

## Curricula of B.E. Degree Syllabus for 3<sup>rd</sup> and 4<sup>th</sup> semester (Second Year) in Civil Engineering (CE)

### SEMESTER – III

SL No	Paper Code	Name of the Paper	Periods/Week			Credit Units	Marks
			L	T	P		
<b>THEORETICAL PAPERS</b>							
1	HS301	Values & Ethics(Non-credit paper)*	3	0	0	0	100
2	M301	Engineering Mathematics-III	3	1	0	3	100
3	ME 301	Basic Engineering Thermodynamics and Fluid Mechanics	3	0	0	2	100
4	CE301	Structural Mechanics	3	1	0	3	100
5	CE302	Surveying-I	3	0	0	3	100
6	CE303	Engineering Geology	3	0	0	2	100
7	CE304	Building Materials & Construction	3	1	0	3	100
<b>PRACTICAL/SESSIONAL PAPERS</b>							
8	CE351	Structural Mechanics Laboratory	0	0	3	2	100
9	CE352	Surveying Practice-I	0	0	3	2	100
10	CE353	Engineering Geology Laboratory	0	0	3	2	100
11	CE381	Civil Engineering Drawing	0	0	3	2	100
		<b>Sub Total:</b>	<b>21</b>	<b>3</b>	<b>12</b>	<b>24</b>	<b>1000</b>
		<b>Total:</b>	<b>36</b>			<b>24</b>	<b>1000</b>

*\*Marks for this paper will not be reflected in total marks for the semester*

### SEMESTER – IV

SL No	Paper Code	Name of the Paper	Periods/Week			Credit Units	Marks
			L	T	P		
<b>THEORETICAL PAPERS</b>							
1	M402	Numerical Method and Optimization Techniques	3	1	0	3	100
2	CE401	Soil Mechanics-I	3	0	0	3	100
3	CE402	Surveying-II	3	1	0	3	100
4	CE403	Structural Analysis-I	3	1	0	3	100
5	CE404	Fluid Mechanics-I	3	0	0	2	100
6	CE405	Quantity Surveying & Valuation	3	0	0	2	100
<b>PRACTICAL/SESSIONAL PAPERS</b>							
7	M452	Numerical Method and Optimization Techniques Laboratory	0	0	3	2	100
8	CE451	Quantity Survey Sessional	0	0	3	2	100
9	CE452	Surveying Practice-II	0	0	3	2	100
10	CE481	Application of AutoCAD	0	0	3	2	100
		<b>Sub Total:</b>	<b>18</b>	<b>3</b>	<b>12</b>	<b>8</b>	<b>1000</b>
		<b>Total:</b>	<b>33</b>			<b>24</b>	<b>1000</b>

**Curricula of B.E. Degree Syllabus for 5<sup>th</sup> and 6<sup>th</sup> semester (Third Year)  
in Civil Engineering (CE)**

**SEMESTER – V**

SL No	Paper Code	Name of the Paper	Periods/Week			Credit Units	Marks
			L	T	P		
<b>THEORETICAL PAPERS</b>							
1	CE501	Soil Mechanics-II	3	1	0	3	100
2	CE502	Environmental Engineering-I	3	1	0	3	100
3	CE503	Structural Analysis-II	3	1	0	3	100
4	CE504	Concrete Technology	3	0	0	3	100
5	CE505	Fluid Mechanics-II	3	0	0	2	100
6	CE506	Water Resources Engineering-I	3	0	0	3	100
<b>PRACTICAL/SESSIONAL PAPERS</b>							
7	CE551	Soil Mechanics Lab-I	0	0	3	2	100
8	CE552	Environmental Engineering Lab	0	0	3	2	100
9	CE553	Concrete Technology Lab-I	0	0	3	2	100
10	CE554	Hydraulics Laboratory	0	0	3	2	100
		<b>Sub Total:</b>	<b>18</b>	<b>3</b>	<b>12</b>	<b>25</b>	<b>1000</b>
		<b>Total:</b>	<b>33</b>			<b>25</b>	<b>1000</b>

**SEMESTER – VI**

SL No	Paper Code	Name of the Paper	Periods/Week			Credit Units	Marks
			L	T	P		
<b>THEORETICAL PAPERS</b>							
1	CE601	Foundation Engineering	3	0	0	2	100
2	CE602	Transportation Engineering-I	3	1	0	3	100
3	CE603	Environmental Engineering-II	3	1	0	3	100
4	CE604	Design of Concrete Structure	3	1	0	3	100
5	CE605	Planning & Construction Management	3	0	0	3	100
6	CE606	Water Resources Engineering-II	3	0	0	3	100
<b>PRACTICAL/SESSIONAL PAPERS</b>							
7	CE651	Soil Mechanics Lab-II	0	0	3	2	100
8	CE652	Transportation Engineering Lab	0	0	3	2	100
9	CE653	Concrete Technology Lab-II	0	0	3	2	100
10	CE681	Design Sessional-I (RCC Structure)	0	0	3	2	100
		<b>Sub Total:</b>	<b>18</b>	<b>3</b>	<b>12</b>	<b>25</b>	<b>1000</b>
		<b>Total:</b>	<b>33</b>			<b>25</b>	<b>1000</b>

## Curricula of B.E. Degree Syllabus for 7<sup>th</sup> and 8<sup>th</sup> semester (Fourth Year) in Civil Engineering (CE)

### SEMESTER – VII

SL No	Paper Code	Name of the Paper	Periods/Week			Credit Units	Marks
			L	T	P		
<b>THEORETICAL PAPERS</b>							
1	CE 701	Design of Steel Structure	3	1	0	3	100
2	CE 702	Hydraulic Structure & Flood Control Engineering	3	0	0	2	100
3	CE 703	Transportation Engineering-II	3	0	0	3	100
4	Refer Appendix I	Elective- I	3	1	0	3	100
5	Refer Appendix II	Elective – II	3	1	0	3	100
<b>PRACTICAL/SESSIONAL PAPERS</b>							
6	HS781	Group Discussion & Personality Development	0	0	2	2	100
7	CE 751	Computer Application in Civil Engineering-I	0	0	3	2	100
8	CE 781	Design Sessional-II (Steel Structure)	0	0	3	2	100
9	CE 791	Project-I	0	0	3	4	100
10	CE 792	Seminar-I	0	0	3	2	100
		<b>Sub Total:</b>	<b>15</b>	<b>3</b>	<b>14</b>	<b>26</b>	<b>1000</b>
		<b>Total:</b>	<b>32</b>			<b>26</b>	<b>1000</b>

### SEMESTER – VIII

SL No	Paper Code	Name of the Paper	Periods/Week			Credit Units	Marks
			L	T	P		
<b>THEORETICAL PAPERS</b>							
1	CE 801	Advance Structural Design	3	0	0	3	100
2	CE802	Pre-stressed Concrete	3	1	0	3	100
3	Refer Appendix-III	Elective-III	3	1	0	3	100
4	Refer Appendix-IV	Elective-IV	3	1	0	3	100
<b>PRACTICAL/SESSIONAL PAPERS</b>							
5	CE 851	Computer Application in Civil Engineering-II	0	0	3	2	100
6	CE 891	Project-II	0	0	6	6	100
7	CE 892	Seminar-II	0	0	3	2	100
8	CE 893	Grand Viva	0	0	0	3	100
		<b>Sub Total:</b>	<b>12</b>	<b>3</b>	<b>12</b>	<b>25</b>	<b>800</b>
		<b>Total:</b>	<b>27</b>			<b>25</b>	<b>800</b>

<b>Appendix-I (Elective-I)</b>		
<b>SL No</b>	<b>Paper Code</b>	<b>Name of the paper</b>
1	CE 711(a)	Structural Dynamics & Earthquake Resistance Structure
2	CE 711 (b)	Dynamics of Soil and Foundation
3	CE 711(c)	Advance Water & Waste Water Technology
4	CE 711 (d)	Rock Mechanics &Tunnelling
5	CE 711 (e)	Water Resource Management & Planning
<b>Appendix-II (Elective-II)</b>		
1	M 712(a)	Mathematical Modelling & Stochastic Process
2	CE 712(a)	Advanced Structural Analysis
3	CE 712(b)	Remote Sensing & GIS
4	CE 712(c)	Environmental Pollution Control Technology
5	CE 712(d)	Urban Transportation System Planning
<b>Appendix-III (Elective-III)</b>		
<b>SL No</b>	<b>Paper Code</b>	<b>Name of the paper</b>
1	HS 811 (a)	Infrastructure Finance
2	CE 811(a)	Solid & Hazardous Waste Management
3	CE 811(b)	Prefabricated Building & Structure
4	CE 811(c)	Composite Structure
5	CE 811(d)	Bridge Engineering
6	CE 811 (e)	Theory of Plates and Shells
<b>Appendix-IV (Elective-IV)</b>		
1	HS 812(a)	Quality Control and Management
2	HS 812 (b)	Industrial Management and Entrepreneurship
3	CE 812 (a)	Traffic Engineering &Transportation Planning
4	CE 812 (b)	Advanced Foundation Engineering
5	CE 812 (c)	Pavement Design
6	CE 812(d)	Design of Offshore Structures

## Semester-III

**Paper Name: Values and Ethics**

**Paper Code: HS 301**

**Weekly Load: L: 3, T: 0, P: 0**

**Credit Point: 03**

**Total Marks: 100**

<b>Module</b>	<b>Course Content</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Nature of professional ethics:-</b> Introduction, definition, morals &ethics sources of ethics, sources of ethics, relationship between ethics and management. Nature of professional ethics, importance of ethics in profession, nature and objectives of ethics, need for ethics. <b>Ethical decision making:-</b> Values, morals, standards, corporate social responsibility, attitude and beliefs, ethical values and dimensions dilemmas- decision making, organization and power politics.	11L
<b>2</b>	<b>Effects of technological growth:-</b> Energy Crisis, Rapid technological growth, environmental degradation and pollution, human operator in Engineering projects and industries, problems of man, machine, interaction. Impact of assembly line and automation.	8L
<b>3</b>	<b>Ethics in profession:-</b> Engineering profession, ethical issues in engineering practice, conflicts between business demands and professional ideals, social and ethical responsibilities of technologists, code of professional Ethics, Whistle blowing and beyond, effects of globalization in modern organization, case study. <b>Managing ethics:-</b> Building a value system, role of law enforcement, training in ethics, ethics in commercial and operational profession, ethics in finance, ethics in HRM, ethics in Global Business, ethics and IT.	15L
<b>4</b>	<b>Engineering Ethics:</b> Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment – Nature of Engineering Ethics, Profession and Professionalism, Professional Ethics, Code of Ethics, Sample Codes – IEEE, ASCE, ASME and CSI.	8L
	<b>Total:</b>	<b>42L</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Text and/or Reference Books:**

1. Blending the best of the East & West, Dr. Subir Chowdhury, EXCEL
2. Ethics & Mgmt. & Indian Ethos, Ghosh, VIKAS
3. Business Ethics, Pherwani, EPH
4. Ethics, Indian Ethos & Mgmt., Balachandran, Raja, Nair, Shroff Publishers
5. Business Ethics: concept and cases, Velasquez, Pearson
6. Engineering Ethics: Charles D, Fleddermann, Pearson / PHI, New Jersey 2004 (Indian Reprint)
7. Engineering Ethics – Concepts and Cases: Charles E Harris, Michael S. Protchard and Michael J Rabins, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)

8. Ethics and the Conduct of Business: John R Boatright, Pearson Education, New Delhi, 2003.

9. Fundamentals of Ethics for Scientists and Engineers: Edmund G Seebauer and Robert L Barry, Oxford University Press, Oxford, 2001.

**Paper Name : Engineering Mathematics-III**

**Paper Code : M 301**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Unit : 03**

**Total Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Complex Analysis:</b> Complex Variable functions; Limit, Continuity, Differentiability and analyticity of functions of a complex variable, Cauchy-Riemann Equations, Laplace Equation, Harmonic function, Mobius transformation, Cauchy's integral Theorem, Cauchy's integral formula, Power series, Taylor's series, Liouville's Theory, Laurent's series, Zeros and singularities, Calculus of residues, Contour integration.	<b>15L+5T</b>
2	<b>Probability:</b> Conditional probability, multiplication rule, independence, total probability, Bayes' theorem, applications. Random variables: Definition, Discrete and continuous random variable, probability mass function and probability density function, expectation and variance Some special distributions: Uniform, Exponential, Hypergeometric, Binomial, Poisson and Normal distribution. Joint distribution: Joint, Marginal and conditional distributions, Covariance, Correlation, Independence of random variables.	<b>12L+4T</b>
3	<b>Statistics:</b> Regression: Least square method, linear fitting, parabolic curve fitting, goodness of fit. Sampling distribution: Central limit theorem, distribution of sample mean and sample variance for a normal population, Chi-square, t and F distribution.	<b>6L+2T</b>
4	<b>Estimation:</b> Consistent and unbiased estimate, Maximum likelihood estimation, Applications. Confidence intervals: Confidence intervals for the means and variances of different distributions. Testing of Hypotheses: Null and alternative hypotheses, Critical and acceptance region, Type-I and Type-II error, power of the test, Neymann-Pearson lemma, Applications in population.	<b>9L+3T</b>
	<b>Total:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Text/Reference Books:**

1. Probability, Statistics and Random Processes-T.Veerarajan, Tata McGrawHill, 2002
2. Stochastic Processes-J. Medhi, Wiley, 1994
3. Theory of Functions of a complex variable- Shanti Narayan, P.K. Mittal, S.Chand Publishing & Company
4. Complex Variables-Spiegel, McGrawHill

**Paper Name: Basic Engineering Thermodynamics & Fluid Mechanics.****Paper Code: ME 301****Weekly Load: ( L: 3, T: 0, P:0)****Credit Point: 02****Total Marks: 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Basic Concepts of Thermodynamics:</b> Definition, Scope and Application of Thermodynamics, Macroscopic and Microscopic Approach, Thermodynamic systems, Working Substance, Pure Substance, Thermodynamic Equilibrium, Properties of Systems, Process, Cycle, Point and Path Function, Heat, Specific Heat, Heat Capacity, Thermodynamic and Mechanical Work, Pressure, Energy.</p> <p><b>Zeroth law and Temperature:</b> Concept of Temperature, Zeroth Law of Thermodynamics, Measurement of Temperature, Thermometers and thermometric property, Temperature measuring scales.</p> <p><b>Properties and Thermodynamic Processes of gas:</b> Introduction, General gas Equation, Equation of state and Characteristic Equation of gas, Universal Gas Constant, Specific heats of Gas, Relation between <math>C_p</math> and <math>C_v</math>, Enthalpy of a Gas, Classification of Thermodynamics Process, Heating and Expansion of gases in Non Flow Process, Real gas.</p>	8L
2	<p><b>First Law of Thermodynamics:</b> Introduction, First law for a closed system undergoing a cycle and undergoing a change of state, Energy- a property of system, PMM-1, Energy of a Isolated System, Limitation of First Law, Application of First law to non Flow Process, First law of Thermodynamics for Flow Process, Mass balance and energy Balance Equation, Engineering application of Steady Flow Energy Equation(SFEE)</p> <p><b>Second Law of Thermodynamics:</b> Introduction, Heat Engine, Heat Reservoirs ,Refrigerator, Heat Pump, Statement of Second Law of Thermodynamics- Clausius statement, Kelvin Plank statement, Equivalence of Kelvin Plank and Clausius statements, PMM-2, Thermodynamic Temperature, Carnot Cycle, Carnots theorem, Entropy, Clausius Inequality, Temperature- Entropy diagram, Change of entropy for various thermodynamic processes, Irreversibility, Reynold's Transport Theorem.</p> <p><b>Air Standard Cycles:</b> Otto Cycle , Diesel Cycle and their efficiency Properties of Pure substances and Steam Power Cycle</p>	16L
3	<p><b>Basics of Heat Transfer Modes:</b> Conduction, Convection, Radiation</p> <p><b>Heat Transfer by Conduction:</b> Fourier's law, Thermal conductivity of materials, Thermal Resistance, Heat conduction through plane and composite walls, overall heat transfer co-efficient, Heat conduction through hollow and composite cylinders, Heat conduction through hollow composite sphere, Critical thickness of Insulation</p> <p><b>Heat Transfer by Convection:</b> Principle of Free and Forced Convection, Convection heat transfer Co-efficient.</p> <p><b>Heat Transfer by Radiation:</b> Introduction, Surface emission properties, Absorptivity,</p>	7L

	Reflectivity and Transmissivity, Concept of a black body, Stefan-Boltzmann law, Kirchhoff's law, Plank's law, Wiens displacement law, Intensity of radiation and lamberts cosine law.	
4	<p><b>Basics of Fluid Mechanics:</b> Types and properties of fluids, Viscosity, Surface tension, Capillarity.</p> <p><b>Fluid Statics:</b> Fluid Pressure and its measurement, Pascal's law, Total pressure and centre of pressure, Hydrostatic forces on surfaces, Buoyancy, Centre of buoyancy, Metacentre, Metacentric height, Stability of submerged and floating body.</p> <p><b>Fluid Kinematics:</b> Fluid motion, Types of fluid flow, Discharge, Continuity equation, Velocity &amp; acceleration, Velocity potential function and stream function</p> <p><b>Fluid Dynamics:</b> Euler's equation of motion along a stream line, Bernoulli's equation, assumptions, Physical significance of different heads, Application of Bernoulli's equation in flow measurement devices – Venturimeter, Orifice meter, Pitot tube.</p>	11L
	<b>Total:</b>	<b>42L</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Text / Reference Books:**

1. P K Nag – Engineering Thermodynamics – TMH Pub.
2. P K Nag – Power Plant Engineering. – TMH Pub.
3. P S Ballaney – Thermal Engineering – Khanna Pub.
4. Domkundwar & Arora – Power Plant Engineering – Dhanpat Rai & Co.
5. R S Khurmi & J K Gupta – Thermal Engineering – S Chand Pub.
6. Kothandaraman, Domkundwar - A Course in Thermodynamics( Thermal Engg.) - Dhanpat Rai & Co
7. R K Bansal – Fluid Mechanics & Hydraulics Machines- Laxmi Pub.
8. A R Basu – Fluid Mechanics & Hydraulics Machines – Dhanpat Rai & Co.
9. R K Rajput - Fluid Mechanics & Hydraulics Machines – S Chand Pub.
10. Som, Biswas - Fluid Mechanics & Hydraulic Machines – TMH Pub

**Paper Name : Structural Mechanics**

**Paper Code: CE 301**

**Weekly Load : L-3, T-1, P-0**

**Credit Points: 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Fundamental of Stresses :</b> Introduction to structural elements, stress- strain relationship, relation between different elastic moduli, stresses and strains in bars subjected to axial loading ,Thermal stress, impact loads, factor of safety, permissible stress, proof stress</p> <p><b>Bending moment and shear force of beam :</b> Types of supports, types of loads, types of beams, shear force and bending moment diagram, relationship between shear force , bending moment and loading.</p>	11L+4T
2	<p><b>Bending stresses in beam:</b> Theory of simple bending with assumptions, Governing equations of bending stresses, moment carrying capacity of beam with symmetric, un-symmetric, built-up and composite (flitched beam) sections.</p> <p><b>Shearing stresses in beam:</b> Governing equations of shearing stresses, shear stresses distributions of beam with different cross-sections, shear center.</p>	11L+4T



3	<p><b>Torsion:</b> Pure torsion, torsional equations of circular shaft, torsional rigidity, torsion of circular solid and hollow shaft, closed coil helical spring.</p> <p><b>Two Dimensional Stress Problems:</b> Principal stresses, maximum shear stresses, Mohr's circle of stresses, construction of Mohr's circle, stresses due to combined bending and torsion</p>	10L+3T
4	<p><b>Deflection of beams by Double Integration:</b> Elastic curve, moment Curvature relationship, governing differential equation, boundary conditions, direct integration solution for simple beams.</p> <p><b>Introduction to thin cylindrical shells:</b> Hoop stress and meridional stress and volumetric changes.</p> <p><b>Columns:</b> Fundamentals, criteria for stability in equilibrium, column buckling theory, Euler's load for columns with different end conditions, limitations of Euler's theory – problems, eccentric load and secant formulae, Rankine &amp; IS code formulae</p>	10L+3T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Reserve</b>	<b>2</b>

**Text/Reference Books:**

Strength of Materials By S S Bhavikatti [Vikas Publishing House Pvt. Ltd]  
Strength of Materials By R. Subramanian [OXFORD University Press]  
Elements of Strength of Material By S. P. Timoshenko & D. H. Young [EWP Pvt. Ltd]  
Strength of Material By A. Pytel & F. L. Singer [AWL Inc]  
Strength of Material By Ramamrutham  
Strength of Material by Popov – Prentice Hall

**Paper Name : Surveying-I**

**Paper Code: CE 302**

**Weekly Load : L-3, T-0, P-0**

**Credit Points: 3**

**Full marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Introduction:</b> Definition, classification of surveying, Type of Survey, objectives, history of surveying, modern trends in surveying, principles of surveying.</p> <p><b>Linear Measurements:</b> Accessories for linear measurements, Ranging and its methods, Errors due to incorrect Chain, Chaining on uneven or slopping ground, errors in chain surveying and tape Corrections – problems</p> <p><b>Chain surveying:</b> Commonly used terms in chain surveying, Reconnaissance and site location, locating ground features by offsets , Degree of precision and limiting length of offset, Obstacle in chaining, Instruments for setting out right angles, Field book -conventional symbols, plotting chain survey and computation of areas</p>	12L

2	<p><b>Compass surveying:</b> Types of compasses, use and adjustments, bearings, local attraction and its adjustments. Chain and compass surveying of an area, booking and plotting. Adjustments of traverse, errors in compass surveying and precautions - problems.</p> <p><b>Plane table surveying:</b> Equipment, leveling, orientation, different methods of survey, two and three point problems, errors and precautions.</p>	10L
3	<p><b>Leveling:</b> Introduction, basic definitions, leveling instruments and their features, temporary adjustment of levels, sensitiveness of bubble tube. Methods of leveling – differential, profile &amp; fly leveling, cross sectional and reciprocal leveling. Effect of curvature and refraction, Reducing errors and eliminating mistakes in leveling. Permanent adjustments of dumpy level. Modern levels – Tilting level, Automatic levels, precise levels. Plotting longitudinal sections and cross sections.</p>	12L
4	<p><b>Contouring:</b> Topographic map, characteristics of contour, contour interval. Methods of locating contours, Interpolation of contours. Measurement of area and volume from contour maps.</p> <p><b>Computation of Area :</b> Various Methods of computation of area, Numerical on computation of area; <b>Computation of Volume:</b> Measurement from Cross-sections, Prismoidal and trapezoidal formula and correction.</p>	8L
	<b>Total</b>	<b>42L</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in hand</b>	<b>2</b>

**Text/Reference Books:**

1. Surveying – Vol I & II B.C. Punmia, Laxmi Publication
2. Surveying & leveling: N NBasak (McGraw Hill Education Private Limited)
3. Surveying & levelling – Vol I & II – T.P. Kanetkar&Kulkarni, Pune vidyapith Griha Publication
4. A text Book of surveying: C.L. Kochher, Dhanpat Rai Publication
5. Fundamentals of surveying – S.K. Roy (Prentice Hall India)
6. Plane Surveying ByAlok De (S. Chand)
7. Surveying by David Clarke

**Paper Name: Engineering Geology**

**Paper Code: CE 303**

**Weekly Load: L-3, T-0, P-0**

**Credit Points: 2**

**Full Marks: 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Introduction:</b> Geology and its importance in Civil Engineering.</p> <p><b>Mineralogy:</b> Definition, internal and external structure of minerals, Classification and physical properties of minerals.</p>	8L

2	<p><b>Classification of rocks .</b></p> <p>a) Igneous rocks: Origin, classification and engineering importance.</p> <p>b) Sedimentary rocks: Process of sedimentation, classification and engineering importance.</p> <p>c) Metamorphic rocks: Metamorphism, classification and engineering importance.</p> <p><b>Structural geology:</b> Introduction to structural elements of rocks, dip &amp; strike, definition, description, brief classification of folds, faults and joints, importance of geological structures in Civil Engineering.</p> <p><b>Engineering properties of rocks:</b> Porosity, permeability, compressive strength, tensile strength and abrasive resistance.</p>	14L
3	<p><b>Rocks as construction materials:</b> Qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing.</p> <p><b>Earthquakes and seismic hazards:</b> Causes and effects, seismic waves and seismographs, Mercalli's intensity scale and Richter's scale of magnitude</p>	14L
4	<p><b>Geophysical exploration:</b> Methods of Geophysical Exploration, electrical resistivity method field procedure – sounding and profiling, interpretation of resistivity data. Geophysical surveys in ground water and other Civil Engg. Projects.</p> <p><b>Applied Geology:</b> Surface and subsurface geological and geophysical investigations in major Civil Engg. Projects. Geological studies of Dams and reservoir sites, Geological studies for selection of tunnels and underground excavations.</p>	6L
	<b>Total</b>	<b>42L</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of weeks in Reserve</b>	<b>2</b>

**Text/Reference Books:**

1. Engineering and General Geology by Parbin Singh, Fourth edition. Katson publishing house Delhi 1987.
2. Engineering Geology for Civil Engineers – D. Venkat Reddy, Oxford, IBH, 1995.
3. Tyrell: Principles of petrology, 1972, Asia, Bombay.
4. Marland P. Billings: Structural Geology, fourth edition, 1975, Wiley eastern Prentice-Hall, U.S.A.1972.
5. A textbook of Geology by P.K.Mukherjee

**Paper Name : Building Materials and Construction**

**Paper Code: CE 304**

**WeeklyLoad : L-3, T-1, P-0**

**Credit Points: 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
--------	----------------	---------------------------------

1	<p><b>Bricks</b> – classification – characteristics –Testing of bricks as per BIS</p> <p><b>Aggregates:</b> Types, Classification and Characteristics</p> <p><b>Lime:</b> Impurities in limestone, Classification, Slaking and hydration, Hardening, Testing, Storage, Handling</p> <p><b>Mortars:</b> Classification and characteristics –Types and uses</p> <p><b>Cement:</b> Composition, Types and Uses</p>	11L
2	<p><b>Wood and wood products:</b> – Structure, characteristics of good timber, defects, seasoning, decay &amp; its prevention. Suitability of timber for specific uses. Wood products: Veneers plywood, Fibre boards, chip boards, block boards, batten boards and laminated boards – characteristics and use.</p> <p><b>Paints, Enamels and Varnishes:</b> Properties and uses.</p> <p>Miscellaneous materials: Bitumen, Tar and Asphalt, Heat insulating, Sound insulating, Asbestos, Adhesives.</p>	8L+4T
3	<p><b>Foundations:</b> Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations</p> <p><b>Brick Masonry:</b> Rules for bonding; stretcher bond, header bond; English and Flemish bonds .</p> <p><b>Doors and Windows:</b>Different parts, Common types of doors and windows of timber and metal.</p> <p><b>Stairs:</b> Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case</p>	13L+6T
4	<p><b>Roofs:</b> Types of pitched roofs and their sketches; Lean – to, coupled and collared roofs; king-post truss, queen-post truss and simple steel trusses; Roof covering materials: -Tiles, AC sheets, and G.I. sheets</p> <p><b>Plastering and Painting:</b> Plastering with cement and lime mortar; White-washing, colour washing and distempering; Painting: New and existing wood and metal work.</p> <p><b>Flooring:</b> Cement concrete, terrazzo, Mosaic, marble and tiled flooring</p> <p>Sanitary &amp; Plumbing Fixtures, Gully Pit, Master Trap, Manhole</p>	10L+4T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Building materials – S.K.Duggal
2. Engineering Materials – S.C. Rangwala
4. Engineering Materials – R.K.Rajput (S.Chand)
5. Building Materials – V.K.Arora
6. Building Construction by B.C.Punmia
7. Building Construction by S.C.Rangawala
8. Handbook of Civil Engineering by Khanna

**Paper Name :Structural Mechanics Sessional**

**PaperCode : CE 351**

**Weekly Load : L-0, T-0, P-3**

**Credit Points -2**

**Full Marks : 100**

1. Tension test on Structural Materials: Mild Steel and Tor steel (HYSD bars)
2. Compression Test on Structural Materials: Timber, bricks

3. Bending Test on Mild Steel
4. Torsion Test on Mild Steel Circular Bar
5. Hardness Tests on Ferrous and Non-Ferrous Metals: Brinell and Rockwell Tests
6. Test on closely coiled helical spring
7. Graphical Solution of Beams Frames & Trusses including Deformation of Truss

**Paper Name : Surveying Practice-I**

**Paper Code: CE 352**

**Weekly Load : L-0, T-0, P-3**

**Credit Points -2**

**Full Marks : 100**

1. <b>Chain surveying:</b> Preparing index plans, Location sketches. Ranging, Construction of Geometric figures, Heights of objects using chain and ranging rods. Getting outline of the structures by enclosing them in triangles/quadrilaterals. Distance between inaccessible points. Obstacles in chain survey.
2. <b>Compass surveying :</b> Measurement of bearings, Construction of Geometrical figures, Distance between two inaccessible points by chain and compass. Chain and compass traverse
3. <b>Plane Table survey:</b> Temporary adjustments of plane table and Radiation method, Intersection, Traversing and Resection methods of plane tabling.
4. <b>Levelling:</b> Adjustment of Dumpy level and Differential leveling, Profile levelling and plotting the profile. Longitudinal and cross sectioning. Gradient of line and setting out grades. Reciprocal leveling. Sensitiveness of Bubble tube. Permanent adjustment of Dumpy levels – third adjustment (Two peg Method)

**Paper Name: Engineering Geology Laboratory**

**Paper Code: CE 353**

**Weekly Load : L-0, T-0, P-3**

**Credit Points -2**

**Full Marks : 100**

1. Study of crystals with the help of crystal models
2. Identification of Rocks and Minerals [Hand Specimens]
3. Microscopic study of Rocks and minerals
4. Study of Geological maps, interpretation of geological structures Thickness problems, Bore-hole Problems

**Paper Name : Civil Engineering Drawing**

**Paper Code : CE 381**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1. Elementary Building Plan, elevation and section
2. Different type of Door and Windows
3. Different type of stairs
4. Different type of R.C.C. Beam and slab details
5. Different type of Steel Structure details

6. Different Type of Foundations

Reference Books :

1. Principles of Building Drawing – M.G.Shah, C.M.Kale – Macmillan Publication

**Semester-IV**

**Paper Name : Numerical Methods and Optimization Techniques**

**Paper Code : M 402**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Unit : 03**

**Total Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Numerical Methods:</b>                      Error Formulation                      Numerical Interpolation:                      Finite differences, Newton’s forward and backward interpolation formulae, Lagrange’s interpolation, error analysis.                      Numerical Differentiation and Integration:                      Numerical differentiation using interpolating polynomial, Trapezoidal rule, Simpson’s 1/3 rd rule of integration, error analysis.</p>	10L+4T
2	<p>Numerical solution of polynomial and transcendental equations:                      Bisection method, Regula-Falsi method, Fixed point iteration, Newton-Raphson method, Gauss-Jacobi iteration and Gauss-Seidel iteration for solving a system of linear equations.                      Numerical solution of ODE:                      Numerical solution of first order ODE with initial condition by Picard’s, Euler’s and Taylor’s series method, Runge-Kutta method, Predictor-Corrector methods (Milne and Adams-Bashforth); Boundary value problems, Shifting and finite difference method.</p>	10L+3T
3	<p>I. Introduction: Historical Development, Engineering application of Optimization, Formulation of design problems as mathematical programming problems, classification of optimization problems.                      II. Linear Programming: Graphical method, Simplex method, Big-M Method, Revised simplex method, Duality in linear programming (LP), Sensitivity analysis, Transportation, assignment and other applications.                      III. Game theory and its applications: Maximin,Minimax Principle, Two-person-zero-sum game, Dominance principle, Graphical Method.</p>	12L+4T
4	<p>IV. Non Linear Programming: Unconstrained optimization techniques, Direct search methods, Constrained optimization, Direct and indirect methods, Optimization with calculus, Kuhn-Tucker conditions.                      V.PERT and CPM</p>	10L+3T
	<b>Total:</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>02</b>

**Text/Reference Books:**

1. S.S. Rao, "Engineering Optimization: Theory and Practice", New Age International (P) Ltd., New Delhi, 2000.
2. J.K.Sharma "Operations Research", National Publishing House
3. H.A. Taha, "Operations Research: An Introduction", 5th Edition, Macmillan, New York, 1992.
4. K. Deb, "Optimization for Engineering Design – Algorithms and Examples", Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
5. An Introduction to Numerical Analysis (2nd edn.)-Atkinson, John Wiley and sons
6. Numerical Analysis-James Blaine Scarborough, Oxford University Press
7. Numerical Methods-S.A. Mollah, Books and Allied Publishers

**Paper Name : Soil Mechanics - I****Paper Code : CE 401****Weekly Load : L-3, T-0, P-0****Credit Points : 3****Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	<b>Introduction:</b> Origin & formation of Soil: Types, Typical Indian Soil, Fundamental of Soil Structure. <b>Soil Phase Relationship:</b> Introduction, Block Diagram, Basic definition, Inter relationship of different parameters, Numerical problems.	7L
2.	<b>Index properties of soil:</b> Introduction, Various Index properties- Moisture Content, Specific Gravity, Particle Size Distribution of soil, Sieving, Sedimentation Analysis, Atterberg's Limits, Soil Indices, Consistency of soil, Plasticity Chart, Insitu Density-Core cutter method & Sand Replacement method, Relative Density or Density Index, Sensitivity, Thixotropy, Numerical Problems. Practical importance of Index properties. <b>Identification &amp; Classification of soil:</b> Introduction, Practical significance of soil classification, Field identification of soil, Soil Classification- Particle size classification, Textural classification, Highway Research board (HRB) classification, Unified Soil Classification (USC) System, and I.S. Classification System, Numerical Problems.	8L
3	<b>Effective Stress Principles:</b> Introduction, Effective Stress, Neutral Stress, and Effective Stress due to different conditions, Critical hydraulic gradient, Quick Sand condition or Sand boiling, Numerical Problems. <b>Permeability:</b> Introduction, Darcy's Law, Discharge velocity and Seepage velocity, Coefficient of permeability, Determination of Co-efficient of permeability-Laboratory methods, Field methods & Indirect method, Factors effecting co-efficient of permeability, Permeability of Stratified Deposits, Numerical problems. <b>Soil Water:</b> Modes of occurrence, Capillary Rise in a glass tube of constant section, Numerical Problems.	11L

4	<p><b>Seepage through Soils:</b> Introduction, Laplace's Equation for two dimensional flow – assumptions, Flow nets- Definition, Properties of flow nets, Graphical method of construction, Confined flow problem, Unconfined flow problem, Determination of phreatic line for Earthen Dams, Applications of flow net, Numerical Problems.</p> <p><b>Stress Distribution in Soil :-</b> Introductions, Bousinesq's &amp; Westergaad's Assumption &amp; Formula for Determination of Stress due to Point Loads, Stress Beneath Line, Strip &amp; Uniformly Loaded Circular - Pressure Bulbs, Newmark's charts- Use For Determination of Stress due to Arbitrarily Loaded Areas. Numerical problems.</p>	16L
	<b>Total</b>	<b>42L</b>
	<b>No.of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/ReferenceBooks :-**

- 1.Principles of Soil Mechanics & Foundation Engineering by – V.N.S. Murthy (UBS Publishers).
- 2.Soil Mechanics & Foundation Engineering by – B.C.Punmia (Laxmi Publications).
- 3.Introduction of Soil Mechanics by- B.M.Das (Galgotia Publications).
- 4.Soil Mechanics by – T.W.Lambe&R.V.Whitman.
- 6.Basic& Applied Soil Mechanics by- GopalRanjan&A.S.R.Rao (WillesEasternLtd.)

**Paper Name : Surveying – II**

**Paper Code : CE 402**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Theodolite surveying:</b> Fundamentals of Theodolite, Components of a Theodolite, Closing error &amp; Adjustments, Horizontal and vertical angle measurements, Calculation of Traverse area, problems on height and distances, traverse table, co-ordinates</p> <p><b>Trigonometrical Levelling:</b> Introduction, Finding heights of Objects</p>	10L+2T
2	<p><b>Tachometer:</b> Introduction, Theory &amp; Principles of stadia, Methods of Tacheometry, Tangential systems, Details of stadia system. Analytic tachometer, Horizontal and inclined sight with staff vertical and normal for both fixed and movable hair tachometer, Errors in tachometer methods.</p> <p><b>Triangulation:</b> Adjustments of station and figure, Leveling adjustment, Method of equal shifts.</p>	10L+4T
3	<p><b>Field Astronomy :</b>Definition of Terms, System of astronomical coordinates, determination of azimuth</p> <p><b>Setting out of Curves:</b> Introduction. Simple curves Definition, Notations Designations, Elements of simple curve, Setting out by Chain &amp; Tape method, linear methods and Rankine's tangential method, Two Theodolite and tachometric method, Introduction to Compound and reverse curves, calculation data &amp; setting out, vertical curve, Transition curves: lemniscates, cubic spiral, cubic parabola, setting out</p>	12L+4T



<b>4</b>	<b>Hydrographic surveying:</b> Vertical control Datum: tide measurement, Horizontal Control: Shore line surveying, Sounding: Location of sounding and reduction, Three point problems, Nautical sextant and station pointer. <b>Remote Sensing:</b> Introduction to remote sensing and its application in civil engineering, <b>Photographic Survey:</b> Introduction to terrestrial and aerial photogrammetry, determination of true north	<b>10L+4T</b>
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Surveying -Vol 2,3& 4 by B.C.Punmia.
2. Plane and Geodetic surveying -Vol 2 by David Clark
3. Surveying and leveling- Vol 2 by T .P. Kanetkar and Kulkarni
4. Fundamentals of surveying-by S.K.Roy, New Delhi.
5. Surveying –Bannister, Raymond and Baker, Pearson Education
6. Advanced Higher Survey by B.N.Ghosh

**Paper Name : Structural Analysis - I**

**Paper Code : CE 403**

**Weekly Load : L-3, T-1, P-0**

**Credit Points: 3**

**Fill Marks – 100**

<b>Module</b>	<b>Course Content</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Determinate plane trusses:</b> Analysis by method of joints, method of section <b>Analysis of determinate portal frames</b> <b>Deflection of beams by area moment method</b>	<b>10L+4T</b>
<b>2</b>	<b>Strain energy:</b> Due to axial load, bending and shear, Torsion; principle of virtual work, Betti's law, Maxwell's theorem of reciprocal deflection, Castiglino's theorems, theorem of minimum potential energy , Unit-Load method,Use of energy principles for deflection analysis of determinate beams, trusses and simple portal frames.	<b>11L+3T</b>
<b>3</b>	<b>Redundant structures:</b> Concepts of statical and kinematic indeterminacy of beams, trusses and portal frames; Application of second theorem of Castigliano and method of consistent deformation for analysis of propped cantilever, fixed beams and continuous beams (maximum two degree of indeterminacy) for simple loading cases.	<b>10L+4T</b>
<b>4</b>	<b>Influence line diagrams:</b> Statically determinate beams and trusses under series of concentrated and uniformly distributed rolling loads, criteria for maximum and absolute maximum moments and shears <b>Theorem of three moments of continuous beam with simply supported, fixed, over hanging ends span.</b>	<b>11L+3T</b>
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Basic structural Analysis by C.S. Reddy
2. Statically indeterminate structures by C.K.Wang
3. Elementary structural analysis by Norris and Wilber
4. Structures – Schodek, Pearson Education
5. Analysis of Structures – Vol.I& Vol. II by Vazirani&Ratwani
6. Elements of Structural Mechanics by N.C.Sinha&S.K.SenGupta [S.Chand Pub]
7. Analysis of Structures by A.K.Jain
8. Analysis of Structures by Dayaratnam
9. Basic Structural Analysis by Gaylord

**Paper Name : Fluid Mechanics - I**

**Paper Code: CE 404**

**Weekly Load : L-3, T-0, P-0**

**Credit Points: 2**

**Full Marks – 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Fluid Statics:</b> Units, Dimensions & Measurement. Forces on plane and curved surfaces. Center of pressure, buoyancy and stability of floating bodies, Metacentre.	10L
2	<b>Discharge measuring devices:</b> Application of Bernoulli's equation- orifices and mouthpieces, measurements of flow, coefficient of contraction, velocity & discharge ( $C_c$ , $C_v$ & $C_d$ ). <b>Weirs &amp; notches:</b> Rectangular, triangular, Cippoletti notch, sharp crested and broad crested weirs & submerged weirs.	8L
3	<b>Turbulent Flow:</b> Introduction, Darcy-Weisbach equation, Coefficient of friction, Eddy viscosity, Boussineq's equation, Universal velocity distribution, Velocity distribution in Smooth pipes & Rough pipes. <b>Flow in pipes:</b> Laminar & Turbulent flow through pipes, fluid friction in pipes, head loss due to friction. Darcy-Weisbach equation, Friction factors for commercial pipes, use of Mody's diagram, minor losses in pipes, pipe networking, HGL & TEL	12L
4	<b>Water Hammer:</b> Speed of pressure wave, slow and rapid closure, use of surge tank. <b>Fundamentals of Open channel flow:</b> Scope and importance, characteristics of open channel flow, distinction between pipe flow and open channel flow, Types of flow: Steady, Unsteady; Uniform, Non uniform, Gradually varied flow, Rapidly varied flow. <b>Forces on Immersed Bodies:</b> Introduction, Cause for drag & lift forces, Types of drag forces, General equation for the forces exerted on a body placed in a moving fluids.	12L
	<b>Total</b>	<b>42L</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Reserve</b>	<b>2</b>

**Text/Reference Books:**

1. Fluid Mechanics by Modi& Seth Standard Book House, New Delhi
2. Fluid Mechanics by A.K.Jain, Khanna Publishers, Nath Market, NaiSarak, New Delhi.
3. Fluid Mechanics & Machinery by H. M. Raghunath – CBS Publishers. New Delhi
4. Fluid Mechanics & Hydraulic Structures by R.K.Bansal

5. Fluid Mechanics by V.L.Streeter

6. Hydraulic Fluid Mechanics & Fluid Machines by S. Ramamrutham, DhanpatRai Publishing Company

**Paper Name : Quantity Surveying & Valuation**

**Paper Code : CE 405**

**Weekly Load : L-3, T-0, P-0**

**Credit Points: 2**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Quantity Surveying:</b> Types of estimates, approximate estimates, items of work, Centre Line Method, unit of measurement, unit rate of payment, quantity estimate of a single storied building, bar bending schedule, details of measurement and calculation of quantities with cost, bill of quantities, abstract of quantities.	14L
2	<b>Analysis of rates.</b> <b>Specification of materials:</b> Brick, cement, fine and coarse aggregates, etc.	4L
3	<b>Specification of works:</b> Cement concrete, reinforced cement concrete, first class brickwork, cement plastering, pointing, white washing, distempering, lime punning, painting and varnishing, etc.	6L
4	<b>Valuation:</b> Values and cost, gross income, outgoing, net income, scrap value, salvage value, market value, Book Value, sinking fund, capitalized value, Y. P., depreciation, obsolescence, deferred income, freehold and leasehold property, mortgage, rent fixation, valuation table.	18L
	<b>Total</b>	<b>42L</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Estimating, costing, Specification and Valuation in Civil Engineering by M..Chakroborty
2. Estimating and Costing in Civil Engineering by B.N.Dutta, USB Publishers & Distributers

**Paper Name : Numerical Methods and Optimization Techniques Laboratory**

**Paper Code : M 452**

**Weekly Load : L: 0 T: 0 P: 3**

**Credit Unit : 02**

**Total Marks : 100**

Unit	Forward and backward difference table
1.	<b>Numerical Differentiation:</b> Use of Newton's forward and backward interpolation formula only.
2.	<b>Numerical Integration:</b> Trapezoidal formula (composite), Simpson's 1/3 <sup>rd</sup> formula (composite), Problems. Numerical Solution of System of linear Equations: Gauss-Jordan method, Gauss-Siedel method, Sufficient condition of convergence.
3.	<b>Numerical Solution of Algebraic and Transcendental Equations:</b> Iteration method, Bisection method, Secant method, Regula-Falsi method, Newton- Raphson method.
4.	<b>Numerical solution of Initial value problems of First order ODE:</b> Taylor's series method, Euler's method, Runge-Kutta method (4 <sup>th</sup> order), Modified Euler's method.

5.	<b>Optimization Techniques:</b> Linear Programming ( Transportation , Assignment , Duality , Simplex)
6.	<b>PERT/CPM:</b> Critical Path Calculation

**Text/Reference Books:**

1. Numerical Methods using C programming-T. Veerarajan
2. Numerical Methods in Science and Engineering- S.Rajasekaran
3. Numerical Methods for Engineering and Science – Guha&Srivastava

**Paper Name : Quantity Survey Sessional**

**Paper Code : CE – 451**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

Sl. No.	Description
1	Detail Engineering estimate of a two storeyed masonry and framed structure building including rate analysis.

**Paper Name : Surveying Practice -II**

**Paper Code : CE 452**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1. <b>Theodolite surveying:</b> Measurement of horizontal angles, repetition and Reiteration methods, Single plane and double plane method of trigonometric leveling Theodolite traverse adjustments.
2. <b>Tachometric surveying:</b> Tacheometric constants, Measurement of horizontal and vertical distance.Tacheometric traverse and contouring.
3. <b>Curve Setting:</b> setting out simple curve by chain and tape, offsets from long chord and tangent, from chord produced, Simple curve by Rankine’s method, setting out compound and reverse curve.
4. <b>Demonstration:</b> Box – Sextant, Nautical sextant and EDM instruments. Use of Total station.
5. Determination of Azimuth of Sun

**Text/Reference Books:**

1. Theory & Analysis of Sample Survey design- by D. Singh
2. Surveying- Theory & Practice- by James Anderson & Edward Mikhail

**Paper Name : Application of AutoCAD**

**Paper Code ; CE 481**

**Weekly Load ; L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks 100**

1. Sheet Layouts & Scaling
2. Drawing different geometrical shapes
3. Modifying different items
4. Text, M Text
5. Solids, Array, Mirror, Donut
6. Dimensioning
7. Layers, Colour& Editing, Line Weight & Line Types

8. Templates, Fillet, Chamfer
9. Blocks, W-Blocks
10. Project of drawing Plan, Elevations and Section of a building

### Semester-V

**Paper Name : Soil Mechanics - II**

**Paper Code : CE 501**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Compaction of Soil</b> :- Principles of Compaction, IS Light &amp; Heavy Compaction Test, Field Compaction Equipments, Various methods of field Compaction Control, CBR Test (Soaked, Un-soaked &amp; Field ) as per IS recommendation.</p> <p><b>Compressibility &amp; Consolidation of Soil</b> :- Terzaghi's Theory of One Dimensional Consolidation, Compressibility characteristics of Soils, Compression Index, Coefficient of Compressibility &amp; Volume change, Coefficient of Consolidation, Degree &amp; rate of Consolidation, Consolidometer &amp; Laboratory One Dimensional Consolidation Test as per latest IS Code, Determination of Consolidation Parameters under Consolidated, Normally Consolidated &amp; Over Consolidated Soil, Secondary Consolidation.</p>	<b>12L+4T</b>
2	<p><b>Shear Strength of Soil</b> :- Basic Concept of Shear Resistance &amp; Shear Strength of Soil, Mohr- Columb's Theory, Determination of Shear Parameter of Soil- Stress Controlled &amp; Strain Controlled Test, Laboratory Determination of Soil Shear Parameter- Direct Shear, Tri-axial Test, Unconfined Compression, Vane Shear Test as per Relevant IS Codes, Stress- Strain Relationship of Clays &amp; Sands, Concept of Critical Void Ratio. Stress Paths, Pore pressure parameters.</p>	<b>8L+4T</b>
3	<p><b>Earth Pressure Theories</b> : Plastic equilibrium of soil , Earth pressure at rest , Active &amp; passive Earth pressure , Rankine's &amp; Coulomb's earth pressure theories, wedge method of analysis , estimation of earth pressure by graphical construction (Culmann Method).</p> <p><b>Retaining Wall &amp; sheet pile structures</b>: Different types of wall, forces on retaining wall, proportioning the wall, safety against sliding and overturning, determination of contact pressure, drainage provision for retaining wall. Cantilever sheet pile in granular soils, cohesive soils; Anchored sheet pile wall; Free-earth support method, Fixed earth support method.</p>	<b>14L+4T</b>
4	<p><b>Stability of slopes</b>: Stability of earth slopes, finite and infinite slopes, stability analysis by Swedish method of slices; Stability analysis by friction circle method, stability number; tension cracks.</p>	<b>8L+2T</b>
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Principles of Soil Mechanics & Foundation Engineering by – V.N.S. Murthy (UBS Publishers).

2. Soil Mechanics & Foundation Engineering by – B.C. Punmia (Laxmi Publications).
3. Introduction of Soil Mechanics by- B.M. Das (Galgotia Publications).
4. Soil Mechanics by – T.W. Lambe & R.V. Whitman.
5. Basic & Applied Soil Mechanics by- Gopal Ranjan & A.S.R. Rao (Wiley Eastern Ltd.)

**Paper Name : Environmental Engineering –I**

**Paper Code : CE 502**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Water demands:</b> Types of demands for domestic, commercial, industrial, fire, public use and losses, per capita demand, variations in demand, factors affecting demand. Design period. Forecasting population- different methods and their suitability.</p> <p><b>Sources of water:</b> surface water: rivers, streams, lakes and impounded reservoirs, determination of quantity of water in the above sources. Underground sources Springs, wells and infiltration galleries, measurement of yield of open wells, tube wells and infiltration galleries.</p> <p><b>Quality of water:</b> Pollution and contamination of water. Sources, classification and prevention of pollution. Water borne diseases. Impurities in water .Water analysis Physical chemical and biological tests, standards for potable water. Estimation of BOD, COD, TKN</p>	19L+7T
2	<p><b>Collection and conveyance of water:</b> Intakes-river, lake, reservoir and canal. Hydraulic design of pressure pipes. Hydrostatic tests on pipes.</p>	4L+1T
3	<p><b>Treatment of water:</b> Aeration, Plain sedimentation, sedimentation with coagulation- coagulant feeding devices, optimum dosage of coagulant. Filters and their different types, disinfection, water softening. The functional design of treatment unit. Removal of iron, manganese, colour, odour and taste. , Fluoridation, desalination.</p>	11L+4T
4	<p><b>Distribution:</b> Systems of distribution, layout of distribution system, Pressure in distribution system, Storage and distribution reservoirs. Capacity of reservoirs. Type of reservoirs. Detection and presentation of leakages.</p>	8L+2T
	<b>Total</b>	<b>42+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

- Environmental Engineering S.K. Garg -Khanna Pub  
 Water Supply & Waste Water Disposal –G .M .Fair ,J . C .Geyer ,D . A .Okun . –Jhon Wiley & Sons .  
 Water Supply Engineering Volume I by Kshirasagar.  
 Manual of Water Supply & treatment - A Government of India Publication.  
 Water Supply and Sanitary Engineering By G.S. Birdi  
 Water supply sanitary engineering by G.S. Birdi

**Paper Name : Structural Analysis – II**

**Paper Code : CE 503**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

<b>Module</b>	<b>Course Content</b>	<b>Lecture / Tutorial Period</b>
<b>1.</b>	Arches: Introduction, Three hinged arch, Two hinged arch and fixed arch, application of unit load method and Castigliano's method. Deflection of beam by conjugate beam method. Column analogy method and application	<b>11L+3T</b>
<b>2.</b>	Moment distribution method : stiffness factor, distribution and carry-over factor, solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway.	<b>10L+4T</b>
<b>3.</b>	Slope Deflection Method: Development of slope deflection equations, solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway.	<b>10L+4T</b>
<b>4.</b>	Influence line diagram for Redundant structures(Beams & Trusses) Portal & Cantilever Method, Vertical Frame Analysis, Horizontal Sway Analysis	<b>11L+3T</b>
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of weeks Required</b>	<b>14</b>
	<b>No. of weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Theory of structures: by S.P.Timoshenko
2. Theory of structures: by S.Ramamurtham.
3. Mechanics of structures: by Thadani
4. Indeterminate structural analysis: by Kinney
5. Statically indeterminate structures: by C.K.Wang
6. Basic structural analysis: by C.S. Reddy
7. Matrix method of structural analysis: by M.B.Kanchi
8. Structural analysis – A matrix approach by G.S.Pandit and Gupta
9. Theory of structures: by Vazirani and Rathwani Vol. II and Vol. III.
10. Intermediate structural Analysis: by Wang.
11. Structural Analysis Vol.II: by S.S. Bhavikatti
12. Basic Structural Analysis by Wilber, Norrish

**Paper Name : Concrete Technology**

**Paper Code : CE 504**

**Weekly Load : L-3, T-0, P-0**

**Credit Points : 3**

**Full Marks : 100**

<b>Module</b>	<b>Course Content</b>	<b>Lecture / Tutorial Period</b>
---------------	-----------------------	----------------------------------

1	<b>Concrete as a Structural Material</b> <b>Cement</b> – Good Concrete Manufacture of Portland Cement, Chemical Composition of Cement, Hydration of Cement, Heat of Hydration and Strength, <b>Aggregates</b> – Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-Aggregate Reaction, Sieve Analysis, Grading Curves, Fineness modules, Grading Requirements. Testing of Aggregates – Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impact Value, and Abrasion Value. <b>Quality of Water</b> – Mixing Water, Curing Water, Harmful Contents.	13L
2	<b>Properties of Fresh Concrete</b> – Workability, Factors Affecting Workability, Slump Test Compacting Factor Test, Kelly Ball Test, Flow Table Test, Segregation, Bleeding, Setting Time, Mixing and Vibration of Concrete, Mixers and Vibrators, curing, Methods, Maturity.	10L
3	<b>Admixtures</b> – different types, effects, uses, Retarders and Super plasticizers. <b>Mix Design by I.S. Code method.</b>	11L
4	<b>Strength of Concrete</b> – Water/Cement ratio, Gel/Space ratio, Strength in Tension, Compression, Effect of Age on Strength, Relation between Compressive and Tensile Strength, Fatigue Strength, Stress Strain Relation and Modules of Elasticity, Poisson's Ratio, Shrinkage and Creep, Compression Test on Cubes, Cylinders, Non-Destructive Tests. Light-weight, Polymer and Fibre-reinforced concrete.	10L
	<b>Total</b>	<b>42L</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Concrete Technology by M.L. Gambhir (Tata McGraw Hill Publishing Co. Ltd.)
2. Concrete Technology by M.S. Shetty (S.Chand)
3. Text book of Concrete Technology by P.D. Kulkarni (Tata McGraw Hill Publishing Co. Ltd.)
4. Concrete Technology by A.R. Santakumar

**Paper Name: Fluid Mechanics - II**

**Paper Code: CE 505**

**Weekly Load: L: 3 T: 0 P: 0**

**Credit Points: 2**

**Total Marks: 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Steady uniform flow:</b> Characteristics, Chezy's and Manning's formulae, Hydraulically efficient Rectangular and trapezoidal sections, Most economical section of channel, Design features of rigid boundary channels. <b>Varied flow through Open channel:</b> Gradually varied and rapidly varied flows Definition, Specific Energy Definition & Diagram. Critical, Sub-critical and Super-critical flows. Channel transitions - construction and raised bed. Establishment of critical flow, Venturi flume and Parshall flume. Specific force: Definition and diagram, Hydraulic Jump	14L
2	<b>Dimensional Analysis and Model Studies:</b> Dimensions and dimensional homogeneity, Importance and use of dimensional analysis.	10L



	Buckingham Pi Theorem – Statement and application, Model Studies – Importance and Use. Geometric, Kinematic and Dynamic Similarity, Froude and Reynold Model Laws and applications. Distorted Models.	
3	<b>Impact of Jets:</b> Introduction, Direct impact of a jet on a stationary flat plate, Oblique impact of a jet on a stationary flat plate, Direct impact & oblique impact of a jet on a moving plate, Direct impact of a jet on a series of flat vanes on the periphery of a large wheel, condition for maximum hydraulic efficiency. <b>Turbines:</b> Impulse-Momentum principle statement. Use and examples of application. Impact of jet on vanes – Flat and Inclined (stationary and moving) Inlet and Outlet velocity triangles. Hydraulic Turbines, Importance of hydropower, classification of turbines, description, typical dimensions and working principle of Pelton, Francis, Kaplan turbine. Unit and specific quantities. Performance characteristics and selection of turbines. Description and functions of draft-tube.	10L
4	<b>Pumps:</b> Classification of pumps, Description and general principle of working of centrifugal and reciprocating pumps. Unit and specific quantities. Performance characteristics. Description of Multistage jet and airlift pumps, Hydraulic Ram, Cavitation in pumps and turbines.	8L
	<b>TOTAL:</b>	<b>42L</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Text/Reference Books:**

1. Fluid Mechanics by Modi& Seth, Standard Book House
2. Fluid Mechanics By A.K.Jain, Khann Publishers, Nath Market, NaiSarak
3. Fluid Mechanics & Machinery By H.M. Raghunath – CBS Publishers
4. Fluid Mechanics & Hydraulic Structures – R.K.Bansal
5. Fluid Mechanics – V.L.Streeter
6. Hydraulic Fluid Mechanics & Fluid Machines by S. Ramamrutham, DhanpatRai Publishing Company

**Paper Name : Water Resources Engineering-I**

**Paper Code : CE 506**

**Weekly Load : L-3, T-0, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Introduction :</b> Definition and scope of Hydrology , Hydrologic cycle , The Global water Budget, Practical Applications. <b>Catchment area:</b> Definition & Delineation <b>Precipitation:</b> Type of precipitation, Measurement of rain fall, Raingauge, types of Raingauge, errors in rain gauge, Adequacy of raingauge station, estimating missing rainfall data, checking the consistency data, double mass curve method, design of rain-gauge network, average annual rainfall, index of wetness, mean rainfall over a drainage basin (Thissen polygon method ,Isohyetal method), intensity duration curves, probable maximum precipitation (PMP) curves	12L
2	<b>Evaporation, evapotranspiration and infiltration</b> – the processes, measurement	8L

	and estimation, Infiltration Indices: - $\phi$ - index , w index , Example	
3	<b>Stream flow measurement:</b> Introduction, Measurement of stage, measurement of velocity, Stage discharge relationship – permanent control, shifting control, examples. Determination of discharge by direct and indirect methods, stage discharge curve; backwater effects <b>Runoff:</b> Introduction, Types, Factors affecting run off, estimation of run-off, rainfall run off relationship	10L
4	<b>Hydrographs:</b> Introduction, characteristics: Base flow separation. Unit Hydrographs: Definition, Assumptions, Derivation of unit hydrographs, S-curve, flood routing, Muskingum Method. <b>Ground water hydrology:</b> Aquifers – Definition, Darcy’s Law, Estimation of Parameters, Flow through water bodies, Water Divide, Basic Laplace Equation, Steady State, Confined & Unconfined equation with recharge, Flood Definition, Effects, Design Flood & Estimation and construction of wells and tube wells Yield of an open well – Equilibrium pumping test, Recuperating test, examples, Tube wells - Strainer type, cavity type and slotted type. Examples.	12L
	<b>Total</b>	<b>42L</b>
	<b>No. of weeks Required</b>	<b>14</b>
	<b>No. of weeks in hand</b>	<b>2</b>

**Text/Reference Books:**

Hydrology and Flood Control Engineering by S.K.Garg, Khanna publishers  
Irrigation Engineering and Hydraulic Structures by S.K.Garg, Khanna publishers  
Introduction to Hydrology by Viessman, Pearson Education  
Ground Water Hydrology by D.K.Todd  
Engineering Hydrology by K. Subramaniyam

**Paper Name : Soil Mechanics Lab -I**

**Paper Code : CE 551**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1.	Field identification of different type of soil without laboratory testing, determination of natural moisture content.
2.	Determination of specific gravity.
3.	Determination of In-situ density by core cutter method/ sand replacement method.
4.	Grain size distribution of cohesionless soil by sieving. Grain size distribution of fine grained soil by hydrometer analysis.
5.	Determination of Atterberg’s limits (liquid limit & plastic limit method).
6.	Determination of co- efficient of permeability by constant head permeameter (coarse grained soil). Determination of co- efficient of permeability by falling head method (fine grained soil).
7.	Determination of compaction characteristics of soil.

**Text/Reference Books:**

1. Soil testing by T.W. Lamb ( Johwilley)  
2. Soil Testing for Engineers by Mittal and Shukla, Khanna Publishers.  
3. Soil Testing by KVS Apparao and VCS Rao, University Science Press.  
4. Measurement of Engineering properties of soil by E Saibaba Reddy & K. Rama Sastri. (New age International publication).

**Paper Name : Environmental Engineering Laboratory**

**Paper Code : CE 552**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks: 100**

1. Determination of pH, turbidity of water
2. Determination of Solids – suspended, dissolved, settleable and volatile for water and waste water
3. Determination of dissolved oxygen (DO) in water
4. Determination of BOD, COD, TKN in waste water
5. Determination of Hardness of water.
6. Determination of Chloride and Iron in water
7. Estimation of ammoniacal nitrogen ( $\text{NH}_3\text{N}$ ) in water and waste water.
8. Determination of Chlorine demand and available Chlorine in water.
9. Available chlorine in bleaching powder, Residual chlorine in water & Chlorine demand.
10. MPN test in water
11. Determination of Acidity and alkalinity in water.

**Text/Reference Books**

1. Relevant IS code
2. Chemistry for environmental Engineering and science by Sawyer & McCarty.
- 3.

**Paper Name : Concrete Technology Lab -I**

**Paper Code: CE 553**

**Weekly Load : L-0,T-0,P-3**

**Credit Points: 2**

**Full Marks : 100**

1. Tests on cement – specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar cubes.
2. Tests on fine aggregate – specific gravity, bulking sieve analysis, fineness modulus, moisture content, bulk density, voids and deleterious materials.
3. Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density and voids.
4. Tests on bricks and tiles (Roofing and Flooring) - Water absorption, breaking loads.

**Text/Reference Books**

BIS Codes on testing of cement, fine and coarse aggregates, Bricks and tiles.  
Laboratory manual of concrete testing (Part I) – V.V Sastry and M. L. Gambhir.

**Paper Name: Hydraulics Laboratory**

**Paper Code: CE 554**

**Weekly Load: L: 0 T: 0 P: 3**

**Credit Points: 2**

**Total Marks: 100**

1. Determination of Orifice co-efficient
2. Calibration of Orifice meter
3. Calibration of V- Notch
4. Measurement of velocity of water in an open channel using a pitot tube

5. Measurement of water surface profile for flow over Broad crested weir
6. Determination of efficiency of a Centrifugal pump
7. Determination of efficiency of a Reciprocating pump
8. Determination of efficiency of a Pelton wheel Turbine
9. Determination of efficiency of a Francis Turbine
10. Determination of efficiency of a Hydraulic Ram

**Text/Reference Books:**

1. Hydraulics Manual by R.S.Khurmi
2. Hydraulics: Lab Manual by S.K.Likhi

## Semester-VI

**Paper Name : Foundation Engineering**

**Paper Code : CE 601**

**Weekly Load : L-3, T-0, P-0**

**Credit Points : 2**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	<b>Site Investigation &amp; Soil Exploration:</b> Subsurface exploration, methods of boring and sampling; different types of samplers; ground water observations. In-situ tests: SPT, SCPT, DCPT, field vane shear, Plate load test, Bore log, preparation of sub-soil Investigation report.	8L
2.	<b>Foundations:</b> Classification, selection- shallow and deep foundations. Shallow foundations : Bearing capacity, Terzaghi's bearing capacity theory, effect of depth of embedment, eccentricity of load, effect of water table, foundation shape on bearing capacity , Bearing capacity on layered media, Bearing capacity as per IS 6403-1981. Numerical problems. Allowable bearing capacity: definition, determination of allowable bearing capacity from in-situ test- SPT and Plate load test. <b>Settlement:</b> Immediate and consolidation settlement, correction for rigidity and dimensional effects, settlement in various types of soil, IS recommendations. Numerical problems.	14L
3.	<b>Deep foundations:</b> Pile: Types, load transfer mechanism, method of installation of piles- classification based on material, Installation Techniques – Selection and uses, Determination of load carrying capacities of piles by static and Dynamic formulae, Pile group . Group efficiency, Numerical problems. Negative skin friction, pile load test.	8L
4.	<b>Mitigation of Construction hazards:</b> Braced excavation, types of bracing system; stability considerations, Dewatering, effect of adjoining structures, bottom heave in clay soil. <b>Introduction to Ground Improvement Technique:</b> Compaction, vibrofloatation, grouting, sand drains, chemical stabilisation, reinforced earth.	12L
	<b>Total</b>	<b>42L</b>
	<b>No. of Week Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

- 1.Principles of Soil Mechanics & Foundation Engineering by – V.N.S. Murthy (UBS Publishers).

2. Soil Mechanics & Foundation Engineering by – B.C. Punmia (Laxmi Publications).
3. Foundation Analysis & Design By J.E. Bowels ( McGraw Hill)
4. Principles of Foundation Engg. By B.M. Das (PWS Publishing)
5. Foundation Design by N.N. Som and S.C. Das

**Paper Name : Transportation Engineering – I**

**Paper Code : CE 602**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	<p><b>Introduction to transportation Engineering:</b> Definition and objectives of transportation Engineering, role of transportation in society, Different modes of transportation, Scope of highway engineering, Historical Development of road Construction; Jayakar Committee Report; Central road fund, Indian Road Congress, central road Research Institute, Moto vehicle act, First twenty year road Plan, second Twenty Year Road Plan, Highway Research Board, third Twenty year road Plan, NHDP, PMGSY, Classification of road, Classification of Highways, Road Pattern, saturation system; Highway financing (pay as you go method and Credit Points financing method) and highway economics (quantifiable and non quantifiable, benefits to highway users, cost of vehicle operation, annual cost method, and benefit-cost ratio method)</p> <p><b>Highway Alignment:</b> Requirements; factors controlling alignment; engineering surveys for highway alignment and location.</p>	8L+2T
2.	<p><b>Highway Geometric Design:</b> Cross-sectional elements; design speed, passing and non-passing sight distances; PIEV theory, requirements and design principles of horizontal alignment including radius of curvature, super elevation, extra-widening, design of transition curves, curve resistance, set back distance, grade compensation and vertical alignment.</p>	12L+5T
3	<p><b>Highway materials:</b> Significance of subgrade soil, CBR test, Desirable properties and Test of Road aggregate; Bituminous Materials, Bitumen, tar, emulsion, types of bitumen, Test on Bitumen, marshal Method of bituminous mix Design, Moorum, Water bound Macadam (WBM), Wet Mix macadam (WMM), bituminous and concrete roads.</p> <p><b>Pavement design:</b> Evaluation of soil subgrade, sub-base, base and wearing courses; design factors for pavement thickness (including design wheel load and ESWL, strength of pavement materials and plate load tests, and effect of climatic variations) Group Index and CBR, IRC method of flexible pavement design; Westergaard's analysis of wheel load stresses in rigid pavements; frictional stresses and warping stresses; IRC recommendations for design of rigid pavements; design of expansion and contraction joints. Benkelman Beam Test. Failure of flexible and rigid pavements.</p> <p><b>Pavement Construction Technique:</b> Types of pavement; construction of earth roads, gravel roads, WBM, bitumen and cement concrete roads; joints in cement concrete pavements.</p>	12L+4T

4	<b>Traffic Engineering:</b> Traffic characteristics, theory of traffic flow, Traffic engineering studies, Intersection design, traffic sign and signal design, highway capacity	10L+3T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Highway Engineering By Khanna& Justo
2. Transportation Engineering -Vazirani& S.P ChandalaKhannaPulishers
3. I.S Specifications on Concrete , Aggregate & Bitumen, Relevant latest IRC Codes (IRC-37 – 2012, IRC 58 – 2015, IRC 73 - 1980, IRC 86 - -1983, IRC 106 – 1990, IRC 64 – 1990, IRC 15- 2002)
4. Principles of Transportation Engineering: P. Chakraborty& A. Das(PHI)
5. Transportation Engineering- C.J Khisty& B.K Lall.
6. Textbook of Highway Engineering by R Srinivasa Kumar (University Press)
7. Pavement Analysis and Design by Yang H. Huang , Pearson Education Publication
8. “Traffic Engineering & Transportation Planning”, by L. R. Kadyali, 4th Edition, Khanna Publishers

**Paper Name : Environmental Engineering – II**

**Paper Code : CE 603**

**Weekly Load ; L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Sewage and drainage:</b> Definition of some common terms used in sanitary engineering. Systems of sanitation, systems of sewerages. Types of sewage. Sources of sanitary sewage. Estimating the quantity of sanitary sewage and storm sewage.	4L+1T
2	<b>Design of sewers.</b> Nomograms, partial flow diagrams. Testing of sewer lines Sewer appurtenances. Pumping of sewage. House drainage. Characteristics of sewage: Physical, Chemical and Biological. Test on sewage; Solids, dissolved oxygen, biochemical oxygen demand, stability and relative stability, chlorides, sulphide, nitrogen. pH value, grease, oil and fat. Biological tests, carbon, nitrogen and sulphur cycles.	10L+4T
3	<b>Treatment of sewage:</b> Primary treatment - screen, grit chamber, detritus tank, skimming tank, plain sedimentation sedimentation with coagulation. Secondary treatment - Filtration, normal rate trickling filters, high rate trickling filters activated sludge process, aeration units, types of activated sludge process, sludge digestion. Functional design of primary and secondary treatment units. Disposal by other methods: Oxidation pond, oxidation ditch, aerated lagoon, septic tank, Imhoff tank, Disposal by dilution, irrigation and farming Solid waste disposal: Quality and quantity of refuse, Collection and conveyance of solid wastes. Disposal of solid waste by composting, and other methods, Salvaging, grinding and discharging into sewers.	18L+8T
4	<b>Air Pollution</b> – Definition, Classification, effects, Criteria Air Pollutants, Health & other ill effects of air Pollution, standard & Limits. Air quality Index, Plume Dispersion Models, Rudiments of Air pollutant Technology Noise Pollution	10L+1T

	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Environmental Engineering S.K. Garg -KhannaPub .
2. Water Supply , Waste Disposal &Environmental Pollution Engineering – A . K .Chatterjee – KhannaPub .
3. Water Supply & Waste Water Disposal –G .M .Fair ,J . C .Geyer ,D . A .Okun . –Jhon Wiley &Sons .
4. Sanitary Engineering Volume II by Kshirasagar.
5. Manual of treatment - A Government of India Publication.
6. Water Supply and Sanitary Engineering By G.S.Birdi
7. Environmental Engineering by Mcaffee, Eddy

**Paper name : Design of concrete structure**

**Paper Code : CE 604**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

<b>Module</b>	<b>Course Content</b>	<b>Lecture / Tutorial Period</b>
<b>1.</b>	<b>Introduction:</b> Principles of design of reinforced concrete members - Working stress and Limit State method of design. <b>Working stress method of design:</b> Basic concepts and IS code provisions for design against bending moment and shear forces - Balanced, under reinforced and over-reinforced beam/ slab sections; design of singly and doubly reinforced sections.	<b>8L+3T</b>
<b>2.</b>	<b>Limit state method of design:</b> Basic concepts and IS code provisions (IS:456) for design against bending moment and shear forces; concepts of bond stress and development length; Use of ‘design aids for reinforced concrete’ (SP:16). <b>Analysis, design and detailing of singly reinforced rectangular, ‘T’, ‘L’ and doubly reinforced beam sections.</b>	<b>14L+4T</b>
<b>3.</b>	<b>Design and detailing of one-way and two-way slab panels</b> as per IS code provisions. Design and detailing of continuous beams and slabs as per IS code provisions. <b>Staircases:</b> Types; Design and detailing of reinforced concrete doglegged staircase.	<b>11L+4T</b>
<b>4.</b>	<b>Design and detailing of reinforce concrete short column</b> of rectangular and circular cross-sections subjected to axial compressive force, combine bending (uni-axial bending and bi-axial bending) and direct stress. <b>Shallow foundations:</b> Types; Design and detailing of reinforced concrete isolated square and rectangular footing for columns as per IS code provisions.	<b>9L+3T</b>
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. IS: 456-2000 - “Indian Standard Plain and reinforced concrete – code of practice”
2. SP: 16-2000 - “Design aids to IS: 456”
3. Reinforced concrete Design by Mallick& Gupta
4. Reinforced concrete Limit state design by Ashok K. Jain
5. Limit State Design of Reinforced Concrete by P.C. Varghese
6. Reinforced Concrete Design by Pillai and Menon [TMH]

7. Reinforced concrete by S.N.Sinha [TMH]

**Paper Name : Planning & Construction Management**

**Paper Code: CE 605**

**Weekly Load : L-3, T-0, P-0**

**Credit Points: 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Planning:</b> General consideration, Definition of aspect, prospect, roominess, grouping, circulation privacy, occlusion</p> <p><b>Regulation and Bye laws :</b> Bye Laws in respect of side space, Back and front space, Covered areas, height of building etc., Lavatory blocks , ventilation, Requirements for stairs, lifts in public assembly building, offices</p> <p><b>Fire Protection:</b> Fire fighting arrangements in public assembly buildings, planning , offices, auditorium</p>	8L
2	<p><b>Construction plants &amp; Equipment:</b> Plants &amp; equipment for earth moving, road constructions, excavators, dozers, scrapers, spreaders, rollers, their uses. Plants &amp; Equipment for concrete construction: Batching plants, Ready Mix Concrete, concrete mixers, Vibrators etc., quality control</p>	8L
3	<p><b>Planning &amp; Scheduling of constructions Projects:</b> Planning by CPM &amp; PERT, Preparation of network, Determination of slacks or floats. Critical activities. Critical path, project duration .expected mean time , probability of completion of project, Estimation of critical path, problems. Cost Optimization Through CPM Technique and Resource allocation.</p>	14L
4	<p><b>Management:</b> Professional practice, Definition, Rights and responsibilities of owner, engineer, Contractors, types of contract, NIT, Condition of Contract, Earnest money, Security money, Termination of contract</p> <p><b>Departmental Procedures:</b> Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, Acceptance of tenders, Arbitration</p>	12L
	<b>Total</b>	<b>42</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

\* Module:1 is as per National Building Code

**Text/Reference Books:**

1. Construction Planning, Equipments and methods by R.L. Puerifoy, McGraw Hill.
2. Management in Construction Industry by P.P. Dharwadkar , Oxford and IBH Publishing company , New Delhi.
3. Construction Management, Critical path Methods in Construction by J.O. Brien, Wiley Enterprise.
4. PERT and CPM by L.S. Srinath.
5. Project planning and control with PERT and CPM; Construction equipment and its management by B.C. Punmia and K.K. Khandelwal , S.C. Sharma.
6. National Building code, BIS.

**Paper Name : Water Resources Engineering-II**

**Paper Code : CE 606**



Weekly Load : L-3, T-0, P-0

Credit Points : 3

Full Marks : 100

Module	Course Content	Lecture / Tutorial Period
1	Types of Irrigation systems, methods of irrigation. <b>Water requirements of crops:</b> Crop period or Base period, Duty & Delta of a crop, relation between Duty & Delta, Duty at various places, flow Duty & quantity Duty, factors affecting Duty, measures for improving Duty of water, crop seasons.	10L
2	<b>Canal Irrigation:</b> Introduction, classification of irrigation canals, Efficient section, certain important definitions, Time factor, Capacity factor, full supply coefficient, Nominal duty, Channel losses, Examples. <b>Design of Drainage channel:</b> Introduction, Determination of runoff coefficients, Estimation of Runoff, Channel design formulae, Problems.	12L
3	<b>Design of unlined alluvial channels by silt Theories:</b> Introduction, Kennedy's theory, procedure for design of channel by Kennedy's method, Lacey's theory, concept of True regime Initial regime and final regime, design procedure using Lacey's theory, Methods of prevention of silt deposition in canals and reservoirs, examples. <b>Lining of Irrigation Cannals :</b> Objectives, advantages and disadvantages of canal lining ,economics and requirements of canal lining, Types of lining, Design of lined Canals- examples	10L
4	<b>River Engineering:</b> Introduction, types of rivers and their characteristics, classification of rivers , Meanders- causes, Meander parameters, Development of a cut-off, cut-off ratio. Control and Training of Rivers: Concept, objectives. Classification of River Training: Marginal embankment or levees, Guide Bank, Groynes or spurs, Artificial cut-off, Pitched Island, Pitching of banks and provision of launched apron, Miscellaneous method such as sills etc. Examples. <b>Water logging and drainage:</b> Causes, effects and prevention of water logging. Type of drains-open drains and closed drains (introduction only), Discharge and spacing of closed drains. Examples. <b>Water resources planning, Management &amp; Laws:</b> India's water resources, water resources development, purpose, classification, functional requirements of Multipurpose projects, project formulation, evaluation, future strategies, planning & management strategies, Water Management, Water Laws.	10L
	<b>Total</b>	<b>42L</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of weeks in hand</b>	<b>2</b>

**Text/Reference Books:**

1. Irrigation Engineering and Hydraulic Structures –By SantoshKr.Garg.Khanna Publishers.
2. Irrigation, water Resources and water Power Engineering – By Dr. P.N.Modi- Standard Book House
3. Water Resource Systems, Planning and analysis By D.P. Luches
4. Jerry R. Stedinger, D.A. Haith, PrnticeHall,Ine, Englewood cliffs, New Jersey
5. Water Resources Engineering – Ralph A. Wurbs and Wesley P. James- Prentice Hall of India.
6. Water Resources Engineering- Larry W. Mays – John Wiley & Sons, Inc.
7. Irrigation Engineering by N NBasak

**Paper Name : Soil Mechanics Lab -II**

**Paper Code : CE 651**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1. Determination of compressibility characteristics of soil by Oedometer test ( co-efficient of consolidation , modulus of volume compressibility, compression and decompression index)
2. Determination of unconfined compressive strength of soil
3. Determination of Shear parameter of soil by Direct shear test
4. Determination of undrained shear strength of soil by Vane shear test.
5. Determination of shear parameter of soil by Triaxial test
6. Determination of CBR of a soil specimen as per IS code recommendation.
7. Standard Penetration Test.

**Text/Reference Books:**

1. Soil testing by T.W. Lamb ( Johwilley)
2. Soil Testing for Engineers by Mittal and Shukla, Khanna Publishers.
3. Soil Testing by KVS Apparao and VCS Rao, University Science Press.
4. Measurement of Engineering properties of soil by E Saibaba Reddy & K. Rama Sastri. (New age International publication.

**Paper Name :Transportation Engineering Lab**

**Paper Code : CE 652**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1. <b>Tests on highway materials</b> – Aggregates- Impact value, Los-Angeles Abrasion value, water absorption, Aggregate Shape test (Elongation & Flakiness Index).
2. <b>Bitumen &amp; Bituminous Materials</b> – Specific gravity, penetration value, softening point, loss on ignition, Flash & Fire point test, Ductility Test, Water Content, Float Test Viscosity Test, Stripping value test,
3. Marshal Stability Test.
4. Benkelman Beam Test.

**Reference Books:**

1. BIS codes on Aggregates & Bituminous Materials
2. Highway material testing ( Laboratory Manual)
3. S.K. Khanna and CE.G. Justo,
4. Relevant I.R.C. codes.

**Paper Name : Concrete Technology Laboratory-II**

**Paper Code : CE 653**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1. Fresh Concrete Workability Test : Slump, Vee-Bee, Compaction Factor Test
2. Hardened Concrete : Compressive Strength, Split Tensile Strength
3. Non Destructive Test of Concrete
4. Tests on Reinforcement Bars
5. Concrete Mix Design

**Paper Name : Design Sessional-I (R.C.C. Structure)**

**Paper Code : CE 681**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1. General considerations, design principle of R.C.C. sections. Limit state method of design Loads and stresses to be considered in the design as per I.S. code provision.
2. Design & detailing of: i) simply supported R.C.C Beam, ii) Continuous T- Beam.
3. Design & detailing of: i) simply supported one way slab, ii) One way Continuous slab.
4. Design of different units – slab, beam column, roofing and staircase from floor plan of a multistoried frame building – two way action of floor slab.

**Reference Books:**

1. Relevant IS code. (IS 456, 2000)
2. SP 16, 2000 and SP 34, 1987
3. Reinforced concrete Design by Mallick & Gupta
4. Reinforced concrete Limit state design by Ashok K. Jain
5. Limit State Design of Reinforced Concrete by P.C. Varghese

## Semester-VII

**Paper Name : Design of Steel Structures**

**Paper Code : CE 701**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	<b>Materials and Specification</b> :-Rolled steel section, types of structural steel , specifications <b>Structure connections</b> :- i) Riveted, Welded and Bolted including High strength friction grip bolted Joints. –types of riveted & bolted joints, assumptions, failure of joints ,efficiency of joints, design of bolted ,riveted & welded joints for axial load. Eccentric connection : - Riveted & bolted joints subjected to torsion & shear, tension & shear, design of riveted, bolted & welded connection.	10L+4T
2.	<b>Compression members</b> : – Design of compression members , effective lengths about major & minor principal axes, I.S code provisions. Permissible stresses, Design rules, Examples. Design of one component, two components and built up compression members under axial load.	11L+3T
3.	<b>Built up columns</b> :- Under eccentric loading Design of lacing and batten plates.Different types of Column Bases- Slab Base , Gusseted Base, Connection details. <b>Beams</b> : - Permissible stresses in bending , compression and tension. Design of rolled steel sections , Plated beams. Simple Beam end connections, Beam -Column connections. I.S code provisions	11L+3T
4.	<b>Tension members</b> :- Design of tension members , I.S code provisions. Permissible stresses, Design rules, Examples. <b>Plastic Design of steel structures</b> :- Introduction. Plastic hinges & Collapse mechanism, Design of beams, simple portals frame	10L+4T

	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. IS 800 – 2007
2. S.P.: 6(1) – 1964 Structural Steel Sections
3. Pasala Dayaratnam – Design of steel structures A.H.Wheeler& Co Ltd. 1990
4. Ramachandra – Design of steel structures, Vol. I & II
5. B.S.Krishnamachar and D. Ajitha Sinha – Design of steel structures Tata McGraw – Hill publishing Co.
6. S.M.A.Kazmi and R.S. Jindal – Design of steel structures – Prentice Hall of India – 1988.
7. Design Of Steel Structures - S.K.Duggal Tata Mc-GrawHill , New Delhi.
8. Design of Steel Structures – L. S. Negi
9. Design of Steel structures – Arya & Azmani

**Paper Name : Hydraulic Structure & Flood Control Engineering**

**Paper Code : CE 702**

**Weekly Load : L-3, T-0, P-0**

**Credit Points : 2**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Diversion Head works:</b> Introduction, Object of Diversion Head work, Necessity, Difference between weir and Barrage, Type of Weirs, Selection of site, layout and description of each part, Effects of construction of a weir on the river regime, causes of failure of weirs on permeable foundation and their remedies</p> <p><b>Theories of seepage and Design of weirs and Barrages:</b> Failure of Hydraulic Structures Founded on Pervious foundations: i) By piping ii) By Direct uplift, Bligh's creep theory of seepage flow, Khosla's theory &amp; concept of flow nets, concept of exit gradient and critical exit gradient, Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage, necessary corrections, examples.</p>	10L
2	<p><b>Hydraulic structures for canals:</b> Canal falls – necessity, locations, types and description of Ogee fall, Trapezoidal-notch fall, Syphon well drop. Examples.</p> <p><b>Cross-Drainage Works:</b> Necessity, types, selection of a suitable type (Introduction only)</p>	8L
3	<p><b>Dam (General):</b> Definition, classification of Dams, factors governing selection of type of dam, selection of suitable site for a dam.</p> <p><b>Gravity Dam:</b> Definition, Typical cross- section, Forces acting on Gravity Dam, Combination of forces for design, Mode of failure and criteria for structural stability of Gravity Dams, Principal and shear stresses. Elementary profile of a Gravity Dam, Concept of High and low Gravity Dam, Examples.</p>	12L
4	<p><b>Earthen Dams:</b> Introduction, Types of Earthen Dams, Methods of Construction, Causes of failure, Design Criteria, Determination of line of seepage or phreatic line in Earthen Dam, seepage control in Earthen Dam, Examples.</p> <p><b>Spillways:</b> Introduction, Types, Location, Essential requirements, spillway capacity. Components of spillway, Controlled and un-controlled spillways, various types of spillways- description of each type in brief, Energy Dissipation below overflow spillways- Hydraulic jump formation, stilling basins, spillway crest Gates- various types and description Of each type in brief. Examples</p>	12L
	<b>Total</b>	<b>42L</b>

	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Irrigation Engineering and Hydraulic Structures by S.K.Garg, Khanna Publishers
2. Hydrology & Flood Control Engineering by S.K.Garg, Khanna Publishers
3. Irrigation Water Resources and Water Power Engineering by Dr. P.N.Modi
4. Dams & Hydraulic Structures by H.K.Gite&G.B.Deshpande
5. A Textbook of Water Power Engineering by R.K.Sharma&T.K.Sharma

**Paper Name : Transportation Engineering – II**

**Paper Code : CE 703**

**Weekly Load : L-3, T-0, P-0**

**Credit Points : 3**

**Full Marks : 100**

<b>Module</b>	<b>Course Content</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<p><b>Introduction and Location survey:</b> Role of Railway in Transportation, Historical Development of Railway in India, Organization of Indian Railways, Classification of Indian railways (By Tonnage, Gauge length, speed on railway Line). Basic requirements of an ideal Alignment, Factors affecting alignment, Preliminary surveys and Engineering surveys on Alignment.</p> <p><b>Permanent way:</b> Requirement of an ideal Permanent way, gauge in a railway track, Different gauge in India and Abroad, Selection of Gauge, railway Track Cross Section, coning Of Wheels, <b>Stress in a railway Track:</b> Track Modulus, Stresses in Rails, Sleepers and Ballast, Tractive Resistances, Hauling Capacity of Locomotive.</p> <p><b>Rails:</b> Function of Rails, Composition of rails, Requirement of Rails, Types of Rail Sections, Comparison of Different types of Rail, Selection of rail, Length of Rail, Corrugated or Roaring rails, Hogged rails, Kink in rails, rail Buckling of Rails, rail failures, Wear on Rail. <b>Rail joints and Welding of rails:</b> Requirement of an ideal joint, types of rail joints, welding of rails, advantages of welding of rails, method of welding of rails, length of welded rails. Creep of rails: Indication of creep, theories of creep, Effect of creep, Measurement of creep, prevention of creep. <b>Sleepers:</b> Function of sleepers, Requirement of sleepers, classification of sleepers, Advantages and disadvantages of different type of sleepers, Adzing of sleepers, Spacing of sleepers and sleeper density. <b>Track fittings and fastenings:</b> Fish Plate, Spikes, Bolts, Chairs, Blocks, Keys, Bearing Plates. <b>Ballast</b> :Function of Ballast, Requirement of Ballast, Types of Ballast, Size and selection of Ballast, Renewal of Ballast. <b>Subgrade and Formations:</b> function, slopes, Cross-section, Drainage</p>	<b>10L</b>

2	<p><b>Geometric Design:</b> Alignment, horizontal curves, super elevation, equilibrium cant and cant-deficiency, Gradients and grade compensation.</p> <p><b>Railway Station Yard:</b> Site, requirements, classification of railway stations.</p> <p><b>Points and crossing:</b> Necessity of point and crossings, turnout, left hand turnouts and right hand turnouts, point of switches and its component parts, crossings and its component parts, number of crossing and angle of crossing.</p> <p><b>Signaling and Inter locking:</b> Objectives, principles of signaling, classification and types of signals in stations and yards &amp; methods of interlocking.</p>	11L
3	<p><b>Docks &amp; Harbour :</b></p> <p>i) <b>Harbour:</b> Types, accessibility and size</p> <p>ii) <b>Tides, wind and waves:</b> Definitions, spring and neap tides, wave movement, littoral drift, deflection of waves, length of waves and wave action on marine structures.</p> <p>iii) <b>Breakwaters :</b> Classifications, materials used, methods of construction and protection</p> <p>iv) <b>Docks:</b> Shapes of docks and basin, location, arrangement of berth, dockwalls, dock entrances, repair dock types.</p> <p>v) <b>Quays:</b> Forces, types and design consideration.</p> <p>vi) Miscellaneous topics on docks and harbours, Transit sheds, warehouses, navigational aids.</p>	11L
4	<p><b>Introduction to airport planning and development:</b> General philosophy of airport planning and development, Organizations of Air Transport in India, ICAO classification of airports, site selection factors, characteristics of jet aircraft. Airport Obstructions,</p> <p><b>Airport design standards ;</b> Orientation of runways, length of runways and corrections, width of runways, sight distances, gradients and clearances, taxiways and Aprons.</p> <p><b>Airport planning:</b> Centralized and decentralized planning concepts, terminal requirements, terminal facilities and Typical layout of airports.</p>	10L
	<b>Total</b>	<b>42L</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. A Text Book of Railway Engineering – S.P. Arora & S.C. Saxena
2. Railway engineering by Satish Chandra and M. M. Agarwal (Oxford University Press)
3. Docks, Harbours and Tunnels by R. Srinivasan
4. Airport planning and Design. S.K. Khanna & M.G. Arora

**Paper Name : Group Discussion and Personality Development**

**Paper Code : HS 781**

**Weekly Load : L : 0 T : 0 P : 2**

**Credit Point : 02**

**Total Marks : 100**

Module	Course Content	Lecture / Tutorial Period
--------	----------------	---------------------------

1	<b>Group Discussion:</b> Students must be made aware of the difference between conversation and group discussion. UGC produced video cassettes could be used to teach them the strategies to be followed in group discussion. Students must also be given practice on contemporary social , economic, political and educational topics.	7P
2	<b>Mock Interview:</b> Students are to be taught the strategies of facing an interview. Mock Interviews Must be arranged for them.	7P
3	<b>Presentation:</b> Students will be taught how to make lab presentations by using different audiovisual aids.	7P
4	<b>Language tests:</b> Students will be prepared for facing language tests like T.O.E.F.L	3P
	<b>TOTAL:</b>	<b>24P</b>
	<b>Total Week Required:</b>	<b>12</b>
	<b>No. of Week Reserved:</b>	<b>04</b>

**Text/Reference Books:**

- 1 .Group discussion and interview(With audio cassette) by Prasad, Published by TMH.
- 2 .Communication at work by Alder and Elmhorst, By MHI

**Paper Name : Computer Application in Civil Engineering – I**

**Paper Code : CE 751**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1. Hands on experience of building design and frame analysis by using commercial software like STAAD pro
2. Hands on experience of using different estimation commercial softwares.

**Paper Name : Design Sessional-II (Steel Structure)**

**Paper Code : CE-781**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1. Problems on general consideration and basic concepts
2. Discussion on different loads ( i.e. wind load , Dead load , live load and others) as per IS800-2007
3. Design & drawing of the following components of a roof truss: <ol style="list-style-type: none"> <li>a. Members of the roof truss.</li> <li>b. Joints of the roof truss members</li> <li>c. Purlines</li> <li>d. Gable bracings</li> <li>e. Column with bracings</li> <li>f. Column base plate</li> <li>g. Column Foundation</li> </ol>

**Text/Reference Books:**

- 1.Design of steel structure – L S Negi(Tata Mccrawhill Publication)
2. Design of steel structures- Arya and Ajmami (Nem Chand &Brs; Roorkee ,U.P.)
- 3.Design of Steel Structures- Duggal(Tata Mcgraw hill)

4.I.S. Code 800-2007

5.I.S. SP-6

6.Handbook on Design and Detailing of Structures-Dayaratnam P.(Wheeler)

7. Design of steel Structure- P. Dayaratnam

8. Structural Design in steel- S.A. Roy (NewAge Int. Pvt. Ltd.)

**Paper Name: Project-I**

**Paper Code : CE 791**

**Weekly Load: L:0, T:0, P:3**

**Credit Point : 4**

**Total Marks: 100**

- Project group made up of Students (preferably not more than four in each group) under the guidance of a faculty member need to complete one project during the Semester VII
- Total marks of the project-I work are 100 and Credit Points are 3. .
- At the beginning of the Semester-VII each project group have to submit their project Synopsis. At the end of Semester-VII students have to submit a Project Report. Each group should submit at least three extra copies of Project Report other than their individual copy, one for their Project guide, one for the departmental library and one for the institutional library.
- Each project group should be demonstrated and presented in front of Board of Experts and evaluation will be made on that.
- Project – I should preferably be from the fields of Design, Soil Mechanics & Concrete Technology.

**Paper Name: Seminar-I**

**Paper Code : CE 792**

**Weekly Load: L:0, T:0, P:3**

**Credit Point : 2**

**Total Marks: 100**

- Each student have to give 10 minutes' individual presentation / lecture on any topic (advanced technology, research or development, new emerging field etc.) followed by 5 minutes interaction / discussion session.
- The presentation should be in front of teachers and students of the class.
- Evaluation should be based on the following parameters of the students: Presentation skill, Delivery of the speech, Depth and breadth of the subject matter presented.
- The attendance of other students in the seminar will be recorded and their participation should also be assessed for evaluation of their participations.
- Each student has to submit technical reports for each presentation they have delivered. Those who have attended Vocational Training should submit a Report at the completion of the training to the departmental in-charge. The Training Report should be authorized by the institutions/organizations where the training has been made.
- Marks will be given based on evaluation throughout the year and a final evaluation at the end of Semester based on either evaluating what students have performed during the Vocational Training (If student have attended that kind of training) or based on a final presentation

## **Appendix-I** **Elective-I (CE 7<sup>th</sup> Semester)**

**Paper Name : Structural Dynamics and Earthquake Resistance Structure**

**Paper Code : CE 711(a)**



**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Theory of vibrations</b> -Newton's Law, D'Alembert principal, Hamilton's principal, Lagrange principal and its application, Degrees of freedom, Dynamics system and types, Classification of vibration, Harmonic motion. <b>Response of single degree freedom system due to free vibrations:</b> Undamped single degree freedom system, Damped single degree freedom system, Natural frequency, modes of vibration, Logarithmic decrement.	11L+3T
2	<b>Response of single degree freedom system due to harmonic loading:</b> Undamped harmonic excitation, Damped Harmonic excitation, Vibration isolation and Transmissibility. <b>Response due to Transient loading:</b> Duhamel's Integral, Response due to constant force, Rectangular load, Introduction to numerical evaluation of Duhamel's integral of undamped system.	11L+5T
3	<b>Two degree and multiple degree freedom systems,</b> Computation of dynamic response to time dependent forces, Vibration isolation, Vibration absorbers.	10L+3T
4	<b>Principles of earthquake resistant design:</b> Terminology, General principles and Design criteria, Methods of Analysis, Equivalent lateral force method of Analysis for multistoried building as per Indian Standard Code of Practice, Introduction to Response Spectrum Method, Fundamental concepts of Ductile detailing	10L+3T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Structural Dynamics by Mario Paz
2. Structural Dynamics by Madhujit Mukhopadhyay
3. Dynamic of Structures by Anil K. Chopra
4. Dynamics of Structures by Ashok K. Jain
5. Earthquake-Resistant Design of Structures by S.K Duggal.

**Paper Name : Dynamics of Soil and Foundation**

**Paper Code : CE 711(b)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Fundamental of vibrations:</b> Degrees of freedom, Natural frequency, Undamped single degree freedom system, Damped single degree freedom system, Transmissibility, Response to ground motion, Introduction to multiple degree freedom system	10L+2T

2	<b>Dynamic properties of Soil:</b> Laboratory and field evaluation of soil properties as per IS codes;	<b>6L+2T</b>
3	<b>Analysis and design of Block type Machine Foundation:</b> Types of Machine Foundations, General requirement of Machine foundations, Dimensional criteria, Methods of Dynamic Analysis, Design considerations for dynamically loaded foundations and constructional features; Machine Foundations Design.	<b>10L+4T</b>
4	<b>Liquefaction of soils:</b> Definition, Causes and effects of Liquefaction, Evaluation of Liquefaction potential, Mitigation of Liquefaction Hazards <b>Propagation of elastic waves in soils:</b> Mechanism of wave propagation, Body waves, Surface waves, Rayleigh waves.	<b>10L+4T</b>
	<b>Total</b>	<b>36L+12T</b>
	<b>No. of Weeks Required</b>	<b>12</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

#### Text/Reference Books

1. Structural Dynamics by Mario Paz
2. Fundamentals Of Soil Dynamics And Earthquake Engineering by B B Prasad, PHI.
3. Soil dynamics and Machine foundation By Swami Saran, Galgotia Publication.
4. Principles Of Soil Dynamics by Braja M. Das,
5. Soil Dynamics and Liquefaction by A. S. Cakmak, Elsevier Computational Mechanics Publication

**Paper Name : Advanced Water & Waste Water Technology**

**Paper Code : CE 711(c)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Water</b> – uses and requirement, Sources, Qualities and quantities, Quality criteria, Intakes and transportation <b>Conventional water treatment methods</b> – Aeration, Sedimentation, Coagulation and flocculation, Filtration, Disinfection – Including design of units, Hardness of water and water softening, other miscellaneous water treatment processes. Water storage and distribution systems, Design of pipe networks, Introduction to plumbing systems in buildings	<b>11L+4T</b>
2	Estimation of quantities of sanitary wastewater and storm water run-off. Sewerage system, Design of sewers, Sewer appurtenances, Materials of sewer construction. <b>Quality and characterisation of domestic wastewater</b> – different parameters including oxygen demands, Standards of sewage disposal, Legal aspects of water pollution control.	<b>10L+3T</b>

3	Principles of wastewater treatment, Physical, chemical and biological treatment methods, Primary and secondary treatment, Bio-filter, Activated sludge process, Stabilisation pond, Septic tank. Introduction to other treatment processes including digestion and disposal of sludge.	10L+3T
4	<b>Principles of stream sanitation.</b> <b>Introduction :</b> Characteristics of various industrial pollutants and their effects, Environmental impact assessment. <b>Wastewater :</b> Theories of industrial wastewater treatment, Neutralisation, Equalisation and proportioning, Removal of suspended solids, Removal of colloidal solids, Removal of inorganic and organic dissolved solids, Disposal of sludge solids, Treatment of typical industrial wastes, Standards for disposal of industrial wastewater.	11L+4T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of weeks Required</b>	<b>14</b>
	<b>No. of Weeks in hand</b>	<b>2</b>

**Text/Reference Books:**

1. Environmental Engineering S.K. Garg -KhannaPub .
2. Water Supply , Waste Disposal &Environmental Pollution Engineering – A . K .Chatterjee – KhannaPub .
3. Water Supply & Waste Water Disposal –G .M .Fair ,J . C .Geyer ,D . A .Okun . –Jhon Wiley &Sons .
4. Sanitary Engineering Volume II by Kshirasagar.
5. Manual of treatment - A Government of India Publication.
6. Water Supply and Sanitary Engineering By G.S.Birdi
7. Environmental Engineering by Mcaffé, Eddy

**Paper Name : Rock Mechanics and Tunneling**

**Paper Code : CE 711(d)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 4**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Classification of rocks :</b> Geological, Engineering classification of rocks and discontinuity, Rock quality designation (RQD).	6L+2T
2	<b>Engineering properties of rocks :</b> Mechanical properties of rocks, Stress-strain behaviour in compression, Elastic constants, Brittle and plastic failure. <b>Strength of rocks :</b> Compressive, Tensile and shear, Point load strength, Tests for determination, Griffith's theory, Shear strength of discontinuities, Deformability of rocks.	14L+4T
3	<b>Engineering properties of rock masses :</b> Anisotropy, Deformability, Elastic modulus – static and dynamic, Permeability, Classification of rock masses for general engineering purposes.	8L+2T
4	<b>Initial stresses in rocks and their measurement :</b> Measurement of primitive stresses in the field, Stability analysis Mechanism of tunneling, Stress release techniques, Equipment for tunneling, Introduction to Tunnel Engineering	14L+6T

	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Fundamentals And Applications Of Rock Mechanics by Debasis Deb, Abiram Kumar Verma, PHI
2. Design Analysis In Rock Mechanics, Third Edition Hardcover – Import, 25 May 2017 By William G. Pariseau , CRC Press.

**Paper Name : Water Resource Management and Planning**

**Paper Code : CE 711(e)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

<b>Module</b>	<b>Course Content</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	<b>Planning and analysis of Water Resource Systems:</b> Introduction, System Analysis, Engineers and Policymakers <b>Methods of Analysis:</b> Introduction, Evaluation of Time streams of Benefits and Costs. Plan formulation, Planning models and solution procedures, Lagranges Multipliers, Dynamic Programming, Recursive equations, Bellmans’ principle of optimality. Curse of dimensionality of discrete dynamic programming. Examples	<b>12L+4T</b>
<b>2</b>	<b>Reservoir Operation:</b> Sequential process, single Reservoir problem - with release as decision variable, with storage as decision variable (deterministic approach). Examples, Related Computer Programming. Multi–reservoir problems (Deterministic approach)	<b>10L+3T</b>
<b>3</b>	<b>Water Resources Planning under Uncertainty:</b> Introduction, probability concepts and Methods –Random variable and Distributions, Univariate probability Distributions ,properties of Random variable – Moment and Expectation ( Univariate Distributions) , Moment Generating Functions, Measures of Central tendency, Measures of Dispersion, Measures of symmetry (Skewness), measures of peaked ness (kurtosis), examples	<b>10L+4T</b>
<b>4</b>	<b>Stochastic River Basin Planning Model:</b> Introduction, Reservoir operation, Stochastic, Dynamic programming, Operating Model, Probability Distribution of Storage volumes and Releases, examples <b>Water quality Management:</b> Prediction and Simulation, Water quality Management Modeling	<b>10L+3T</b>
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Applied Hydrology by V.T. Chow , Mcgraw-Hill
2. Stochastic Hydrology by Jayaram Reddy
3. Water Resources Engineering by Larry W Mays, John Wiley & Sons(Asia)
4. Water Resources Systems Planning & Analysis by Ddenice P Loucks, Jerry R Stedinger & Douglas A Heinth, Prentice Hall

**Appendix-II**  
**Elective-II (CE 7<sup>th</sup> Semester)**

**Paper Name : Mathematical Modelling and Stochastic Processes**

**Paper Code : M 712(a)**

**Weekly Load : L: 3 T: 1 P: 0**

**Credit Unit : 4**

**Total Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Mathematical Modeling:</b> Introduction to mathematical modeling-its significances and utilities.</p> <p><b>Modeling in nonlinear phenomena:</b> Modeling in biological ecosystem, Epidemiology, Pharmacology, Socio-economic sectors, Demography; Logistic map, Dynamical system, Stable and unstable equilibrium points, Node and focus, Concept of bifurcation and chaos, Different forms of Bifurcation.</p>	15L+5T
2	<p><b>Modeling in time series data analysis:</b> Filtering of time series data, Kalman Filter, Simple exponential smoothing; Searching for periodicity in a time series data by Ferraz-Mello's Date compensated Discrete Fourier Transform, Lomb-Scargle Method of Periodogram, Maximum Entropy Method, Maximum Likelihood Method, Rayleigh Power-Spectrum Analysis and Simple Denoising Algorithm using Wavelet Transform; Scaling analysis of a time series data, Hurst Exponent, Finite Variance scaling method; Autocorrelation, stationary and non-stationary time series, Autoregressive and moving average method, chaos in a time series; Persistent and Anti-Persistent data; Fractals and Fractal Dimensions, Higuchi's Method to determine the fractal dimension for a time series data.</p>	11L+4T
3	<p><b>Soft Computing Techniques:</b> Basics of Fuzzy Logic, Difference between crisp set and fuzzy set, Concept of membership function, Application of fuzzy logic in engineering systems: an introduction.</p> <p>Introduction to neural network, concept of perceptron, Introduction to artificial neural network, Forward bias and feedback model in neural network, Applications in engineering systems</p>	8L+3T
4	<p><b>Stochastic processes:</b> Introduction; Stationary, Ergodic and Markov processes; Markov chains and Absorbing Markov chains.</p>	8L+2T
	<b>Total:</b>	<b>42L+14T</b>
	<b>Total Week Required:</b>	<b>14</b>
	<b>No. Of Week Reserved:</b>	<b>02</b>

**Text/Reference Books:**

- 1 Non-Linear Dynamics: Integrability, Chaos and Patterns-M. Lakshmanan, Springer India Pvt. Ltd.
- 2 Mathematical Modelling-J.N. Kapoor, New Age Publishers
- 3 Time series analysis: Forecasting and Control: Box, Jenkins & Reinsel, John Wiley and Sons

- 4 Probability, Statistics and Random Processes: T. Veerarajan, Tata McGraw Hill Publishing  
 5. Neural Networks-S. Haykin, Macmillian Publishing Company  
 6. Fuzzy Logic and Neural Networks: Basic Concepts and Application- Chennakesava R. Alavala, New Age International Pvt. Ltd.  
 7. Introduction to Fuzzy Set Theory and Fuzzy Logic-Chander Mohan, Viva Books Pvt. Ltd., 2015.

**Paper Name : Advanced Structural Analysis**

**Paper Code : CE 712(a)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	Elementary theory of elasticity, Stress–strain, Strain-displacement relations, Derivation of equilibrium equations, Various 2D, 3D and spring elements, Use of simple soil mechanics, highways and other stress-strain problems. <b>Matrix methods in structural analysis:-</b> Flexibility and Stiffness method; Elements of matrix algebra; Application of matrix methods to plane truss; continuous beam & frames.	12L+3T
2.	<b>Finite difference technique:-</b> Application to beams, long columns and beams on elastic foundations. <b>Introduction of finite Element Technique in structural analysis:-</b> Fundamental concept, Finite Element modeling, Finite element formulation to One Dimensional.	10L+3T
3.	<b>Finite element solution for two dimensional pin-jointed trusses:-</b> degree of freedom, co-ordinate system, element stiffness, boundary conditions, global stiffness matrix. <b>Interpolation functions of one dimensional element:-</b> linear, quadratic and cubic interpolation functions.	10L+4T
4.	<b>Finite element solution for beams:-</b> degree of freedom, co-ordinate system, element stiffness, boundary conditions, global stiffness matrix.	10L+4T
	<b>Total</b>	<b>42L+14T</b>
	<b>No.of weeks Required</b>	<b>14</b>
	<b>No. Of weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Numerical Methods for Civil Engineers By Chopra
2. Numerical Methods by Madhujit Mukherjee

**Paper Name : Remote Sensing & GIS**

**Paper Code : CE 712(b)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Introduction:</b> Definition and types of remote sensing, Tacheometry (Planimetry/ altimetry), Triangulation (Frame work / adjustment), Trilateration (EDM/ Total	8L+2T

	Station), Geodetics (physical/ geometrical geodesy), Error Analysis (causes / law of weights), Numerical example	
2	<b>Photogrammetry:</b> Camera System (phototheodolite/ aircraft), Ground photograph (oblique/orthogonal streophoto), Aerial photograph ( perspective scale/ flight planning), distortion (relief / tilt), Geometrix ( parallax / mapping), application (topographics / interpretation), Numerical examples <b>Satellite survey:</b> Satellite Sensing (Sensors / platforms), energy sources (electromagnetic / atmospheric interaction), visual interpretation ( Band width), digital processing (imageries / enhancement), data integration (multi-approach / GIS), microwave imaging (active system / radars), applications	16L+6T
3	<b>Astronomy:</b> Celestial sphere (star-coordinates / transformation), field astronomy (azimuth, solar and polar method), 3D computation (local vs global), spherical trigonometry, Multilateration, Observation, Corrections in astronomy, Correlation of low, medium, remote objects, Global Positioning Systems	10L+3T
4	<b>Geoinformatics:</b> GIS concept (Introduction/ definition), planning and management, spatial data model, database and DBMS, linking of attributes, geospatial analysis, modern trends	8L+3T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Surveying (Volume 2): Duggal S.K. Tata McGraw Hill
2. Remote Sensing & GIS: Bhatta B. Oxford Univ Press
3. Remote Sensing & Image Interpretation: Lilesand, Kiefer and Chipman Wiley
4. Remote Sensing & Geographical information System Reddy M.A. (BS publication).

**Paper Name : Environmental Pollution Control Technology**

**Paper Code : CE 712(c)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	Introduction : Man, Environment and ecosystems – their inter-relationships, Types of environmental pollutants, Their sources and effects, Environmental impact assessment, Food Chain, Carbon Cycle, Nitrogen Cycle, Eco pond system	10L+4T
2.	Air pollution : Air Pollution Control Device, Plume dispersion Models, Legal aspects of air pollution control.	10L+4T
3.	Solid wastes : Container Hauling System Design, Transfer station, Processing, Disposal and reuse. Landfill Design, Incernation Design	10L+3T
4.	Noise pollution : Characteristics of sound and its measurement, Levels of noise, Important noise level parameters, Noise control measures, Standards of noise levels for different cases.	12L+3T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Solid Waste Management By Iqbal Khan
2. Air Pollution – Wark, wagner
3. Air Pollution Control by starney

**Paper Name : Urban Transportation System Planning**

**Paper Code : CE 712(d)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Introduction:</b> Transport and Socioeconomic Activities, Historical Development of Transport, Transportation in the Cities, Freight Transportation, Future Developments <b>Urban Transportation System Planning - Conceptual Aspects:</b> Transport Planning Process, Problem Definition, Solution Generation, Solution Analysis, Evaluation and Choice, Implementation, Sequence of Activities Involved in Transport analysis.	9L+3T
2	<b>Trip Generation Analysis:</b> Trip Production Analysis, Category Analysis, Trip Attraction Modelling. <b>Trip Distribution Analysis:</b> Presentation of Trip-Distribution Data, PA Matrix to OD Matrix, Basis of Trip Distribution, Gravity Model of Trip Distribution, Calibration of Gravity Model, Singly and Doubly Constrained Gravity Models, A case Studies, Growth Factor Methods of Trip Distribution, Uniform Factor Method, Average Factor Method, Fratar Growth-Factor Method, Disadvantage of Growth Factor Method.	16L +5T
3	<b>Mode Choice Modelling:</b> Influencing Factors, Earlier Modal Split Models, Trip-End Type Modal Split Model, Trip-Interchange Modal Split Model, Disaggregate Mode-Choice Model, Logit Model of Mode Choice, Binary Choice Situations, Multinomial Logit Model, Model calibration, Case studies. <b>Route Assignment:</b> Description of transport network, Route Choice Behavior, The Minimum Path, Minimum Path Algorithm, Route Assignment Techniques, All-or-Nothing Assignment, Multipath Traffic Assignment, Capacity-Restrained Traffic Assignment	11L+4T
4	<b>Transportation Surveys:</b> Definition of Study Area, Zoning, Types of Movements, Types of Surveys, Home-Interview Survey, Commercial Vehicle Survey, Intermediate Public Transport Survey, Public Transport Survey, Roadside-Interview Survey, Cordon-Line Survey, Post-Card Questionnaire Survey, Registration-Number Survey, Tag-on-Vehicle Survey. <b>Transport Related Land-Use Models:</b> Development of Land - Use models, The Lowry Model, Application of Lowry Model	6L+2T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. "Traffic Engineering & Transportation Planning", by L. R. Kadyali, 4th Edition, Khanna Publishers
2. Bowmen, J. and M. ben-Akiva, Activity based travel Forecasting; in Activity based travel forecasting. Washington,DC: U.S. Department of Transportation, Report DOT-97-17.
3. Bruton M.J., Introduction to Transportation Planning, Hutchinson of London, 1988



4. Chakroborty P., Das N., Principles of Transportation Engineering, PHI, New Delhi, 2003
5. Dickey J.W., Metropolitan Transportation Planning, Tata Mc-Graw Hill 1980
6. Hutchinson B.G., Principles of Urban Transportation System Planning, Mc-Graw Hill, 1974.
7. Khisty C J., Lal B. Kent, Transportation Engineering – An Introduction, Prentice-Hall,

### Semester-VIII

**Paper Name : Advanced Structure Design**

**Paper Code : CE 801**

**Weekly Load : L-3, T-0, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	<b>Design of RCC liquid storage structure</b> resting on ground (rectangular and circular), I.S code method. Design of flat slab and its detailing.	<b>12L+4T</b>
2.	<b>Fundamental concept on effect of lateral loads</b> due to wind and earthquake on building frame (as per IS 875 and 1893)	<b>10L+4T</b>
3.	<b>Plate girders</b> - Design of Webs & Flanges , Concepts of curtailment of flanges – Riveted & Welded Web stiffeners, Web Flange splices - Riveted, Welded & Bolted. <b>Gantry Girder</b> - Design gantry girder considering lateral buckling – I.S code provisions.	<b>12L+4T</b>
4.	<b>R.C.C.Bridges:</b> Different Types – IRC loading – General consideration IRC specification simple design of a solid slab bridge.	<b>8L+2T</b>
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Relevant IS and IRC codes.
2. Fundamentals of Prestressed concrete – N.C. Sinha & S.K. Roy.
3. Design of Bridge Structures – Jagadish & Jayaram – Prentice Hall
4. Principle & Practice of Bridge Engineering – S.P. Bindra- Dhanpat Rai.
5. Prestressed Concrete-Ramamrutham.
6. Design Steel Structures- Arya Azmani – Nemchand Bros.
7. Design of Steel Structures- Duggal- Tata McGraw Hill
8. The Steel Skeleton Vol-II Baker, Horne & Heyman- ELBS
9. Plastic Design of Steel Frames – Beedle – Jhon Wiley & Sons.
10. Advanced Design in Structural Steel – Lothers – Prentice – Hall.

**Paper Name : Pre-Stressed concrete**

**Paper Code : CE 802**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	<b>Introduction:</b> Basic concept of prestressing Classification and Types of Prestressed Concrete Structures, advantages of prestressed concrete, application of prestressed concrete, Prestressed Concrete versus Reinforced Concrete <b>Analysis of prestress and bending stresses:</b> Basic assumption, resultant stresses at a section, pressure line, concept of load balancing, cracking moment.	10L+3T
2.	<b>Prestress Losses:</b> Total Losses in Pretensioned Members, Total Losses in Post-Tensioned Members, Methods for Estimating Prestress Losses, Elastic Shortening, Relaxation, Shrinkage, Creep, Friction, Anchorage Slip <b>Deflections of prestressed concrete member:</b> Background Information, Short-Term Deflections, Long-Term Deflections (Simplified Method), Long-Term Deflections (Incremental Time-Step Method), Deflection Limitations, Deflection Control.	11L+4T
3.	<b>Flexural strength of prestressed concrete sections:</b> Types of flexural failure, strain compatibility method, Indian code provisions <b>Design for shear and torsion:</b> shear and principal stresses, ultimate shear resistance of prestressed concrete member, design of shear reinforcements, prestressed concrete member in torsion, design of reinforcements for torsion, shear and bending	11L+3T
4.	<b>Design of prestressed concrete sections:</b> design for flexure, minimum section modulus and prestressing force, magnel's graphical solution. <b>Continuous Beams and Indeterminate Structures:</b> Background Information, Secondary Moments and Zero-Load C Line, Linear Transformation, Properties of Concordant Tendons, Equivalent Loads.	10L+4T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
4. IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012
5. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
6. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.

**Paper Name : Computer Application in Civil engineering –II Laboratory**

**Paper Code : CE 851**

**Weekly Load : L-0, T-0, P-3**

**Credit Points : 2**

**Full Marks : 100**

1. Hands on experience of road design through different commercial softwares (MXROAD)
2. Hands on Experience of scheduling of different Projects by using different project management softwares.

**Paper Name: Project-II**

**Paper Code : CE 891**

**Weekly Load: L:0, T:0, P:6**

**Credit Point : 06**

**Total Marks: 100**

- This is a new Project started at Semester-VII.
- The full Marks of the Project – II is 100 and the credit point is 100.
- Each project group should complete their project in this Semester and finally prepare a comprehensive Project Report. Each group should submit at least three extra copy of Project Report other than their individual copy, one for their Project guide, one for the departmental library and one for Institute's main library.
- Project work and Project report of each project group should be demonstrated and presented in front of Board of Experts and evaluation will be made on that.
- This project should preferably be from the area of Electives taken.

**Paper Name: Seminar-II**

**Paper Code : CE 892**

**Weekly Load: L:0, T:0, P:3**

**Credit Point : 02**

**Total Marks: 100**

- Each student have to give 10 minutes' individual presentation / lecture on any topic (advanced technology, research or development, new emerging Field etc.) followed by 5 minutes interaction / discussion session.
- The presentation should be in front of teachers, students of the class.
- Marks will be given based on evaluation throughout the year and a final evaluation at the end of Semester based on a final presentation.
- Evaluation should be based on the following parameters of the students: Presentation skill, Delivery of the speech, Depth and breadth of the subject matter presented.
- The attendance of other students in the seminar will be recorded and their participation should also be assessed for evaluation of their participations.
- Each student has to submit a technical report for each presentation they have delivered.

**Paper Name: Grand Viva**

**Paper Code : CE 893**

**Weekly Load: L:0, T:0, P:0**

**Credit Point : 03**

**Total Marks: 100**

Viva-Voce based on all the **Theoretical as well as Practical Papers** starting from **Semester-I** to **Semester-VIII** will be conducted at the end of Semester-VIII. Board of experts will evaluate the performance of each individual student.

The board should consist at least one External Expert from the same discipline, Members from corresponding department and experts for all non-departmental subjects.

**Appendix-III**  
**Elective-III( CE 8<sup>th</sup> Semester)**

**Paper Name : Infrastructure Finance**

**Paper Code : HS 811(a)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<p><b>Infrastructure Development – Introduction</b> Definition of infrastructure; Multiplier effects of infrastructure development on economic development of the nation Sources of financing infrastructure projects: Traditional and private investments; Various financial instruments Limitations of traditional procurement system of infrastructure; Legal frameworks and Incentives for private sector participation in infrastructure development</p> <p><b>Public Private Partnerships – Procurement Process</b> Introduction to infrastructure development through PPP route; Benefits of PPP mode of procurement; Types of PPP Models and their contractual structure Stakeholders’ perspectives: Granting authority, Funders and Concessionaire Government’s role in successful PPP projects Financial and Economic Appraisal of BOT Projects; VFM evaluation PPP procurement process; Lifecycle of PPP projects Contractual package of PPP project; Bankable concession agreement. Case studies- Procurement process of Indian PPP projects</p>	12L+3L
2	<p><b>Concession – Design and Award</b> Introduction to concession design and award Concession Design: Price setting; Price adjustment; Specific performance targets; Penalties and bonuses; Public parties’ security rights; Duration, termination, and compensation; Force majeure and other unforeseen changes; Dispute settlement Concession Award: Competitive bidding; Direct negotiations and unsolicited proposals; Competitive negotiations; Prequalification and shortlisting; Bid structure and evaluation; Bidding rules and procedures Case study – Model concession agreements of highways projects in India</p>	8L+4L
3.	<p><b>Risk Management of Infrastructure Projects</b> Risks associated with various infrastructure projects; Introduction to risk management concept Risk analysis techniques Risk mitigation strategies Risk allocation frameworks of major infrastructure projects procured through various PPP modes Case study – Risk allocation frameworks of Indian PPP projects</p>	9L+4L

<b>4.</b>	<b>Project Finance</b> Introduction to project financing concept Analysis of project viability Designing security arrangements Preparing the project financing plan Case study – Financial structure and infrastructure project finance	<b>13L+3L</b>
	<b>Credit Rating of Infrastructure Projects</b> Introduction to credit rating of infrastructure projects and role of credit ratings in financing infrastructure projects Rating frameworks of various national and international credit rating agencies for infrastructure projects in various sectors.	
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Akintoye, A., Beck, M., &Hardcastle, C. (Eds.). (2003). Public-Private Partnerships - Managing risks and opportunities. Oxford: Blackwell Science Limited.
2. Finnerty, J. D. (1996). Project financing - Asset-based financial engineering. New York: John Wiley & Sons, Inc.
3. Merna, T., &Njiru, C. (2002). Financing infrastructure projects (First ed.). London: Thomas Telford.
4. Nevitt, P. K., &Fabozzi, F. J. (2000). Project financing (7 ed.). London, UK: Euromoney Books.
5. Raghuram, G., Jain, R., Sinha, S., Pangotra, P., & Morris, S. (2000). Infrastructure Development and Financing: Towards a Public-Private Partnership: MacMillan.

**Paper Name : Solid & Hazardous Waste Management**

**Paper Code : CE 811(a)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

<b>Module</b>	<b>Course Content</b>	<b>Lecture / Tutorial Period</b>
<b>1.</b>	Identification, characterization and regulatory requirements for disposal of hazardous, nonhazardous and domestic wastes. Transport of Municipal Solid Waste, Routing and Scheduling, Site selection and Geo environmental process and mechanism of attenuation.	<b>12L+4T</b>
<b>2.</b>	Design practices of solid wastes. Tailing dams for disposal of flyash, coal, copper, iron and other metal wastes	<b>10L+4T</b>
<b>3.</b>	Single and double lined landfill design, linear material clay, geosynthetics amended soils and other admixtures. Leachate collection and detection system.	<b>10L+3T</b>
<b>4.</b>	Landfill construction. Construction quality control and performance monitoring. Application of geosynthetics in waste disposal design, Site remediation .Biomedical wastes : definition; category; handling; treatment and disposal Radioactive wastes	<b>10L+3T</b>
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of weeks required</b>	<b>14</b>
	<b>No. of weeks in hand</b>	<b>2</b>

**Text/Reference Books:**

1. Environmental Engineering S.K. Garg -KhannaPub .
2. Water Supply , Waste Disposal &Environmental Pollution Engineering – A . K .Chatterjee – KhannaPub
3. Water Supply & Waste Water Disposal –G .M .Fair ,J . C .Geyer ,D . A .Okun . –Jhon Wiley &Sons .
4. Environmental Engineering by Mcaffee, Eddy

**Paper Name : Prefabricated Building and Structure****Paper Code : CE 811(b)****Weekly Load : L-3, T-1, P-0****Credit Points : 3****Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Introduction:</b> Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems – Production – Transportation – Erection. <b>Prefabricated components:</b> Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls	13L+3T
2	<b>Design principles:</b> Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.	10L+3T
3	<b>Joint in structural members:</b> Joints for different structural connections – Dimensions and detailing – Design of expansion joints	9L+4T
4	<b>Design for abnormal loads:</b> Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., – Importance of avoidance of progressive collapse.	10L+4T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of weeks Required</b>	<b>14</b>
	<b>No. of Weeks in hand</b>	<b>2</b>

**Text/Reference Books:**

1. Building Construction with Precast Concrete Structural Elements by Wai Kwong Lau.
2. Precast concrete Design and Applications by Hass, A.M., Applied Science Publishers, England.
3. Precast Concrete Structures by Kim S. Elliott.
4. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1976.
5. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

**Paper Name : Composite Structure****Paper Code : CE 811(c)****Weekly Load : L-3, T-1, P-0****Credit Points : 3****Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
--------	----------------	---------------------------

1.	<b>Introduction to composite materials:</b> Definitions, History, Lamina and Laminate, General characteristics of FRPs, Micromechanics and Micromechanics, Application of composites. <b>Elastic properties of lamina:</b> Introduction, Volume and Weight fractions, Assumptions and laminations, Longitudinal strength and stiffness, Transverse and in plane shear modulus, Stress-strain relationship	12L+3L
2.	Analysis of laminated composites: Laminates, Basic assumption, Strain-Displacement relationship, Equilibrium equations, Laminated stiffness, Determination of Lamina stiffness and strains. Analytical Methods of laminated plate: Introduction, Classical Laminated Theory, Basic assumption, Equilibrium equations of laminated plates, Bending of composite plates, Bending of composite plates	10L+4L
3.	Finite Element Analysis of composite structures: Introduction, The Finite Element Method, Basic step, Static analysis, Free vibration analysis	11L+3L
4.	Analyses of laminated composites by First order shear deformation theory and Higher order shear deformation theory.	9L+4L
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Mechanics of Composite Materials & Structure by Madhujit Mukhopadhyay
2. Design and Manufacture of Composite Structures by G. Eckold
3. Composite Structures of Steel and Concrete: Beams, Slabs Columns and Frames for Buildings by R.P Jonshon

**Paper Name : Bridge engineering**

**Paper Code : CE 811(d)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	Introduction to bridge structures : Types, Uses, Advantages and limitation of various types. Site selection, Site investigation, Calculation of waterway, Afflux and other effects. Bridge loadings : Indian Road Congress and Indian Railways Specifications.	12L+4T
2.	R.C.C.Bridges: Different Types – IRC loading – General consideration IRC specification simple design of a solid slab bridge.	10L+4T
3.	Design of steel bridges : Truss and plate girder types. Design of R.C.C. bridges : Use of IS, Pigeaud's and other methods, Load distribution theories and applications to simply supported T-girder bridges.	10L+3T
4.	Bridge substructure : Design considerations for piers and abutments and foundations of various types.	10L+3T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Bridge Engineering by S. Ponnuswamy, Mcgraw hill
2. Essentials Of Bridge Engineering by D. Johnson Victor ,
3. Design Of Bridge Structures by T.R.Jagadeesh and M.A.Jayaram , PHI

**Paper Name : Theory of Plates and Shells****Paper Code : CE 811(e)****Weekly Load : L-3, T-1, P-0****Credit Points : 4****Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	Introduction to thin plates, Stress strain relations, strain displacement relation, equations of equilibrium, small deflection theory, virtual work principle, Classical plate theory, FSDT, HSDT. Pure bending and cylindrical bending of isotropic rectangular plates, Energy method, Navier and Levy solutions of rectangular plates.	11L+3T
2	Bending of circular plates. Bending analysis of laminated composites plates.	10L+4T
3	Approximate solution methods for plate problems. Shell behavior, shell surfaces and characteristics, classification of shells equilibrium equations in curvilinear co-ordinates. Stress-strain & force displacement relations. Membrane analysis of shells of revolution.	11L+4T
4	Cylindrical shells under different loads. Shallow shells, membrane solution of elliptic paraboloids and hyperboloids. Solution of some typical problems. Introducing to stability of shells.	10L+3T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Reference Books:**

1. S. Timoshenko, "Theory of Plates and Shells", McGraw-Hill Publishing Company.
2. R. Szilard, "Theory & Analysis of Plate - Classical & Numerical Methods", John Wiley & Sons Publishing Company
3. Ramaswamy, G. S., "Design & Construction of Concrete Shell Roofs", McGraw-Hill Publishing Company
4. Glibson J. E., "Theory of Cylindrical Shells", North-Holland Publishing Co
5. N. K. Bairagi, "Shell Analysis", Khanna Publishers

**Appendix-IV**  
**Elective-IV ( CE 8<sup>th</sup> Semester)**

**Paper Name : Quality Control and Management****Paper Code: HS 812(a)****Weekly Load : L-3, T-1, P-0****Credit Points : 3****Full Marks : 100**



Module	Course Content	Lecture / Tutorial Period
1	<b>Introduction:</b> Quality control and management , Construction Projects Agencies involved in Construction Projects, mutual relationship, quality control at site, Roles and Responsibilities of QA / QC Engineer - Civil  <b>Total Quality Management,</b> Concept and philosophy of total quality management, ISO / IS Requirements, Impact of large construction project.	12L+1T
2	<b>Quality Control on Construction Projects:</b> Inspection of reinforced concrete, masonry and steel works, testing techniques and quality at reports, Safety consideration during construction, demolition and during use of equipment.	8L+2T
3	<b>Statistical Analysis:</b> Fundamentals of Statistics, Sampling frequencies, reliability analysis, optimum sample size, Six Sigma Quality	10L+10T
4	<b>Quality Assurance and Codes:</b> Introduction to Quality Assurance, Quality Assurance in constructions. Code recommendation for quality control in civil engineering projects.	12L+1T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Fundamentals of Quality Control and Improvement, Amitava Mitra , Wiley , 3 rd Edition, 2008.
2. Quality Planning and Analysis, Frank Gryna, TMH, 2001.
3. Total Quality Management, J.R. Evans – South-Western; 3rd Revised edition, 2002.
4. Total Quality Management, L. Suganthi, PHI, 1st Edition, 2004.
5. Statistical Quality Control, M Mahajan, Dhanpat Rai & Co, 2010
6. Construction Safety, by Jimmy W. Hinze, Prentice Hall Inc 1997.

**Paper Name : Industrial Management & Entrepreneurship**  
**Paper Code : HS 812(b)**  
**Weekly Load : (L=3, T=0, P=0)**  
**Credit Point : 03**  
**Total Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1	<b>Introduction:</b> Management: Its Nature, Purpose and Importance, Management process: Planning, Organizing, Staffing, Directing and Controlling, Management Function: Marketing, HR and OB, Operation and Financial Management.  Analytical and statistical Tools and techniques used in management: Forecasting based on cross sectional and longitudinal data as a part of managerial planning. Quantitative tools for Decision making. PERT and CPM as efficient controlling techniques.	10L

<b>2</b>	<p><b>Motivation, Leadership and HRM in Organization:</b> Maslow's Hierarchy' of Needs theory, Herzberg's Two factor theory, Broom's Expectancy Theory, Leadership: Trait approaches-Leadership Behavior and Styles(overview), Brief overview of HRM with emphasis on HR process.</p> <p><b>Marketing Management:</b> Concept of customer centric marketing management, Basic Idea of Segmentation Targeting and Positioning. Understanding Marketing Mix.</p>	<b>10L</b>
<b>3</b>	<p><b>Financial Management:</b> Importance and Scope of Financial Management. Overview of Working Capital management,CVP analysis and Capital Budgeting. Indian Financial Market emphasizing on Sensex Calculation.</p> <p><b>Operations Management:</b> Basic Idea on Plant location and facility layout, Tools and Techniques for measuring productivity. Measurement of Quality for Product and Service. Basic understanding on Inventory Management. Overview of TQM and JIT.</p>	<b>10L</b>
<b>4</b>	<p><b>Business Environment and Strategic Management:</b> Business Mission, Vision, Formulation of objectives, Assessment of the external environment with the help of SWOT, EAD including Portor's Industry Analysis, Assessment of Internal competences, Strategic alternatives, Portfolio Analysis.</p> <p><b>Innovation and Entrepreneurship:</b> <b>Entrepreneurship:</b> Opportunity identification, Market Potential Estimation, Business plan development and feasibility analysis. <b>Managing new innovation:</b> new product development, intellectual property management. Brief idea about different types of venture capitalist and investors including financial organisation</p>	<b>12L</b>
	<b>Total</b>	<b>42L</b>
	<b>Total week required</b>	<b>14</b>
	<b>No. of week reserved</b>	<b>02</b>

**Text/Reference Books:**

1. Industrial Management By S C jain, W S Bawa, Dhanpat Rai & Co (P) Ltd
2. Discourses of Strategic Management , Dilip Roy,Asian Book Private Limited
3. Strategic Management & Business Policy , Azhar Kazmi, McGraw Hill Education
4. Industrial & Business Management , Martand T. Telsang, S Chand Pub.
5. Management Theory & Practices , C B Gupta, S Chand Pub
6. Fundamentals of Entrepreneurship Development & Business Communication , Pranam Dhar, ABS Pub House.
7. Production & Operation Management , S Anil Kumar & N Suresh, New Age International pub.
8. Marketing Management , Kotler & Keller, Perason Pub.
9. Human Resource Management , Gary Dessler & Biju Varkkey, Pearson Pub.
10. Business Organization & Management , Tulsian, Pearson Education Asia Pub.

**Paper Name : Traffic Engineering and Transportation Planning**

**Paper Code : CE – 812(a)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 4**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
--------	----------------	---------------------------

1	<b>Traffic Engineering &amp; its elements:</b> Introduction, Objectives and Scope of Traffic Engineering; Components of Road Traffic – vehicle, Driver and Road; Road User and Vehicle Characteristics and their effect on Road Traffic; Traffic Maneuvers. Traffic Stream Characteristics- Relationship between Speed, Flow and Density <b>Traffic Engineering Studies:</b> Traffic Volume & Occupancy Survey, Origin and Destination Studies, Speed, journey time and delay Studies; Parking Studies, Accident and other studies	15L+5T
2	<b>Highway capacity analysis:</b> Its importance in transportation studies – basic, possible and practical capacity – determination of theoretical maximum capacity -passenger car units – level of service – concept in HC manual – factors affecting level of service.	9L+2T
3	<b>Design of Intersection:</b> Design of at grade & grade separated intersection – rotary intersection – capacity of rotary intersection – traffic signals – warrants of traffic signals,-types of signals, signal coordination, design of fixed time signal – Websters approach. Channelization, Traffic signs, Delineators and Road Markings (IRC:67-2001)	6L+2T
4	<b>Transportation Planning:</b> Brief ideas about urban and regional Transportation systems; Components of transportation system planning, Planning Surveys, Trip generation and distribution, Traffic assignment and modal split. Economic evaluation of transportation plans.	12L+5T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of weeks in hand</b>	<b>2</b>

**Text/Reference Books::**

1. "Traffic Engineering & Transportation Planning", by L. R. Kadyali, 4th Edition, Khanna Publishers
2. "Transportation Engineering and Planning", by C. S. Papacostas and P. D. Prevedouros, 3rd Edition, PHI
3. "Transportation Engg: An introduction", by C. J. Khisty& B. K. Lall, 3rd Edition, PHI, 2006.
4. "Principles of Transportation Engg", by P. Chakraborty and A. Das, 1st Edition, 2nd reprint 2005. PHI
5. "Modelling Transport", Juan de Dios Ortúzar, Luis G. Willumsen, 4th Edition, Wiley
6. "Highway Engineering" by S. K. Khanna& C. E. G. Justo, 10<sup>th</sup> Edition, Khanna Publishers, New Delhi.

**Paper Name : Advanced Foundation Engineering**

**Paper Code : CE – 812(b)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

Module	Course Content	Lecture / Tutorial Period
1.	Foundations on expansive and collapsible soil, under reamed pile, uplift resistance of piles.	6L+3T
2.	Well foundation and its elements; size and depth; forces on well foundation; methods of sinking; scour depth; analysis of well foundation for bearing capacity and lateral stability	8L+3T
3.	Ground improvement principles and techniques. Soil stabilization, Different stabilization methods. In-situ densification of granular and cohesive soil, Different types of compactions, Preloading, Sand drains and Stone columns,	14L+4T

	Grouting, Reinforced earth.	
4.	Soil dynamics theory of vibration, degrees of freedom, Machine foundation design.	14L+4T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books**

1. Fundamentals Of Soil Dynamics And Earthquake Engineering by B B Prasad, PHI.
2. Soil dynamics and Machine foundation By Swami Saran, Galgotia Publication.
3. Structural Dynamics by Mario Paz
4. Analysis and Design of Substructures: Limit State Design by Swami Saran, Oxford and Amp. IBH .
5. Theory and Practice Of Foundation Design By M. N. Som, S. C. Das, PHI.
6. Foundation Design In Practice By KarunamoyGhosh, PHI.

**Paper Name : Pavement Design**

**Paper Code : CE-812(c)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

**Credits: 4**

Module	Course Content	Lecture / Tutorial Period
1	<b>Principles of Pavement Design:</b> Types of Pavements, Concept of pavement performance, Structural and functional failure of pavement, Different types of pavement performance, Different pavement design approaches.	6L+2T
2	<b>Traffic Consideration in Pavement Design:</b> Vehicle types, Axle configurations, Contact shapes and contact stress distribution, Concept of standard axle load, Vehicle damage factor, Axle load surveys, Estimation of design traffic <b>Pavement Material Characterization:</b> Identification of different type of materials Field and laboratory methods for characterization of pavement materials	14L+3T
3	<b>Analysis and Design of Flexible Pavements :</b> Selection of appropriate theoretical model for flexible pavements, Analysis of different layers of flexible pavements based on linear elastic theory, Different methods of design of flexible pavements, IRC guidelines(IRC:37-2012), AASHTO Guidelines <b>Analysis and Design of Rigid Pavements:</b> Selection of appropriate theoretical models for rigid pavements, Analysis of wheel load stresses, curling, temperature differential, Critical stress combinations, Different methods of design of rigid pavements, IRC guidelines (IRC:58-2011), AASHTO Guidelines	14L+6T
4	<b>Pavement Overlay Designs:</b> Overlay design as per Indian Roads Congress guidelines (IRC-81), Overlay design as per AASHTO-1993 guidelines, Recycling of flexible and rigid pavements.	8L+3T
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of weeks in hand</b>	<b>2</b>

**Text/Reference Books:**

1. Principles of Pavement Design by E.J.Yoder and M.W. Witczak, Wiley
2. Pavement Analysis and Design by Y. H. Huang, PHI

3. Highway Engineering by Khanna and Justo, Nem Chand
4. IRC-37, IRC-58, IRC-73, IRC-81, IRC-106 and other relevant IRC codes by Indian Roads Congress

**Paper Name :Design of Offshore Structures**

**Paper Code : CE-812(d)**

**Weekly Load : L-3, T-1, P-0**

**Credit Points : 3**

**Full Marks : 100**

<b>Module</b>	<b>Course Content</b>	<b>Lecture / Tutorial Period</b>
<b>1</b>	Introduction, Wind, Tides and Waves : Generation, Propagation, Deepwater and shallow water waves, Breaking of waves. Breakwaters, Wharves, Piers, Bulkheads, Dolphins, Moorings, Fenders.	<b>10L+4T</b>
<b>2</b>	Shore processes : Continental drift, Beach wave interaction, Littoral drift, Shore stability, Tidal channels and basins.	<b>10L+3T</b>
<b>3</b>	Elements of hydrodynamics : Wave forces on structures, Diffraction theory, Fluid structure interaction.	<b>10L+3T</b>
<b>4</b>	Offshore marine structure : Mobile wharves, Radar platforms, Lighthouse platforms, Permanent drilling islands, Fixed drilling and production platforms, Mobile drilling units, Self contained platforms. Analysis of fixed platforms.	<b>12L+4T</b>
	<b>Total</b>	<b>42L+14T</b>
	<b>No. of Weeks Required</b>	<b>14</b>
	<b>No. of Weeks in Hand</b>	<b>2</b>

**Text/Reference Books:**

1. Offshore Structures Design, Construction and Maintenance by Mohamed El-Reedy
2. Offshore structural engineering reliability and risk assessment by SrinivasanChandrasekaran
3. Offshore structures by Springer-Verlag
4. Structural Reliability Analysis of offshore structures by AthanasiosKalias