concretes</b>	No. of Classes: 9
<p><b>Mix Design:</b> Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.</p> <p><b>Special Concretes:</b> Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.</p>		
Text Books:		
<ol style="list-style-type: none"> <li>1. Concrete Technology by M.S. Shetty. – S. Chand &amp; Co.; 2004</li> <li>2. Concrete Technology by A.R. Santhakumar, 2<sup>nd</sup> Edition, Oxford university Press, New Delhi</li> <li>3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi</li> </ol>		
Reference Books:		
<ol style="list-style-type: none"> <li>1. Properties of Concrete by A. M. Neville – Low priced Edition – 4th edition</li> <li>2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, Mc-Graw Hill Publishers</li> </ol>		
IS Codes:		
IS 383 IS 516 IS 10262 - 2009		
Web References:		
<a href="https://nptel.ac.in/courses/105/102/105102012/">https://nptel.ac.in/courses/105/102/105102012/</a>		
E-Text Books:		
<a href="https://www.academia.edu/38871769/CONCRETE_TECHNOLOGY_THEORY_AND_PRACTICE_Multicolor_Illustrative_Edition">https://www.academia.edu/38871769/CONCRETE_TECHNOLOGY_THEORY_AND_PRACTICE_Multicolor_Illustrative_Edition</a>		



### CE512PE: THEORY OF ELASTICITY (Professional Elective - I)

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE512PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Strength of Materials I & II								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>To Introduce fundamental elasticity model of deformation in rectangular and polar coordinate.</li> <li>To Give foundation for 2D and 3D study in solid mechanics problems.</li> <li>To Introduce to torsion and warping of prismatic structure</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>The more fundamental elasticity model of deformation should replace elementary strength of material analysis.</li> <li>Able to understand theory, formulate and to present solutions to a wide class of problems in 2D and 3D</li> <li>Acquire the foundation for advanced study in areas of solid mechanics.</li> </ul>								
Unit: I	Introduction					No. of Classes: 9		
<p>Introduction: Elasticity - notation for forces and stress - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - differential equations of equilibrium - boundary conditions – Strain Displacement Relations - compatibility equations - stress function.</p>								
Unit: II						No. of Classes: 9		
<p>Two dimensional problems in rectangular coordinates - solution by polynomials - Saint-Venants principle - determination of displacements - bending of simple beams – Simple Supported and Cantilever Beam.</p>								

Unit: III		No. of Classes: 9
<p>Two dimensional problems in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress distributions Edge Dislocation - general solution of two-dimensional problem in polar coordinates - application to Plates with Circular Holes – Rotating Disk. Bending of Prismatic Bars: Stress function - bending of cantilever - circular cross section - elliptical cross section - rectangular cross section.</p>		
Unit: IV		No. of Classes: 9
<p>Analysis of stress and strain in three dimensions - principal stress - stress ellipsoid - director surface - determination of principal stresses Stress Invariants - max shear stresses Stress Tensor – Strain Tensor- Homogeneous deformation - principal axes of strain-rotation. General Theorems: Differential equations of equilibrium - conditions of compatibility - determination of displacement - equations of equilibrium in terms of displacements - principle of super position - uniqueness of solution - the reciprocal theorem Strain Energy.</p>		
Unit: V		No. of Classes: 9
<p>Torsion of Circular Shafts - Torsion of Straight Prismatic Bars – Saint Venants Method - torsion of prismatic bars - bars with elliptical cross sections - membrane analogy - torsion of a bar of narrow rectangular bars - solution of torsional problems by energy method - torsion of shafts, tubes, bars etc. Torsion of Rolled Profile Sections.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Theory of Elasticity by Timoshenko, McGraw-Hill Publications.</li> <li>2. Theory of Plasticity by J. Chakarbarthy, McGraw-Hill Publications.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Theory of Elasticity by Y.C.Fung.</li> <li>2. Theory of Elasticity by Gurucharan Singh.</li> </ol>		
<p>Web References:</p>		
<p>E-Text Books:</p>		

### CE513PE: ROCK MECHANICS (Professional Elective – I)

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE513PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite:								
Course Objectives: The objectives of the course are to: <ul style="list-style-type: none"> <li>Identify the classification of Rocks as per engineering aspects</li> <li>Explain the basic laboratory in-situ tests, strengths and its responses</li> <li>Understand Rock slopes and its failures, underground and open excavations and its requirements.</li> </ul>								
Course Outcomes: Upon completion of this course, students should be able to: <ul style="list-style-type: none"> <li>Able to determine the required rock properties and classify rock mass</li> <li>Determination of bearing capacity of rocks,</li> <li>Checking the stability of slopes, and design underground and open excavation.</li> <li>The students will be able to predict strength of rock mass with respect to various Civil Engineering applications.</li> </ul>								
Unit: I	<b>Engineering Classification of Rocks</b>					No. of Classes: 9		
<b>Engineering Classification of Rocks:</b> Classification of intact rocks, Rock mass classifications, Rock Quality Designation (RQD), Rock Structure Rating (RSR), Rock Mass Rating (RMR), Norwegian Geotechnical Classification (Q-system), Strength and modulus from classifications, Classification based on strength & modulus and strength and fracture strain, Geoenvironmental classification.								
Unit: II	<b>Laboratory and In-Situ Testing of Rocks</b>					No. of Classes: 9		
<b>Laboratory and In-Situ Testing of Rocks:</b> Physical properties, Compressive strength, Tensile strength, Direct shear test, Triaxial shear test, Slake durability test, Schmidt rebound hardness test, Sound velocity test, In-Situ Tests: Seismic methods, Electrical resistivity method, In situ stresses, Plate loading test, Goodman jack test, Plate jacking test, In-situ shear test, Field permeability test.								

Unit: III	<b>Strength, Modulus and Stresses-Strain Responses of Rocks</b>	No. of Classes: 9
<p><b>Strength, Modulus and Stresses-Strain Responses of Rocks:</b> Factors influencing rock response, Strength criteria for isotropic intact rocks, Modulus of intact rocks, effect of confining pressure, Uniaxial Compressive strength, Strength criteria for intact rocks, Strength due to induced anisotropy in rocks,. Stress Strain Models: Constitutive relationships, Elastic, Elasto-plastic, Visco-elastic, Elasto- viscoplastic stress-strain models.</p>		
Unit: IV	<b>Introduction to Rock Slopes</b>	No. of Classes: 9
<p><b>Introduction to Rock Slopes:</b> Introduction to Rock slopes, Modes of failure, Rotational failure, Plane failure, Design charts, Wedge method of analysis, Buckling failure, Toppling failure, Improvement of slope stability and protection.</p>		
Unit: V	<b>Underground and Open Excavations</b>	No. of Classes: 9
<p><b>Underground and Open Excavations:</b> Blasting operational planning, Explosive products, Blast Design, Underground blast design, Controlled blasting techniques, blasting damage and control, Safe practice with explosives and shots.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Goodman – Introduction to Rock mechanics, Willey International</li> <li>2. Ramamurthy, T. - Engineering in Rocks for slopes, foundations and tunnels, Prentice Hall of India (2007).</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Jaeger, J. C. and Cook, N. G. W. – Fundamentals of Rock Mechanics, Chapman and Hall, London. (1979)</li> <li>2. Hoek, E. and Brown, E. T. - Underground Excavation in Rock, Institution of Mining and Metallurgy, 1982.</li> <li>3. Brady, B. H. G. and Brown, E. T. - Rock Mechanics for Underground Mining, Chapman &amp; Hall, 1993.</li> </ol>		
<p>Web References:</p>		
<p>E-Text Books:</p>		

## SM505MS: ENGINEERING ECONOMICS AND ACCOUNTANCY

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
SM505MS	HSMC	L	T	P	C	CIA	SEE	Total
		2	0	0	2	30	70	100
Contact Classes: 30	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 30			
Prerequisite: -								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>To prepare engineering students to analyze cost/ revenue/ financial data and to make economic and financial analysis in decision making process and to examine the performance of companies engaged in engineering.</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <p>To perform and evaluate present and future worth of the alternate projects and to appraise projects by using traditional and DCF Methods. To carry out cost benefit analysis of projects and to calculate BEP of different alternative projects.</p>								
Unit: I	Introduction to Engineering Economics					No. of Classes: 6		
<p>Introduction to Engineering Economics- Basic Principles and Methodology of Engineering Economics–Fundamental Concepts- Demand – Demand Determinants - Law of Demand- Demand Forecasting and Methods- Elasticity of Demand- Theory of Firm – Supply- Elasticity of Supply.</p>								
Unit: II	Macroeconomic Concepts					No. of Classes: 6		
<p>Macroeconomic Concepts: National Income Accounting - Methods of Estimation- Various Concepts of National Income - Inflation – Definition – Causes of Inflation and Measures to Control Inflation - New Economic Policy 1991 (Industrial policy, Trade policy, and Fiscal policy) Impact on Industry.</p>								

Unit: III	Cash Flows and Capital Budgeting	No. of Classes: 6
Cash Flows and Capital Budgeting: Significance of Capital Budgeting - Time Value of Money- Choosing between alternative investment proposals- Methods of Appraisal Techniques- Pay Back Period - Average Rate of Return – Net Present Value- Internal Rate of Return – Profitability Index.		
Unit: IV	Borrowings on Investment	No. of Classes: 6
Borrowings on Investment: Equity Vs Debt Financing- Leverages- Concept of Leverage- Types of Leverages: Operating Leverage- Financial Leverage and Composite Leverage. (Simple Problems)		
Unit: V	Introduction to Accounting	No. of Classes: 6
Introduction to Accounting: Accounting Principles- procedure- Double entry system - Journal- ledger- Trial balance- Trading and Profit and Loss account- Balance Sheet. Cost Accounting, Introduction- Classification of costs- Breakeven Analysis, Meaning and its application, Limitations. (Simple Problems).		
Text Books:		
<ol style="list-style-type: none"> <li>1. Henry Malcom Steinar-Engineering Economics, Principles, McGraw Hill Pub.</li> <li>2. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.</li> <li>3. Jain and Narang” Accounting, Kalyani Publishers.</li> <li>4. Arora, M.N.” Cost Accounting, Vikas Publication.</li> <li>5. S. N. Maheshwari, Financial Management, Vikas Publishing House.</li> <li>6. Zahid A Khan, Arshad N Siddique, et.al, Principles of Engineering Economics with Applications, 2e, Cambridge University Press.</li> </ol>		
Web References:		
<ul style="list-style-type: none"> <li>• <a href="https://www.brainkart.com/subject/Engineering-Economics-and-Financial-Accounting_150/">https://www.brainkart.com/subject/Engineering-Economics-and-Financial-Accounting_150/</a></li> <li>• <a href="https://www.accounting.com/resources/basic-accounting-terms/">https://www.accounting.com/resources/basic-accounting-terms/</a></li> <li>• <a href="https://www.toppr.com/guides/principles-and-practice-of-accounting/meaning-and-scope-of-accounting/meaning-of-accounting/">https://www.toppr.com/guides/principles-and-practice-of-accounting/meaning-and-scope-of-accounting/meaning-of-accounting/</a></li> </ul>		
E-Text Books:		
<ul style="list-style-type: none"> <li>• <a href="https://books.google.co.in/books?id=VLENC6v6xWMC&amp;printsec=frontcover#v=onepage&amp;q&amp;f=false">https://books.google.co.in/books?id=VLENC6v6xWMC&amp;printsec=frontcover#v=onepage&amp;q&amp;f=false</a></li> <li>• <a href="http://sibsagarpolytechnic.co.in/classnote/ENGINEERING_ECONOMICS.pdf">http://sibsagarpolytechnic.co.in/classnote/ENGINEERING_ECONOMICS.pdf</a></li> <li>• <a href="https://www.studypool.com/documents/4716711/engineering-economics-accountancy-jntuh-r18-">https://www.studypool.com/documents/4716711/engineering-economics-accountancy-jntuh-r18-</a></li> </ul>		

**CE506PC: HIGHWAY ENGINEERING & CONCRETE TECHNOLOGY  
LAB**

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE506PC	PCC	L	T	P	C	CIA	SEE	Total
		0	0	3	1.5	30	70	100
Contact Classes: 0	Tutorial Classes: 0	Practical Classes: 45			Total Classes: 45			
Prerequisite: Building Materials, Concrete Technology, Highway Materials								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>To learn laboratory tests and their procedures cement, fine aggregate, coarse aggregates and bitumen</li> <li>To Evaluate fresh concrete properties</li> <li>To Understand the test procedures for characterization of Concrete and bituminous mixes.</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>Categorize the test on materials used Civil Engineering Building &amp; Pavement constructions</li> <li>To perform the tests on concrete for its characterization.</li> <li>To Design Concrete Mix Proportioning by Using Indian Standard Method.</li> <li>Examine the tests performed for Bitumen mixes.</li> <li>To prepare a laboratory report.</li> </ul>								
I	<b>Test on Cement</b>					No. of Classes: 9		
<ol style="list-style-type: none"> <li>Normal Consistency and fineness of cement.</li> <li>Initial setting time and final setting time of cement.</li> <li>Specific gravity of cement</li> <li>Soundness of cement</li> <li>Compressive strength of cement</li> <li>Workability test on concrete by compaction factor, slump and Vee-bee.</li> </ol>								
II	<b>Test on Aggregates (Coarse and Fine)</b>					No. of Classes: 9		
<ol style="list-style-type: none"> <li>Specific gravity (Pycnometer and wire basket), water absorption</li> <li>Shape (Flakiness and elongation indices)</li> <li>Impact and abrasion value tests</li> <li>Crushing resistance and durability tests</li> <li>Sieve Analysis and gradation charts (Job mix formula using Rothfuch's charts)</li> <li>Bulking of sand, Bulk and compact densities of fine and coarse aggregates.</li> </ol>								

III	<b>Test on Fresh Concrete</b>	No. of Classes: 9
<ol style="list-style-type: none"> <li>1. Slump test</li> <li>2. CF (compact factor stress)</li> <li>3. Vee-bee Test</li> <li>4. Flow Table Test.</li> </ol>		
IV	<b>Test on hardened concrete</b>	No. of Classes: 9
<ol style="list-style-type: none"> <li>1. Compression test on cubes &amp; Cylinders</li> <li>2. Flexure test</li> <li>3. Split Tension Test</li> <li>4. Modulus of Elasticity.</li> </ol>		
V	<b>Tests on Bitumen and Bituminous concrete</b>	No.of Classes: 9
<ol style="list-style-type: none"> <li>1. Penetration, softening point and spot test</li> <li>2. Ductility, Elastic recovery and viscosity</li> <li>3. Flash and fire points and specific gravity</li> <li>4. Marshall's Stability (sample preparation and testing for stability and flow values)</li> </ol>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Concrete Manual by M.L. Gambhir, Dhanpat Rai &amp; Sons</li> <li>2. Highway Material Testing manual, Khanna, Justo and Veeraraghavan, Nemchand Brothers.</li> </ol>		
<p>IS CODES :</p> <ol style="list-style-type: none"> <li>1. IS 10262 :2009 "Concrete Mix Proportioning – Guidelines"</li> <li>2. IS 516:2006 "Methods of Tests on Strength of Concrete"</li> <li>3. IS 383 :1993 "Specification For Coarse And Fine Aggregates From Natural Sources For Concrete"</li> <li>4. IS 1201 -1220 (1978) "Methods for testing tars and bituminous materials"</li> <li>5. IRC SP 53 -2010 "Guidelines on use of modified bitumen"</li> <li>6. MS-2 Manual for Marshalls Mix design 2002.</li> </ol>		
<p>Web References:</p> <p><a href="https://nptel.ac.in/courses/105/108/105108077/">https://nptel.ac.in/courses/105/108/105108077/</a></p>		
<p>E-Text Books:</p> <p><a href="https://www.academia.edu/38871769/CONCRETE_TECHNOLOGY_THEORY_AND_PRACTICE_Multicolour_Illustrative_Edition">https://www.academia.edu/38871769/CONCRETE_TECHNOLOGY_THEORY_AND_PRACTICE_Multicolour_Illustrative_Edition</a></p>		



**CE507PC: GEOTECHNICAL ENGINEERING LAB**

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE507PC	PCC	L	T	P	C	CIA	SEE	Total
		0	0	3	1.5	30	70	100
Contact Classes: 0	Tutorial Classes: 0	Practical Classes: 45			Total Classes: 45			
Prerequisite: Geotechnical Engineering Theory, Soil Mechanics (Co-requisite)								
Course Objectives <ul style="list-style-type: none"> <li>To obtain index and engineering properties of locally available soils, and to understand the behavior of these soil under various loads.</li> </ul>								
Course Outcomes: At the end of the course, the student will be able to Classify and evaluate the behavior of the soils subjected to various loads.								
Experiment	List of Experiments						No. of Classes	
1	Atterberg Limits (Liquid Limit, Plastic Limit, and shrinkage limit)						5	
2	Field density by core cutter method and Field density by sand replacement method						5	
3	Determination of Specific gravity of soil Grain size distribution by sieve analysis						5	
4	Permeability of soil by constant and variable head test methods						5	
5	Standard Proctor's Compaction Test						5	
6	Determination of Coefficient of consolidation (square root time fitting method)						4	
7	Unconfined compression test						4	
8	Direct shear test						4	
9	Vane shear test						4	
10	Differential free swell index (DFSI) test						4	
Reference: 1 Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International.								

## EN508HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EN508HS	HSMC	L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
Contact Classes: 0	Tutorial Classes:0	Practical Classes: 30			Total Classes: 30			
I	<b>INTRODUCTION</b>					No. of Classes: 6		
<p>The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.</p> <p>The proposed course should be a laboratory course to enable students to use ‘good’ English and perform the following:</p> <ul style="list-style-type: none"> <li>• Gathering ideas and information to organize ideas relevantly and coherently.</li> <li>• Engaging in debates.</li> <li>• Participating in group discussions.</li> <li>• Facing interviews.</li> <li>• Writing project/research reports/technical reports.</li> <li>• Making oral presentations.</li> <li>• Writing formal letters.</li> <li>• Transferring information from non-verbal to verbal texts and vice-versa.</li> <li>• Taking part in social and professional communication.</li> </ul>								
II	<b>Objectives</b>					No. of Classes: 6		
<p>This Lab focuses on using multi-media instruction for language development to meet the following targets:</p> <ul style="list-style-type: none"> <li>• To improve the students’ fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.</li> <li>• Further, they would be required to communicate their ideas relevantly and coherently in writing.</li> <li>• To prepare all the students for their placements</li> </ul>								

III	<b>Syllabus</b>	No. of Classes: 6
<p>The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:</p> <ol style="list-style-type: none"> <li>1. <b>Activities on Fundamentals of Inter-personal Communication and Building Vocabulary</b> - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations &amp; Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations &amp; usage of vocabulary.</li> <li>2. <b>Activities on Reading Comprehension</b> –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading&amp; effective googling.</li> <li>3. <b>Activities on Writing Skills</b> – Structure and presentation of different types of writing – <i>letter writing/Resume writing/ e-correspondence/Technical report writing/</i> – planning for writing – improving one’s writing.</li> <li>4. <b>Activities on Presentation Skills</b> – Oral presentations (individual and group) through JAM sessions/seminars/<u>PPTs</u> and written presentations through posters/projects/reports/</li> <li>5. <b>Activities on Group Discussion and Interview Skills</b> – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference &amp; video-conference and MockInterviews</li> </ol>		
IV	<b>Minimum Requirement</b>	No. of Classes: 6
<p>The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:</p> <ul style="list-style-type: none"> <li>• Spacious room with appropriate acoustics.</li> <li>• Round Tables with movable chairs</li> <li>• Audio-visual aids</li> <li>• LCD Projector</li> <li>• Public Address system</li> <li>• P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ</li> <li>• T. V, a digital stereo &amp; Camcorder</li> <li>• Headphones of High quality.</li> </ul>		
V	<b>Suggested Software</b>	No.of Classes: 6
<p>The software consisting of the prescribed topics elaborated above should be procured and used.</p> <ul style="list-style-type: none"> <li>• Oxford Advanced Learner’s Compass, 7<sup>th</sup> Edition</li> <li>• DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.</li> <li>• Lingua TOEFL CBT Insider, by Dream tech</li> <li>• TOEFL &amp; GRE (KAPLAN, AARCO &amp; BARRONS, USA, Cracking GRE by CLIFFS)</li> </ul>		

**Text Books:**

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2<sup>nd</sup> Edition
3. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5<sup>th</sup> Edition.

**References:**

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata McGraw-Hill 2009

**Web References:**

**E-Text Books:**

**\*MC509: INTELLECTUAL PROPERTY RIGHTS**

B.Tech. III Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
*MC509	MC	L	T	P	C	CIA	SEE	Total
		3	0	0	0	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
I	<b>INTRODUCTION</b>					No. of Classes: 9		
Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.								
II	<b>Trade Marks</b>					No. of Classes: 9		
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.								
III	<b>Law of copy rights</b>					No. of Classes: 9		
Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.								
IV	<b>Trade Secrets</b>					No. of Classes: 9		
Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.								
V	<b>New development of intellectual property</b>					No.of Classes: 9		
New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law. •								
Text & Reference Books:								
<ol style="list-style-type: none"> <li>1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.</li> <li>2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, TataMcGraw Hill Publishing company ltd.</li> </ol>								

**CE601PC: HYDROLOGY AND WATER RESOURCES ENGINEERING**

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE601PC	PCC	L	T	P	C	CIA	SEE	Total
		3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: 0			Total Classes: 60			
Prerequisite: Basic knowledge of Fluid Mechanics and Hydraulic & Hydraulic Machines.								
<p>Course Objectives: The objectives of the course are to:</p> <p>This course provides the description of hydrological cycle and derive various formulas used in estimation of different basic components of surface and Ground water cycle. and its components. Further it will explain the water requirement for irrigation and connectivity of hydrology to the field requirement.</p>								
<p>Course Outcomes: At the end of the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>Understand the different concepts and terms used in engineering hydrology</li> <li>To <b>identify and</b> explain various formulae used in estimation of surface and Ground water hydrology components</li> <li>Demonstrate their knowledge to <b>connect</b> hydrology to the field requirement.</li> </ul>								
Unit: I	<b>Introduction, Precipitation</b>				No. of Classes: 12			
<p><b>Introduction:</b> Concepts of Hydrologic cycle, Global Water Budget, Applications in Engineering. Sources of data.</p> <p><b>Precipitation</b> Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Arithmetic, Theissen's and Isohyetal methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India</p>								
Unit: II	<b>Abstractions from precipitation, Runoff</b>				No. of Classes: 12			
<p><b>Abstractions from precipitation</b> evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney &amp; Criddle Methods, potential evapotranspiration over India, actual evapotranspiration, , interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.</p> <p><b>Runoff</b> Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.</p>								

Unit: III	<b>Hydrographs</b>	No. of Classes: 12
<p><b>Hydrographs</b>  Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow- Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function - Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.</p>		
Unit: IV	<b>Groundwater Hydrology Hydraulics Crop Water Requirements</b>	No. of Classes: 12
<p><b>Groundwater Hydrology</b>  Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy’s Law. <b>Well Hydraulics</b> - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.</p> <p><b>Crop Water Requirements</b> – Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying waterto the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.</p>		
Unit: V	<b>Canal Systems</b>	No.of Classes: 12
<p><b>Canal Systems:</b> Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Regime channels, Kennedy’s and Lacey’s theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals-Types of lining-Advantages and disadvantages. Drainage of irrigated lands- necessity, methods.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Hydrology by K. Subramanya (Tata McGraw-Hill)</li> <li>2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers</li> <li>3. G L Asawa, Irrigation Engineering, Wiley Eastern.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)</li> <li>2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications)</li> <li>3. Ground water Hydrology by David Keith Todd, John Wiley &amp; Son, New York.</li> <li>4. Elements of Water Resources Engineering by K.N.Duggal and J.P.Soni (New Age International).</li> <li>5. International).</li> </ol>		

Web References:

<https://www.youtube.com/watch?v=IphCId7mkhk>

<https://www.youtube.com/watch?v=fx1uUek3Igg&list=PL2BD2DA229B513E12>

E-Text Books:

[https://www.vssut.ac.in/lecture\\_notes/lecture1525502082.pdf](https://www.vssut.ac.in/lecture_notes/lecture1525502082.pdf)

<https://www.worldcat.org/title/hydrology-and-water-resources-engineering/oclc/649900474>



## CE602PC: ENVIRONMENTAL ENGINEERING

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE602PC	PCC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite:								
<p>Course Objectives: The objective of this Course is:            This subject provides the knowledge of water sources, water treatment, design of distribution system waste water treatment, and safe disposal methods. The topics of characteristics of waste water, sludge digestion are also included.</p>								
<p>Course Outcome: On completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Assess characteristics of water and wastewater and their impacts</li> <li>• Estimate quantities of water and waste water and plan conveyance components</li> <li>• Design components of water and waste water treatment plants</li> <li>• Be conversant with issues of air pollution and control.</li> </ul>								
Unit: I	Introduction				No. of Classes: 9			
<p>Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.</p>								
Unit: II	Layout and general outline of water treatment units				No. of Classes: 9			
<p>Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices– Design of distribution systems–pipe appurtenances.</p>								

Unit: III	Characteristics of sewage	No. of Classes: 9
<p>characteristics of sewage –waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming –self-purification of rivers.</p>		
Unit: IV	Waste water treatment plant	No. of Classes: 9
<p>Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters – ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.</p>		
Unit: V	Air pollution	No. of Classes: 9
<p>Air pollution– classification of air pollution– Effects air pollution–Global effects– Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior – Control of particulates – Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants– automobile pollution and control.</p>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw HillEducation (India) Pvt Ltd, 2014</li> <li>2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.</li> <li>3. Environmental Engineering, I and II by BC Punmia, Std. Publications</li> <li>4. Environmental Engineering, I and II by SK Garg, Khanna Publications.</li> <li>5. Environmental Pollution and Control Engineering CS Rao, Wiley Publications.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Water and Waste Water Technology by Steel, Wiley</li> <li>2. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.</li> <li>3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011</li> <li>4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr. Wiley, 2007.</li> <li>5. Introduction to Environmental Engineering and Science by Gilbert Masters, PrenticeHall, New Jersey.</li> <li>6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.</li> <li>7. Integrated Solid Waste Management, Tchobanoglous, Theissen &amp; Vigil. McGraw HillPublication.</li> </ol>		
<p><b>Web References:</b></p>		
<p><b>E-Text Books:</b></p>		

## CE603PC: FOUNDATION ENGINEERING

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE603PC	PCC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite:								
Course Objectives: The objectives of the course are to: <ul style="list-style-type: none"> <li>To Plan Soil exploration programme for civil Engineering Projects</li> <li>To check the stability of slopes</li> <li>To determine the lateral earth pressures and design retaining walls</li> <li>To determine the Bearing capacity of Soil</li> <li>To design pile group foundation.</li> </ul>								
Course Outcomes: Upon completion of this course, students should be able to: <ul style="list-style-type: none"> <li>understand the principles and methods of Geotechnical Exploration</li> <li>decide the suitability of soils and check the stability of slopes</li> <li>calculate lateral earth pressures and check the stability of retaining walls</li> <li>analyse and design the shallow and deep foundations.</li> </ul>								
Unit: I	<b>SOIL EXPLORATION</b>					No. of Classes: 9		
<b>SOIL EXPLORATION:</b> Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs and preparation of soil investigation report.								
Unit: II	<b>SLOPE STABILITY</b>					No. of Classes: 9		
<b>SLOPE STABILITY:</b> Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices, Bishop’s Simplified method of slices – Taylor’s Stability Number- stability of slopes of earth dams under different conditions.								

Unit: III	<b>EARTH PRESSURE THEORIES, RETAINING WALLS</b>	No. of Classes: 9
<p><b>EARTH PRESSURE THEORIES:</b> Active, Passive and at rest soil pressures Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory.</p> <p><b>RETAINING WALLS:</b> Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.</p>		
Unit: IV	<b>SHALLOW FOUNDATIONS</b>	No. of Classes: 9
<p><b>SHALLOW FOUNDATIONS</b> - Types - choice of foundation – location and depth - safe bearing capacity shear criteria – Terzaghi's, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.</p>		
Unit: V	<b>PILE FOUNDATION</b>	No. of Classes: 9
<p><b>PILE FOUNDATION:</b> Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Basic and Applied Soil Mechanics by Gopal Ranjan &amp; ASR Rao, New age International Pvt .Ltd, New Delhi</li> <li>2. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.</li> <li>2. Geotechnical Engineering Principles and Practices by Cuduto, PHI International</li> <li>3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company PvtLtd(1998).</li> <li>4. Geotechnical Engineering by S. K.Gulhati &amp; Manoj Datta – Tata Mc.Graw Hill Publishingcompany New Delhi. 2005.</li> <li>5. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishingcompany, Newyork.</li> </ol>		
<p>Web References:</p>		
<p>E-Text Books:</p>		

## CE604PC: STRUCTURAL ENGINEERING – II (STEEL)

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE604PC	PCC	L	T	P	C	CIA	SEE	Total
		3	1	0	4			
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: 0			Total Classes: 60			
Prerequisite: Building Materials								
Course Objectives: The objectives of the course are to: <ul style="list-style-type: none"> <li>Explain the mechanical properties of structural steel, plasticity, yield.</li> <li><b>Describe</b> the salient features of Limit State Method of design of Steel structures.</li> <li><b>Identify</b> and <b>explain</b> the codal provisions given in IS. 800.</li> <li><b>Analyze</b> the behaviour of steel structures under tension, compression and flexure.</li> <li><b>Design</b> the tension, compression, flexural members and plate girder</li> <li>Design the connection in steel structure, build - up member and (bolted and welded).</li> </ul>								
Course Outcomes: Upon completion of this course, students should be able to: <ul style="list-style-type: none"> <li>Analyze the tension members, compression members.</li> <li>Design the tension members, compression members and column bases and joints and connections</li> <li>Analyze and Design the beams including built-up sections and beam and connections.</li> <li>Identify and Design the various components of welded plate girder including stiffeners.</li> </ul>								
Unit: I	Materials – Types of structural steel					No. of Classes: 12		
Materials – Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states - Design Strengths - deflection limits – serviceability – stability check. Design of Connections– Different types of connections – Bolted connections – Design strength – efficiency of joint– prying action - Welded connections – Types of welded joints – Design requirements - Design of Beam-column connections - Eccentric connections - Type I and Type II connection – Framed connection– stiffened / seated connection.								
Unit: II	Design of tension members					No. of Classes: 12		

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

Design of compression members – Buckling class – slenderness ratio – Design of simple compression members - laced – battened columns – splice – column base – slab base.

Unit: III	Plastic Analysis;Plastic moment	No. of Classes: 12
Plastic Analysis;Plastic moment – Plastic section modulus - Plastic analysis of continuous beams Design of Flexural Members – Laterally supported and unsupported Beams – Design of laterally supported beams - Bending and shear strength/buckling – Built-up sections - Beam splice.		
Unit: IV	Design of welded plate girders	No. of Classes: 12
Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener– intermediate stiffeners – Design of web splice and flange splice.		
Unit: V	Design of Industrial Structures	No.of Classes: 12
Design of Industrial Structures; Types of roof trusses - loads on trusses – wind loads - Purlin design –truss design – Design of welded Gantry girder <u>Note:</u> Design of structural members include detailed sketches.		
Text Books:		
<ol style="list-style-type: none"> <li>1. Design of steel structures by S.K.Duggal,Tata Macgrawhill publishers,2000,2<sup>nd</sup> Edition.</li> <li>2. Design of steel structures by N.Subramanian,Oxford University press,2008.</li> <li>3. Design of steel structures by K.S.Sairam,Pearson Educational India, 2<sup>nd</sup> Edition, 2013.</li> </ol>		
Reference Books:		
<ol style="list-style-type: none"> <li>1. Design of steel structures by Edwin H.Gayrold and Charles Gayrold,Tata Mac-grawhillpublishers,1972</li> <li>2. Design of steel structures by L.S.JayaGopal,D.Tensing,Vikas Publishing House.</li> </ol>		
Web References:		
E-Text Books:		

## CE611PE: PRESTRESSED CONCRETE (Professional Elective – II)

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE611PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Reinforced Concrete Design								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>Understand the principles &amp; necessity of prestressed concrete structures.</li> <li>Know different techniques of prestressing.</li> <li>Get the knowledge on various losses of prestress.</li> <li>Understand Analysis and design of prestressed concrete members.</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>Acquire the knowledge of evolution of process of prestressing.</li> <li>Acquire the knowledge of various prestressing techniques.</li> <li>Develop skills in analysis design of prestressed structural elements as per the IS codal provisions.</li> </ul>								
Unit: I	<b>Introduction</b>					No. of Classes: 9		
<p><b>Introduction:</b> Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics.</p>								
Unit: II	<b>Methods and Systems of prestressing</b>					No. of Classes: 9		
<p><b>Methods and Systems of prestressing:</b> Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.<b>Losses of Prestress:</b> Loss of prestress in pretensioned and posttensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.</p>								

Unit: III	<b>Flexure, Shear</b>	No. of Classes: 9
<p><b>Flexure:</b> Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.</p> <p><b>Shear:</b> General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions.</p>		
Unit: IV	<b>Transfer of Prestress in Pretensioned Members</b>	No. of Classes: 9
<p><b>Transfer of Prestress in Pretensioned Members:</b> Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe’s methods – Anchorage zone reinforcement- IS Provisions.</p>		
Unit: V	<b>Composite Beams, Deflections</b>	No. of Classes: 9
<p><b>Composite Beams:</b> Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.</p> <p><b>Deflections:</b> Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.</p>		
Text Books:		
Reference Books:		
<ol style="list-style-type: none"> <li>1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. New Delhi.</li> <li>2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.</li> <li>3. Prestressed concrete by S. Ramamrutham Dhanpat Rai &amp; Sons, Delhi.</li> <li>4. Prestressed Concrete by N. Rajagopalan Narosa Publishing House</li> </ol>		
Web References:		
E-Text Books:		



## CE612PE: ELEMENTS OF EARTHQUAKE ENGINEERING (Professional Elective – II)

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE612PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Structural Engineering –II & RC Design								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>Understand Engineering Seismology</li> <li>Explain and discuss single degree of freedom systems subjected to free and forced vibrations</li> <li>Acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes</li> <li>understand importance of ductile detailing of RC structures.</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>Explain and derive fundamental equations in structural dynamics</li> <li>Discuss and explain causes and Theories on earthquake, seismic waves, measurement of earthquakes</li> <li>Evaluate base shear using IS methods</li> <li>Design and Detail the reinforcement for earthquake forces.</li> </ul>								
Unit: I	<b>Engineering Seismology, Theory of Vibrations</b>					No. of Classes: 9		
<p><b>Engineering Seismology:</b> Earthquake phenomenon - cause of earthquakes-Faults-Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales- Energy Released-Earthquake measuring instruments seismogram - Seismoscope, Seismograph, - strong ground motions-Seismic zones of India.</p> <p><b>Theory of Vibrations:</b> Elements of a vibratory system- Degrees of Freedom-Continuous system- Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forced vibrations-Harmonic excitation-Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.</p>								
Unit: II	<b>Conceptual design, Introduction to earthquake resistant design</b>					No. of Classes: 9		

<p><b>Conceptual design:</b> Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical Members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel.</p> <p><b>Introduction to earthquake resistant design:</b> Seismic design requirements-regular</p>								
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and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

Unit: III	<b>Reinforced Concrete Buildings</b>	No. of Classes: 9
<p><b>Reinforced Concrete Buildings:</b> Principles of earthquake resistant design of RC members- Structural models for frame buildings - Seismic methods of analysis- IS code based methods for seismic design  - Vertical irregularities - Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear.</p>		
Unit: IV	<b>Masonry Buildings</b>	No. of Classes: 9
<p><b>Masonry Buildings:</b> Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.</p>		
Unit: V	<b>Structural Walls and Non-Structural Elements</b>	No. of Classes: 9
<p><b>Structural Walls and Non-Structural Elements:</b> Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non- structures- Effects of non-structural elements on structural system- Analysis of non-structural elements- Prevention of non-structural damage  Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920-2016 - Behaviour of beams, columns and joints in RC buildings during earthquakes.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press</li> <li>2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, PrenticeHall of India Pvt. Ltd.</li> </ol>		

Reference Books:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Earthquake Resistant Design of Building structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N.Iyengar, I.K.International Publishing House Pvt. Ltd.
4. Masonry and Timber structures including earthquake Resistant Design –Anand S.Arya, Nemchand & Bros  
Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy.

BIS Codes: 1. IS 1893(Part-1):2016. 2. IS 13920:2016. 3. IS 4326. 4. IS 456:200

Web References:

E-Text Books:

**CE613PE: ADVANCED STRUCTURAL ANALYSIS (Professional Elective – II)**

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE613PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite:								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>Understand the matrix method of analysis statically indeterminate frames and trusses.</li> <li>Know the transformation of coordinates and assembly of stiffness matrices</li> <li>Differentiate between flexibility and stiffness methods of analysis of beams, frames and planetrusses</li> <li>Understand the structural behavior of large frames with or without shear walls.</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>Analyze the multistory building frames by various approximate methods.</li> <li>Solve the continuous beams, portal frames by matrix methods of analysis.</li> <li>Analyze and design of large frames with or without shear walls.</li> </ul>								
Unit: I	Introduction to matrix methods					No. of Classes: 9		
<p>Introduction to matrix methods of analysis statically indeterminacy and kinematics indeterminacy- degree of freedom-coordinate system-structure idealization stiffness and flexibility matrices-suitability element stiffness equations-elements flexibility equations-mixed force-displacement equations-for truss element, beam element and tensional element</p> <p>Transformation of coordinates-element stiffness matrix-and load vector-local and global coordinates.</p>								
Unit: II	Assembly of stiffness matrix					No. of Classes: 9		
<p>Assembly of stiffness matrix from element stiffness matrix-direct stiffness method-general procedure-bank matrix-semi bandwidth-computer algorithm for assembly by direct stiffness matrix method.</p>								

Unit: III	No. of Classes: 9
Analysis of plane truss-continuous beam-plane frame and grids by Flexible methods.	
Unit: IV	No. of Classes: 9
Analysis of plane truss-continuous beam-plane frame and grids by stiffness methods.	
Unit: V	No. of Classes: 9
Special analysis procedures-static condensation and sub structuring-initial and thermal stresses. Shear Walls Necessity-structural behavior of large frames with and without shear walls-approximate methods of analysis of shear walls.	
Text Books:	
<ol style="list-style-type: none"> <li>1. Matrix methods of structural analysis by Willam Weaver and gere, CBS Publishers.</li> <li>2. Advanced Structural Analysis by A.K. Jain Nemchand Publishers.</li> </ol>	
Reference Books:	
<ol style="list-style-type: none"> <li>1. Advanced Structural Analysis by Devdas Menon, Narosa publishing house.</li> <li>2. Matrix methods of structural analysis by Pandit and gupta</li> <li>3. Matrix methods of structural analysis by J Meek</li> <li>4. Structural Analysis by Ghali and Neyveli.</li> </ol>	
Web References:	
E-Text Books:	

### CE605PC: ENVIRONMENTAL ENGINEERING LAB

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE605PC	PCC	L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
Contact Classes: 0	Tutorial Classes: 0	Practical Classes: 30			Total Classes: 30			
Prerequisite:								
Course Objectives <ul style="list-style-type: none"> <li><b>Perform</b> the experiments to determine water and waste water quality</li> <li><b>Understand</b> the water &amp; waste water sampling, their quality standards</li> <li><b>Estimate</b> quality of water, waste water, Industrial water</li> </ul>								
Course Outcomes: At the end of the course, the student will be able to <ul style="list-style-type: none"> <li>Understand about the equipment used to conduct the test procedures</li> <li>Perform the experiments in the lab</li> <li>Examine and Estimate water, waste water, air and soil Quality</li> <li>Compare the water, air quality standards with prescribed standards set by the local governments</li> <li>Develop a report on the quality aspect of the environment</li> </ul>								
Experiment	List of Experiments						No. of Classes	
1	Determination of pH						2	
2	Determination of Electrical Conductivity						2	
3	Determination of Total Solids (Organic and inorganic)						2	
4	Determination of Acidity						2	
5	Determination of Alkalinity						2	
6	Determination of Hardness (Total, Calcium and Magnesium Hardness)						2	

7	Determination of Chlorides	2
8	Determination of optimum coagulant Dosage	2
9	Determination of Dissolved Oxygen (Winkler Method)	2
10	Determination of COD	2
11	Determination of BOD/DO	2
12	Determination of Residual Chlorine	2
13	Total count No	2
14	Noise level measurement	2

Reference:

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2. Introduction to Environmental Engineering by P. Arne Vesilind, Susan M. Morgan, Thompson / Brooks/ Cole; Second Edition 2008.
3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, McGraw - Hill International Editions, New York 1985.
4. MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6. Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication

Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

**CE606PC: COMPUTER AIDED DESIGN LAB**

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE606PC	PCC	L	T	P	C	CIA	SEE	Total
		0	0	2	1	30	70	100
Contact Classes: 0	Tutorial Classes: 0	Practical Classes: 30			Total Classes: 30			
Prerequisite: Computer Aided Civil Engineering Drawing or AUTO CAD Principles –Excel-Structural Engineering -1 & 2								
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>• Learn the usage of any fundamental software for design</li> <li>• Create geometries using pre-processor</li> <li>• Analyse and Interpret the results using post processor</li> <li>• Design the structural elements.</li> </ul>								
<b>Course Outcomes:</b> At the end of the course, the student will be able to <ul style="list-style-type: none"> <li>• Model the geometry of real-world structure Represent the physical model of structuralelement/structure</li> <li>• Perform analysis</li> <li>• Interpret from the Post processing results</li> <li>• Design the structural elements and a system as per IS Codes.</li> </ul>								
Experiment	List of Experiments						No. of Classes	
1	Analysis & Design determinate structures using a software						3	
2	Analysis & Design of fixed & continuous beams using a software						3	
3	Analysis & Design of Plane Frames						3	
4	Analysis & Design of space frames subjected to DL & LL						3	
5	Analysis & Design of residential building subjected to all loads (DL,LL,WL,EQL)						3	
6	Analysis & Design of Roof Trusses						3	
7	Design and detailing of built up steel beam						3	
8	Developing a design programme for foundation using EXCEL Spread Sheet						3	
9	Detailing of RCC beam and RCC slab						3	
10	Detailing of Steel built up Compression member						3	
<b>Note:</b> Drafting of all the exercises is to be carried out using commercially available designingsoftware's.								



**\*MC609: ENVIRONMENTAL SCIENCE**

B.Tech. III Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
*MC609	MC	L	T	P	C	CIA	SEE	Total
		3	0	0	0	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite:								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>• Understanding the importance of ecological balance for sustainable development.</li> <li>• Understanding the impacts of developmental activities and mitigation measures</li> <li>• Understanding the environmental policies and regulations.</li> </ul>								
<p>Course Outcomes: At the end of the course, the student will be able to:</p> <p>Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.</p>								
Unit: I	<b>Ecosystems</b>				No. of Classes: 9			
<p><b>Ecosystems:</b> Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.</p>								
Unit: II	<b>Natural Resources</b>				No. of Classes: 9			
<p><b>Natural Resources: Classification of Resources:</b> Living and Non-Living resources, <b>water resources:</b> use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. <b>Mineral resources:</b> use and exploitation, environmental effects of extracting and using mineral resources, <b>Land resources:</b> Forest resources, <b>Energy resources:</b> growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.</p>								
Unit: III	<b>Biodiversity And Biotic Resources</b>				No. of Classes: 9			
<p><b>Biodiversity And Biotic Resources:</b> Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.</p>								

Unit: IV	<b>Environmental Pollution and Control Technologies</b>	No. of Classes: 9
<p><b>Environmental Pollution and Control Technologies: Environmental Pollution:</b> Classification of pollution, <b>Air Pollution:</b> Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. <b>Water pollution:</b> Sources and types of pollution, drinking water quality standards. <b>Soil Pollution:</b> Sources and types, Impacts of modern agriculture, degradation of soil. <b>Noise Pollution:</b> Sources and Health hazards, standards, <b>Solid waste:</b> Municipal Solid Waste management, composition and characteristics of e-Waste and its management. <b>Pollution control technologies:</b> Wastewater Treatment methods: Primary, secondary and Tertiary.</p> <p>Overview of air pollution control technologies, Concepts of bioremediation. <b>Global Environmental Problems and Global Efforts:</b> Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.</p>		
Unit: V	<b>Environmental Policy, Legislation &amp; EIA</b>	No.of Classes: 9
<p><b>Environmental Policy, Legislation &amp; EIA:</b> Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). <b>Towards Sustainable Future:</b> Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.</li> <li>2. Environmental Studies by R. Rajagopalan, Oxford University Press.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.</li> <li>2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.</li> <li>3. Environmental Science by Daniel B. Botkin &amp; Edward A. Keller, Wiley INDIA edition.</li> <li>4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.</li> </ol>		
<p>Web References:</p>		
<p>E-Text Books:</p>		

**CE701PC: ESTIMATION, COSTING AND PROJECT MANAGEMENT**

B.Tech. IV Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE701PC	PCC	L	T	P	C	CIA	SEE	Total
		3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: 0			Total Classes: 60			
Prerequisite: Building materials & Auto Cad Lab-1								
<p>Course Objectives: The objective of this Course is:                      The subject provide process of estimations required for various work in construction. To have knowledge of using SOR &amp; SSR for analysis of rates on various works and basics of planning tools for a construction projects.</p>								
<p>Course Outcome: On completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>• understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.</li> <li>• quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.</li> <li>• understand how competitive bidding works and how to submit a competitive bid proposal.</li> <li>• An idea of how to optimize construction projects based on costs</li> <li>• An idea how construction projects are administered with respect to contract structures and issues.</li> <li>• An ability to put forward ideas and understandings to others with effective communication processes.</li> </ul>								
Unit: I	General items of work in Building				No. of Classes: 12			
General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating. Detailed Estimates of Buildings								
Unit: II	Reinforcement bar bending and bar requirement				No. of Classes: 12			
Reinforcement bar bending and bar requirement schedules Earthwork for roads and canals.								

Unit: III	Rate Analysis	No. of Classes: 12
Rate Analysis – Working out data for various items of work over head and contingent charges		
Unit: IV	Contracts	No. of Classes: 12
Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation - Standards specifications for different items of building construction.		
Unit: V	<b>Construction project planning</b>	No. of Classes: 12
<p><b>Construction project planning-</b> Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts.</p> <p>Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three-time estimates, analysis, slack computations, calculation of probability of completion</p>		
<p><b>NOTE: NUMBER OF EXERCISES PROPOSED:</b></p> <ol style="list-style-type: none"> <li>Three in flat Roof &amp; one in Sloped Roof Exercises on Data – three Nos</li> </ol>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>Estimating and Costing by B.N. Dutta, UBS publishers, 2000.</li> <li>Estimating and Costing by G.S. Birdie</li> <li>Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016</li> <li>Chitkara, K. K. Construction Project Management. Tata McGraw-Hill Education, 2014.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>Standard Schedule of rates and standard data book by public works department.</li> <li>S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works– B.I.S.)</li> <li>Estimation, Costing and Specifications by M. Chakraborti; Laxmi publications.</li> <li>Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011</li> <li>Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006</li> <li>Jha, Kumar Neeraj., Construction Project management, Theory &amp; Practice, Pearson Education India, 2015.</li> </ol>		
<p>Web References:</p> <p><a href="https://nptel.ac.in/courses/105/103/105103093/">https://nptel.ac.in/courses/105/103/105103093/</a></p>		
<p>E-Text Books:</p> <p><a href="https://drive.google.com/file/d/1TsG32d5bspMwx0xIoMsU5_Gn45amxMGk/view">https://drive.google.com/file/d/1TsG32d5bspMwx0xIoMsU5_Gn45amxMGk/view</a></p>		

**CE711PE: REMOTE SENSING & GIS (PE – III)**

B.Tech. IV Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE711PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Geoinformatics								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>• Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digitalimages</li> <li>• know the concept of Geographical Information System (GIS), coordinate system GIS Dataand its types</li> <li>• Understand the students managing the spatial Data Using GIS.</li> <li>• Understand Implementation of GIS interface for practical usage.</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>• <b>Describe</b> different concepts and terms used in Remote Sensing and its data</li> <li>• Understand the Data conversion and Process in different coordinate systems of GIS interface</li> <li>• <b>Evaluate</b> the accuracy of Data and implementing a GIS</li> <li>• <b>Understand the applicability of</b> RS and GIS for various applications.</li> </ul>								
Unit: I	Concepts of Remote Sensing Basics of remote sensing					No. of Classes: 9		
<p>Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology &amp; units, energy resources, energy interactions with earth surface features &amp; atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, typesof sensors. Remote Sensing Platforms and Sensors, <b>IRS satellites, Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation.</b></p> <p>Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative &amp; quantitative analysis and pattern recognition, classification techniques and accuracy estimation.</p>								
Unit: II	Introduction to GIS					No. of Classes: 9		
<p><b>Introduction to GIS:</b> Introduction, History of GIS, GIS Components, GIS Applications in Real life, TheNature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co- ordinate systems, Map projections, Map transformation, Geo-referencing,</p>								

Unit: III	Spatial Database Management System and data structures	No. of Classes: 9
<p><b>Spatial Database Management System:</b> Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization</p> <p><b>Data models and data structures:</b> Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata.</p>		
Unit: IV	Spatial Data input and Editing, Analysis	No. of Classes: 9
<p><b>Spatial Data input and Editing:</b> Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macrocomponents of accuracy, sources of error in GIS.</p> <p><b>Spatial Analysis:</b> Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.</p> <p><b>Terrain Analysis: Generation of Contours and analyzing them using software like QGIS, SURFER, ArcGIS.etc...</b></p> <p><b>LiDAR (Light Detection And Ranging) – Principles and Properties -Application of LiDAR in land resources survey.</b></p>		
Unit: V	Implementing a GIS and Applications	No.of Classes: 9
<p><b>Implementing a GIS:</b> Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS</p> <p><b>Applications of GIS:</b> GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.</p>		
Text Books:		
<ol style="list-style-type: none"> <li>1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2<sup>nd</sup> Edition, 2011.</li> <li>2. Introduction to Geographic Information systems by Kang-tsung Chang, McGraw Hill Education(Indian Edition), 7<sup>th</sup> Edition, 2015.</li> <li>3. Fundamentals of Geographic Information systems by Michael N. Demers, 4<sup>th</sup> Edition, WileyPublishers, 2012.</li> </ol>		
Reference Books:		
<ol style="list-style-type: none"> <li>1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, WileyPublishers, 7<sup>th</sup> Edition, 2015.\</li> <li>2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3<sup>rd</sup> Edition, 2010.</li> <li>3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R.SathiKumar, N. Madhu, Pearson Education, 1<sup>st</sup> Edition, 2007.</li> <li>4. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy.</li> </ol>		
Web References:		
<p><a href="https://nptel.ac.in/courses/105/108/105108077/">https://nptel.ac.in/courses/105/108/105108077/</a></p>		
E-Text Books:		
<p><a href="https://www.gisresources.com/wp-content/uploads/2013/09/anji-reddy_GIS.pdf">https://www.gisresources.com/wp-content/uploads/2013/09/anji-reddy_GIS.pdf</a></p>		

CE712PE: GROUND IMPROVEMENT TECHNIQUES (PE – III)

B.Tech. IV Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE712PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Geo-Technical Engineering, Foundation Engineering								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>• To know the need of ground improvement</li> <li>• To acquire the knowledge on the various ground improvement techniques available and their applications for different types of soils</li> <li>• To understand suitable ground improvement technique for given soil conditions.</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>• Know the necessity of ground improvement</li> <li>• Understand the various ground improvement techniques available</li> <li>• Select &amp; design suitable ground improvement technique for existing soil conditions in the field.</li> </ul>								
Unit: I	Introduction to Engineering Ground Modification					No. of Classes: 9		
<p><b>Introduction to Engineering Ground Modification:</b> Need and objectives, Identification of soil types, In situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, and their applications.</p>								
Unit: II	Mechanical Modification					No. of Classes: 9		
<p><b>Mechanical Modification:</b> Shallow Compaction Techniques- Deep Compaction Techniques- Blasting-Vibrocompaction- Dynamic Tamping and Compaction piles.</p>								

Unit: III	Hydraulic Modification	No. of Classes: 9
<p><b>Hydraulic Modification:</b> Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering-Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains,</p>		
Unit: IV	Physical and Chemical Modification	No. of Classes: 9
<p><b>Physical and Chemical Modification</b> – Modification by admixtures, Modification Grouting, Introduction to Thermal Modification including freezing.</p>		
Unit: V	Modification by Inclusions and Confinement	No. of Classes: 9
<p><b>Modification by Inclusions and Confinement</b> - Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill publications</li> <li>M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey</li> <li>Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.</li> <li>Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley &amp; Sons, 1994.</li> <li>K. Krisch &amp; F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis</li> <li>Donald P Coduto – Foundation Design Principles and Practices, 2<sup>nd</sup> edition, Pearson, Indian edition, 2012.</li> </ol>		
<p>Web References:</p>		
<p>E-Text Books:</p>		



### CE713PE: ADVANCED STRUCTURAL DESIGN (PE – III)

B.Tech. IV Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE713PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Structural Engineering I(RCC) & II(STEEL) and Structural analysis								
Course Objectives: The objectives of the course are to: To make the student more conversant with the design principles of critical structures using limit state approach.								
Course Outcomes: Upon completion of this course, students should be able to: <ul style="list-style-type: none"> <li>Enhance the capabilities to design the special structural elements as per Indian standard code of practice.</li> <li>Analyze, design, draw and detailing of critical structural components with a level of accuracy.</li> </ul>								
Unit: I	Design and Detailing of cantilever					No. of Classes: 9		
Design and Detailing of cantilever type of Retaining walls – Stability Check. Principles & Design of Counter fort Retaining walls.								
Unit: II	Flat slabs, Ribbed slabs					No. of Classes: 9		
<b>Flat slabs:</b> Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs- Check for one way and two way shears <b>Ribbed slabs:</b> Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.								

Unit: III	Design of RCC Circular Water Tanks	No. of Classes: 9
<b>Design of RCC Circular Water Tanks .</b>		
Unit: IV	Introduction - Definition and basic forms	No. of Classes: 9

Introduction - Definition and basic forms – Components of a bridge - Classification of bridges – IRC Loading Standards and specifications - Design of Reinforced Concrete Slab Bridge decks.

Unit: V

Design of Steel Gantry Girders.

No.of Classes: 9

**Design of Steel Gantry Girders.**

**Text Books:**

1. Advanced RCC by Krishnam Raju, CBS Publishers & distributors, New Delhi.
2. Advanced RCC by Varghese, PHI Publications, New Delhi.
3. Structural Design and drawing (RCC and steel) by Krishnam Raju, Univ. Press, New Delhi
4. R.C.C Structures by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi.

**Reference Books:**

1. RCC Designs by Sushil Kumar, standard publishing house.
2. Fundamentals of RCC by N.C. Sinha and S.K. Roy, S. Chand Publications, New Delhi.
3. N. Krishna Raju, Design of Bridges, Oxford & IBH Publishing Company Pvt. Ltd, New Delhi. Fourth edition 2009.

**Web References:**

**E-Text Books:**

## CE721PE: IRRIGATION AND HYDRAULIC STRUCTURES (PE – IV)

B.Tech. IV Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE721PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Hydraulics, Hydrology & Water Resources Engineering								
Course Objectives: The objectives of the course are to: <ul style="list-style-type: none"> <li>To study various types of storage works and, diversion headwork, their components and design principles for their construction.</li> </ul>								
Course Outcomes: Upon completion of this course, students should be able to: <ul style="list-style-type: none"> <li>Know types of water retaining structures for multiple purposes and its key parameters considered for planning and designing</li> <li>Understand details in any Irrigation System and its requirements</li> <li>Know, Analyze and Design of a irrigation system components.</li> </ul>								
Unit: I	Storage Works-Reservoirs					No. of Classes: 9		
Storage Works-Reservoirs - Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation –Life of Reservoir. Types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.								
Unit: II	Gravity dams					No. of Classes: 9		
Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.								

Unit: III	Earth dams	No. of Classes: 9
<p>Earth dams: types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage. Spillways: types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins Significance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of Stilling Basins.</p>		
Unit: IV	Diversion Head works	No. of Classes: 9
<p>Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion head work - components. Causes and failure of Weirs and Barrages on permeable foundations, -Silt Ejectors and Silt Excluders Weirs on Permeable Foundations – Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.</p>		
Unit: V	Canal Falls	No. of Classes: 9
<p>Canal Falls - types of falls and their location, Design principles of Notch Fall and Sarada type Fall. Canal regulation works, principles of design of cross and distributary head regulators, types of Canal escapes - types of canal modules, proportionality, sensitivity, setting and flexibility. Cross Drainage works: types, selection of suitable type, various types, design considerations for cross .</p>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg, Khanna Publishers.</li> <li>2. Irrigation engineering by K. R. Arora Standard Publishers.</li> <li>3. Irrigation and water power engineering by Punmia &amp; Lal, Laxmi publications Pvt. Ltd., New Delhi.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Theory and Design of Hydraulic structures by Varshney, Gupta &amp; Gupta</li> <li>2. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers 2015.</li> <li>3. Irrigation Theory and Practice by A. M. Micheal Vikas Publishing House 2015.</li> <li>4. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers.</li> </ol>		
<p><b>Web References:</b></p> <p><a href="https://nptel.ac.in/courses/105/105/105105110/">https://nptel.ac.in/courses/105/105/105105110/</a></p>		
<p><b>E-Text Books:</b></p> <p><a href="https://www.academia.edu/39785798/_G_L_Asawa_Irrigation_and_Water_Resources_Engin_z_lib_org_?e_mail_work_card=view-paper">https://www.academia.edu/39785798/_G_L_Asawa_Irrigation_and_Water_Resources_Engin_z_lib_org_?e_mail_work_card=view-paper</a></p>		

**CE722PE: PIPELINE ENGINEERING (PE – IV)**

B.Tech. IV Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE722PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Fluid Mechanics, Hydraulics and Hydraulic machinery								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>To familiarize the students with the various elements and stages involved in transportation of water.</li> <li>To understand standards and practices in piping design.</li> <li>To know various equipment and their operation in pipeline transportation.</li> <li>To understand technology in transportation of fluids.</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>Get an understanding of the key steps in a pipeline's lifecycle: design, construction, installation, asset management and maintenance.</li> </ul>								
Unit: I	Elements of pipeline design, Pipeline route selection, survey and geotechnical guidelines					No. of Classes: 9		
<p><b>Elements of pipeline design:</b> Types of piping systems; transmission lines, In-plant piping systems, Distribution mains, Service lines. Types of Water distribution networks; serial networks, branched networks and looped networks. Network components and Network model. Basic hydraulic principles; continuity and Energy principle.</p> <p><b>Pipeline route selection, survey and geotechnical guidelines:</b> Introduction - Preliminary route selection - Key factors for route selection - Engineering survey - Legal survey - Construction / As-built survey - Geotechnical design.</p>								
Unit: II	Frictional Head loss in Pipes					No. of Classes: 9		
<p><b>Frictional Head loss in Pipes:</b> Major and Minor losses, Artificially roughened pipes, Moody Diagram. Friction coefficient relationships, Empirical formulae, Simple pipe flow problems Equivalent pipes; pipes in series, parallel, series-parallel; problems. Water Hammer and energy transmission through pipes: gradual and Instantaneous closure.</p>								

Unit: III	Reservoirs, Pumps and Valves, Network Parameters and Types of analysis	No. of Classes: 9
<p><b>Reservoirs, Pumps and Valves:</b> Types of Reservoirs, Pumps; introduction, system head-discharge- pump head and head-discharge relationships, characteristic curves, pump combination. Valves: check valves, flow control valves, Pressure Reducing valves, both Flow control and Pressure Reducing Valves.</p> <p><b>Network Parameters and Types of analysis:</b> Network parameters, Parameter interrelationships, Necessity of Analysis, common Assumptions, types of analysis, rules for Solvability of Pipe networks.</p>		
Unit: IV	Network Formulation of Equations	No. of Classes: 9
<p><b>Network Formulation of Equations:</b> States of parameters, Single-Source Networks with known pipe Resistances. Multisource Networks with known pipes resistances. Networks with unknown pipe resistances. Inclusion of Pumps, Check Valves, Flow Control Valves and Pressure Reducing Valves –Problems.</p> <p>Hardy Cross Method: Methods of balancing heads (Loop Method). Method of Balancing Flows (Node Method). Modified Hardy Cross Method. Convergence Problem. Different software for WDN analysis and design.</p>		
Unit: V	Materials selection and quality management, Pipeline construction, protection, Instrumentation, pigging & Operations	No.of Classes: 9
<p><b>Materials selection and quality management:</b> Elements of design – Materials designation standards – Quality management.</p> <p><b>Pipeline construction:</b> Construction – Commissioning.</p> <p><b>Pipeline protection, Instrumentation, pigging &amp; Operations:</b> Pipeline coating – Cathodic protection – Cathodic protection calculations for land pipelines – Internal corrosion – Flow meters and their calibration – Sensors – Pigs-Pipeline Operations and maintenance.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Analysis of Water Distribution Networks, P.R. Bhave and R. Gupta, Narosa Publishing House Pvt. Ltd.</li> <li>2. Pipeline Engineering, Henry Liu, Lewis Publishers (CRC Press), 2003.</li> <li>3. Piping and Pipeline Engineering: Design, Construction, Maintenance Integrity and Repair, George A. Antaki, CRC Press, 2003.</li> </ol>		

Reference Books:

1. Piping Calculation Manual, E. Shashi Menon, McGraw-Hill, 2004.
2. Pipeline Rules of Thumb Handbook, E. W. McAllister, 7<sup>th</sup> Edition, 2009.
3. Liquid Pipeline Hydraulics, E. Shashi Menon, Mareel Dekker Inc., 2004.

Web References:

E-Text Books:

## CE723PE: GROUND WATER HYDROLOGY (PE – IV)

B.Tech. IV Year I Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE723PE	PCC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: Hydraulics & Fluid Mechanics								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li><b>To explain</b> the concepts of Groundwater Development and Management.</li> <li>To <b>demonstrate and</b> derive the basic equations used in Groundwater development and management and the corresponding equations</li> </ul> <p>To know the investigations, field studies to conduct basic ground water studies.</p>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li><b>Identify</b> different fundamental equations and concepts as applied in the Groundwater studies</li> <li><b>Discuss</b> and derive differential equation governing groundwater flow in three dimensions</li> <li>To <b>solve</b> groundwater mathematical equations and analyze pumping tests in steady and non-steady flow cases</li> <li><b>Distinguish</b> and understand the saline water intrusion problem in costal aquifers.</li> </ul>								
Unit I	<b>Ground Water Occurrence</b>					No. of Classes: 9		
<p><b>Ground Water Occurrence</b>            Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, Vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as aquifers, types of aquifers, porosity, specific yield and specific retention. Ground Water Movement-Permeability, Darcy's law, storage coefficient, Transmissivity, Differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system, ground water flow contours and their applications.</p>								
Unit II	<b>Analysis of Pumping Test Data-I</b>					No. of Classes: 9		
<p><b>Analysis of Pumping Test Data-I</b>            Steady flow ground water flow towards a well in confined and unconfined aquifers- Dupit's and Theism's equations, assumptions, formation constants, yield of an open well interface and well tests.</p>								



Unit III	<b>Analysis of Pumping Test Data-II</b>	No. of Classes: 9
<p><b>Analysis of Pumping Test Data-II</b>  Unsteady flow towards well-Non-Equilibrium equations, Theis solution, Jacob and Chow's simplifications, Leak aquifers.</p>		
Unit IV	<b>Surface and sub-surface Investigation</b>	No. of Classes: 9
<p><b>Surface and sub-surface Investigation</b>  surface methods of exploration-Electrical resistivity method and Seismic refraction methods. Subsurface methods geophysical logging and resistivity logging. Concept of artificial recharge of ground water, recharge methods, Applications of GIS and RS in artificial recharge of ground water along with case studies.</p>		
Unit V	<b>Saline water intrusion in aquifer</b>	No. of Classes: 9
<p><b>Saline water intrusion in aquifer</b>  Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of water intrusion. Ground water basin management-case studies.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Ground water Hydrology by David Keith Todd, John Wiley &amp; Son, New York.</li> <li>2. Ground water by H.M. Raghunath, Wiley Eastern Ltd.</li> <li>3. Groundwater System Planning &amp; Management, R. Willes &amp; W.W.G. Yeh, Prentice Hall.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Ground water by Bawvwr, John Wiley &amp; Sons.</li> <li>2. Applied Hydrogeology by C.W. Fetta, CBS Publishers &amp; Distributors.</li> </ol> <p>Ground Water Assessment, Development and Management by K R Karanth, McGraw Hill Publications</p>		
<p>Web References:</p>		
<p>E-Text Books:</p>		

## CS7000E: DATA STRUCTURES (Open Elective - II)

B.Tech. CSE/IT IV Year I Sem

L T P C  
3 0 0 3

### Prerequisite:

1. A course on “Programming for Problem Solving “

### Course Objectives:

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms

### Course Outcomes:

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

### UNIT - I

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

### UNIT - II

**Dictionaries:** linear list representation, skip list representation, operations - insertion, deletion and searching.

**Hash table representation:** hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

### UNIT - III

**Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

### UNIT - IV

**Graphs:** Graph Implementation Methods. Graph Traversal Methods.

**Sortings:** Heap Sort, External Sorting- Model for external sorting, Merge Sort.

### UNIT - V

**Pattern matching and Tries:** Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

### TEXT BOOKS:

1. Fundamentals of data structures in C, 2<sup>nd</sup> edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press.
2. Data structures using c – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

### REFERENCE BOOKS:

1. Data structures: A Pseudocode Approach with C, 2<sup>nd</sup> edition, R.F.Gilberg And B.A.Forouzan, Cengage Learning.
2. Introduction to data structures in c, 1/e Ashok Kamthane.

## SM702MS: PROFESSIONAL PRACTICE, LAW AND ETHICS (PC)

B.Tech. IV Year I Semester

L	T	P	C
2	0	0	2

### Course Objectives:

- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession.

**Course Outcome:** The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen

### UNIT - I

Professional Practice and Ethics: Definition of Ethics, Professional Ethics - Engineering Ethics, Personal Ethics; Code of Ethics - Profession, Professionalism, Professional Responsibility, Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. Introduction to GST- Various Roles of Various Stake holders

### UNIT - II

Law of Contract: Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

### UNIT - III

Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats.

### UNIT - IV

Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other - Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017.

### UNIT - V

Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970

### TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ravinder Kaur, Legal Aspects of Business, 4e, Cengage Learning, 2016.

### REFERENCE BOOKS:

1. RERA Act, 2017.
2. Wadhwa (2004), Intellectual Property Rights, Universal Law Publishing Co.
3. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.
4. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers.

## CE811PE: SOLID WASTE MANAGEMENT (PE – V)

B.Tech. IV Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE811PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite:								
Course Objectives: The objectives of the course are to: <ul style="list-style-type: none"> <li><b>Define</b> the terms <b>and Understands</b> the necessity of solid waste management</li> <li><b>Explain</b> the strategies for the collection of solid waste</li> <li><b>Describe</b> the solid waste disposal methods</li> <li><b>Categorize</b> Hazardous Waste.</li> </ul>								
Course Outcomes: Upon completion of this course, students should be able to: <ul style="list-style-type: none"> <li>Identify the physical and chemical composition of solid wastes</li> <li>Analyze the functional elements for solid waste management.</li> <li>Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.</li> <li>Identify and design waste disposal systems.</li> </ul>								
Unit: I	<b>Solid Waste</b>					No. of Classes: 9		
<b>Solid Waste:</b> Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management - Integrated solid waste management, Solid Waste Management Rules 2016.								
Unit: II	<b>Engineering Systems for Solid Waste Management</b>					No. of Classes: 9		
<b>Engineering Systems for Solid Waste Management:</b> Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning - transfer and transport; processing techniques;								

Unit: III	<b>Engineering Systems for Resource and Energy Recovery</b>	No. of Classes: 9
<p><b>Engineering Systems for Resource and Energy Recovery:</b> Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composting - recovery of thermal conversion products; Pyrolysis, Gasification, RDF - recovery of energy from conversion products; materials and energy recovery systems.</p>		
Unit: IV	<b>Landfills</b>	No. of Classes: 9
<p><b>Landfills:</b> Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.</p>		
Unit: V	<b>Hazardous waste Management</b>	No. of Classes: 9
<p><b>Hazardous waste Management:</b> – Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Tchobanoglous G, Theisen H and Vigil SA ‘Integrated Solid Waste Management, Engineering Principles and Management Issues’ McGraw-Hill, 1993.</li> <li>4. Vesilind PA, Worrell W and Reinhart D, ‘Solid Waste Engineering’ Brooks/Cole Thomson Learning Inc., 2002.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, ‘Environmental Engineering’, McGraw Hill Inc., New York, 1985.</li> <li>2. Qian X, Koerner RM and Gray DH, ‘Geotechnical Aspects of Landfill Design and Construction’ Prentice Hall, 2002.</li> </ol>		
<p>Web References:</p>		
<p>E-Text Books:</p>		

## CE812PE: ENVIRONMENTAL IMPACT ASSESSMENT (PE – V)

B.Tech. IV Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE812PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite:								
Course Objectives: The objectives of the course are to: <ul style="list-style-type: none"> <li><b>Define and Classify</b> Environmental Impacts and the terminology</li> <li><b>Understands</b> the environmental Impact assessment procedure</li> <li><b>Explain</b> the EIA methodology</li> <li><b>List and describe</b> environmental audits.</li> </ul>								
Course Outcomes: Upon completion of this course, students should be able to: <ul style="list-style-type: none"> <li>Identify the environmental attributes to be considered for the EIA study</li> <li>Formulate objectives of the EIA studies</li> <li>Identify the methodology to prepare rapid EIA</li> <li>Prepare EIA reports and environmental management plans.</li> </ul>								
Unit: I	<b>Introduction</b>					No. of Classes: 9		
<b>Introduction:</b> The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.								
Unit: II	<b>EIA Methodologies</b>					No. of Classes: 9		
<b>EIA Methodologies:</b> Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts								

Unit: III	<b>Environmental Management Plan</b>	No. of Classes: 9
<p><b>Environmental Management Plan:</b> EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief &amp; Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.</p>		
Unit: IV	<b>Environmental Legislation and Life cycle Assessment</b>	No. of Classes: 9
<p><b>Environmental Legislation and Life cycle Assessment:</b> Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules.</p> <p>Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria-case studies.</p>		
Unit: V	<b>Case Studies</b>	No. of Classes: 9
<p><b>Case Studies:</b> Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S.Publications, Hyderabad, 2007</li> <li>2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co., New York, 1991.</li> <li>2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.</li> </ol>		
<p>Web References:</p>		
<p>E-Text Books:</p>		

## CE813PE: AIR POLLUTION (PE – V)

B.Tech. IV Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE813PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite:								
Course Objectives: The objectives of the course are to: <ul style="list-style-type: none"> <li>• <b>Understand the</b> Air pollution Concepts</li> <li>• <b>Identify</b> the source of air pollution</li> <li>• <b>Know</b> Air pollution Control devices</li> <li>• <b>Distinguish the</b> Air quality monitoring devices</li> </ul>								
Course Outcomes: Upon completion of this course, students should be able to: <ul style="list-style-type: none"> <li>• Identify sampling and analysis techniques for air quality assessment</li> <li>• Describe the plume behavior for atmospheric stability conditions</li> <li>• Apply plume dispersion modelling and assess the concentrations</li> <li>• Design air pollution controlling devices.</li> </ul>								
Unit: I	<b>Air Pollution</b>					No. of Classes: 9		
<b>Air Pollution:</b> Definition of Air Pollution - Sources & Classification of Air Pollutants - Effects of air pollution - Global effects – Ambient Air Quality and standards – Monitoring air pollution, Sampling and analysis of Pollutants in ambient air - Stack sampling.								
Unit: II	<b>Meteorology and Air Pollution</b>					No. of Classes: 9		
<b>Meteorology and Air Pollution:</b> Factors influencing air pollution, Wind rose, Mixing Depths, Lapse rates and dispersion - Atmospheric stability, Plume behaviour, Plume rise and dispersion, Prediction of air quality, Box model - Gaussian model - Dispersion coefficient - Application of tall chimney for Pollutant dispersion.								



Unit: III	<b>Control of Particulate Pollutants</b>	No. of Classes: 9
<p><b>Control of Particulate Pollutants:</b> Properties of particulate pollution - Particle size distribution - Control mechanism - Dust removal equipment – Working principles and operation of settling chambers, cyclones, wet dust scrubbers, fabric filters &amp; ESP.</p>		
Unit: IV	<b>Control of Gaseous Pollutants</b>	No. of Classes: 9
<p><b>Control of Gaseous Pollutants:</b> Process and equipment for the removal by chemical methods - Working principles and operation of absorption and adsorption equipment - Combustion and condensation equipment.</p>		
Unit: V	<b>Automobile and Indoor Pollution</b>	No. of Classes: 9
<p><b>Automobile and Indoor Pollution:</b> Vehicular pollution – Sources and types of emission – Effect of operating conditions-Alternate fuels and emissions-Emission controls and standards, Strategies to control automobile pollution– Causes of indoor air pollution-changes in indoor air quality-control and air cleaning systems-indoor air quality.</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> <li>1. M.N. Rao and HVN Rao, Air Pollution, Tata McGraw Hill Publishers</li> <li>2. Noel, D. N., Air Pollution Control Engineering, Tata McGraw Hill Publishers, 1999.</li> </ol>		
<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000.</li> <li>2. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford &amp; I.B.H.</li> <li>3. Air Pollution and Health by T. Holgate, Hillel S. Koren, Jonathan M. Samet, Robert L. Maynardpublisher Academic Press.</li> </ol>		
<p>Web References:</p>		
<p>E-Text Books:</p>		

**CE821PE: AIRPORT, RAILWAYS, AND WATERWAYS (PE – VI)**

B.Tech. IV Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE821PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite:								
<p>Course Objectives: The objectives of the course are to:</p> <ul style="list-style-type: none"> <li>Deal with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage.</li> <li>Introduce component of railway tracks, train resistance, crossing, signaling, high speed tracks and Metro Rail.</li> <li>Explain the classes of harbors, features, planning and design of port facilities.</li> </ul>								
<p>Course Outcomes: Upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>An ability to design of runways and taxiways.</li> <li>An ability to design the infrastructure for large and small airports</li> <li>An ability to design various crossings and signals in Railway Projects.</li> <li>An ability plan the harbors and ports projects including the infrastructure required for newports and harbors.</li> </ul>								
Unit: I	<b>Airport Engineering</b>					No. of Classes: 9		
<p><b>Airport Engineering:</b> Introduction to Air Transportation - Aircraft Characteristics - Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram.</p>								
Unit: II	<b>Introduction to Railways</b>					No. of Classes: 9		
<p><b>Introduction to Railways:</b> Role of Indian Railways in national development – Railways for Urban Transportation – LRT, Mono Rail, Metro Rail &amp; MRTS. Permanent Way: Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density – Functions, Materials, Ballast, Subgrade and Embankments, Ballast less Tracks.</p>								

Unit: III	<b>Geometric Design of Railway Track</b>	No. of Classes: 9
<b>Geometric Design of Railway Track:</b> Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.		
Unit: IV	<b>Track maintenance and Operation</b>	No. of Classes: 9
<b>Track maintenance and Operation:</b> Points and Crossings - Turnouts, Stations and Yards - Level Crossings. Signaling and Interlocking - Track Circuiting - Track Maintenance.		
Unit: V	<b>Dock &amp; Harbour Engineering</b>	No. of Classes: 9
<b>Dock &amp; Harbour Engineering:</b> Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification. Harbour works: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lock gates: materials, size, Dredging: classification, dredgers, uses of dredged materials.		
Text Books:		
<ol style="list-style-type: none"> <li>1. Venkataramaiah C(2016), "Transportation Engineering Vol II – Railways, Airports, Docks, Harbors, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad</li> <li>2. J S Mundry, Railway Track Engineering (5<sup>th</sup> Edition) McGraw Hill Education 2017.</li> </ol>		
Reference Books:		
<ol style="list-style-type: none"> <li>1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)</li> <li>2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28<sup>th</sup> Edition, Charotar Publishing House Pvt. Ltd.</li> <li>3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)</li> <li>4. Robert Horonjeff, Francis X. McKelvey, William J Sproule, Seth B. Young (2010), Planning &amp; Design of Airports, McGraw-Hill Professional.</li> <li>5. Transportation Engineering by R. Srinivasa Kumar, University Press India.</li> </ol>		
Web References:		
E-Text Books:		

## CE822PE: URBAN TRANSPORTATION PLANNING (PE – VI)

B.Tech. IV Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE822PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Tutorial Classes: 0		Practical Classes: 0			Total Classes: 45	
<b>Prerequisite: Transportation Engineering</b>								
Unit: I	<b>Transport Planning Process</b>					No. of Classes: 9		
<p><b>Transport Planning Process:</b> Scope – interdependence of land use and traffic – systems approach to transport planning – Transport surveys – definition of study area – zoning survey - types and methods</p> <p>inventory on transport facilities - inventory of land use and economic activities.</p>								
Unit: II	<b>Trip Generation</b>					No. of Classes: 9		
<p><b>Trip Generation:</b> Factors governing trip generation and attraction rates – multiple linear regression analysis – category analysis – critical appraisal of techniques</p>								

Unit: III	<b>Trip Distribution Methods</b>					No. of Classes: 9		
<p><b>Trip Distribution Methods:</b> Presentation of trip distribution data - PA matrix to OD matrix – Growth factor methods - gravity model and its calibration – opportunity model</p>								
Unit: IV	<b>Modal split analysis</b>					No. of Classes: 9		
<p><b>Modal split analysis:</b> Influencing factors – Earlier modal split models: Trip end type and trip interchange type – limitations – Disaggregate mode choice model – Logit model - binary choice situations – multinomial logit model – model calibration</p>								
Unit: V	<b>Route assignment</b>					No. of Classes: 9		
<p><b>Route assignment:</b> Description of highway network – route choice behaviour – shortest path algorithm</p> <p>- assignment techniques – all nothing assignment – multi path assignment – capacity restrained assignment – diversion curves</p>								

**Text Books:**

1. Kadiyali, LR (1987), Traffic Engineering and Transportation Planning, Khanna Publishers, NewDelhi.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. McGraw Hill BookCompany, New York.

**Reference Books:**

1. Papacostas, C. S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning.3rd Edition, Prentice - Hall of India Pvt Ltd.
2. NPTEL videos on Urban Transportation Planning, Dr. V. Tamizh Arasan, IIT Madras
3. Paul.H. Wright (1995), Transportation Engineering – Planning & Design, John Wiley & Sons,New york.
4. John W Dickey (1995), Metropolitan Transportation Planning, Tata McGraw-Hill publishingcompany Ltd, New Delhi.

**Web References:**

**E-Text Books:**

**CE823PE: FINITE ELEMENT METHODS FOR CIVIL ENGINEERING  
(PE – VI)**

B.Tech. IV Year II Semester								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE823PE	PEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 45			
Prerequisite: SA – I & SA – II								
<p>Course Objectives: The objectives of the course are to: The subject provides introduction to finite element methods to analyse structural elements.</p>								
<p>Course Outcomes: Upon completion of this course, students should be able to: At the end of the course the student will able to Ansllyse simple structrual elements using Finite Element approach.</p>								
Unit: I	Introduction to Finite Element Method					No. of Classes: 9		
<p>Introduction to Finite Element Method – Basic Equations in Elasticity Stress – Strain equation – concept of plane stress – plane strain advantages and disadvantages of FEM. Element shapes – nodes – nodal degree of freedom Displacement function – Natural Coordinates – strain displacement relations.</p>								
Unit: II	Lagrangian – Serendipity elements – Hermite polynomials – regular					No. of Classes: 9		
<p>Lagrangian – Serendipity elements – Hermite polynomials – regular, Irregular 2 D &amp; 3D – Element – shape functions upto quadratic formulation. Finite Element Analysis (FEA) of – one dimensional problems – Bar element – Shape functions stiffnessmatrix – stress – strain relation</p>								

Unit: III	FEA Beam elements	No. of Classes: 9
FEA Beam elements – stiffness matrix - shape function– Analysis of continuous beams.		
Unit: IV	FEA Two-dimensional problem	No. of Classes: 9
FEA Two-dimensional problem – CST – LST element – shape function – stress – strain. Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis - formulation of CST element.		
Unit: V	Solution Techniques	No. of Classes: 9
Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.		
Text Books:		
<ol style="list-style-type: none"> <li>1. A first course in Finite Element Method by Daryl L. Logan, 5<sup>th</sup> Edition, Cengage Learning India Pvt. Ltd.</li> <li>2. Introduction to finite Elements in Engineering by Tirupathi R. Chandrupatla, and Ashok D. Belegundu, Prentice Hall of India</li> </ol>		
Reference Books:		
<ol style="list-style-type: none"> <li>1. Finite Element Analysis by P. Seshu, PHI Learning Private Limited</li> <li>2. Concepts and applications of Finite Element Analysis by Robert D. Cook <i>et al.</i>, Wiley India Pvt. Ltd.</li> <li>3. Applied Finite Element Analysis by G. Ramamurty, I.K. International Publishing House Pvt. Ltd.</li> </ol>		
Web References:		
E-Text Books:		

## CE6000E: DISASTER PREPAREDNESS & PLANNING MANAGEMENT (Open Elective - I)

B.Tech. Civil Engg. III Year II Sem.

L	T/P/D	C
3	0/0/0	3

**Course Objectives:** The objectives of the course are

- To Understand basic concepts in Disaster Management.
- To Understand Definitions and Terminologies used in Disaster Management.
- To Understand Types and Categories of Disasters.
- To Understand the Challenges posed by Disasters.
- To understand Impacts of Disasters Key Skills.

**Course Outcomes:** The student will develop competencies in

- the application of Disaster Concepts to Management.
- Analyzing Relationship between Development and Disasters.
- Ability to understand Categories of Disasters.
- Realization of the responsibilities to society.

### UNIT - I:

**Introduction** - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

### UNIT - II

**Disasters** - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

### UNIT - III

**Disaster Impacts** - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

### UNIT - IV

**Disaster Risk Reduction (DRR)** - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

### UNIT - V

**Disasters, Environment and Development** - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.



**TEXT BOOKS:**

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, RajatPublication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

**REFERENCE BOOKS:**

1. <http://ndma.gov.in/> (Home page of National Disaster Management Authority)
2. <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State ofCalifornia, EMSA no.214, June 2003
4. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health andPsychosocial Support in Emergency Settings. Geneva: IASC

## CE7000E: REMOTE SENSING & GIS (Open Elective - II)

**B.Tech. Civil Engg. IV Year I Sem.**

**L T/P/D C**  
**3 0/0/0 3**

**Course Objectives:** The objectives of the course are to

- Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images
- know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types
- Understand the students managing the spatial Data Using GIS.
- Understand Implementation of GIS interface for practical usage.

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

- **Describe** different concepts and terms used in Remote Sensing and its data
- Understand the Data conversion and Process in different coordinate systems of GIS interface
- **Evaluate** the accuracy of Data and implementing a GIS
- **Understand the applicability** of RS and GIS for various applications

### UNIT - I

Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

### UNIT- II:

**Introduction to GIS:** Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co- ordinate systems, Map projections, Map transformation, Geo-referencing,

### UNIT- III:

**Spatial Database Management System:** Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization

**Data models and data structures:** Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata,

### UNIT- IV:

**Spatial Data input and Editing:** Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

**Spatial Analysis:** Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques

### UNIT- V: Implementing a GIS and Applications

**Implementing a GIS:** Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS

#### Applications of GIS

GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

**TEXT BOOKS**

1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2<sup>nd</sup> Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGraw Hill Education (Indian Edition), 7<sup>th</sup> Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4<sup>th</sup> Edition, Wiley Publishers, 2012.

**REFERENCE BOOKS**

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, Wiley Publishers, 7<sup>th</sup> Edition, 2015.\
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3<sup>rd</sup> Edition, 2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R. Sathi Kumar, N. Madhu, Pearson Education, 1<sup>st</sup> Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy.

## CE8000E: ENVIRONMENTAL IMPACT ASSESSMENT (Open Elective - III)

**B.Tech. Civil Engg. IV Year II Sem.**

**L T/P/D C**  
**3 0/0/0 3**

Course Objectives: The objectives of the course are to

- **Define and Classify** Environmental Impacts and the terminology
- **Understands** the environmental Impact assessment procedure
- **Explain** the EIA methodology
- **List and describe** environmental audits

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

- Identify the environmental attributes to be considered for the EIA study
- Formulate objectives of the EIA studies
- Identify the methodology to prepare rapid EIA
- Prepare EIA reports and environmental management plans

### UNIT- I

**Introduction:** The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

### UNIT- II

**EIA Methodologies:** Environmental attributes -Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

### UNIT- III

**Environmental Management Plan:** EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

### UNIT- IV

**Environmental Legislation and Life cycle Assessment:** Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules.

Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria-case studies.

### UNIT- V

**Case Studies:** Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

### TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S.Publications, Hyderabad, 2007.
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

### REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.

## POWER PLANT ENGINEERING (IV-II)

### Course Objectives:

- I. **Analyze** different types of steam cycles and estimate efficiencies in a steam power plants
- II. **Impart knowledge on** basic working principles of gas turbine and diesel engine power plants
- III. **To Educate** about solar energy, fuel cells and other direct energy conversion methods.
- IV. **To Illustrate** hydroelectric power generation and renewable energy sources
- V. **To Analyze** the nuclear power stations and power plant economic calculations.

### Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

CO-1	<b>To Understand</b> various types of coal handling equipment, properties of coal and coal combustion techniques	BTL - 2
CO-2	<b>To analyze</b> various types of power plants and their components, performance and analysis of steam turbines and gas turbines.	BTL - 4
CO-3	<b>Evaluate</b> power generation potential of hydro power and wind power turbines	BTL - 5
CO-4	<b>To understand</b> solar energy, fuel cells and other direct energy conversion methods.	BTL - 2
CO-5	<b>To analyze</b> the impact of pollutants on environment and to estimate various costs related to power plants	BTL - 4

### **Syllabus:**

#### **UNIT-I**

Coal Based Thermal Power Plants: Basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems.

#### **UNIT - II**

##### **Internal Combustion Engine Plant:**

Gas Turbine and Combined Cycle Power Plants: Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

#### **UNIT-III**

Basics of Nuclear Energy Conversion: Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

#### **UNIT-IV**

Hydroelectric Power Plants: Classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems.

#### **Unit - V**

Energy, Economic and Environmental Issues: Power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

#### **TEXT BOOKS:**

1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

#### **REFERENCE BOOKS:**

1. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

