Himachal Pradesh Technical University, Hamirpur (H.P.)

CURRICULUM (CBCS)

CIVIL ENGINEERING

(3rd to 8th Semester)

Teaching and Examination Scheme

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SCHEME OF TEACHING AND EXAMINATION B.TECH CIVIL ENGINEERING SEMESTER –III										
S. N.	**Cat.**	**Subject Code**	**Title**	**Teaching Hours Per Weak**			**Credits**	**Examination**		
				L	**T**	**P/D**	**C**	**IA**	**ESE**	**Total**
1	FC	MA-301	Probability and Statistics	2	2	0	3	40	60	100
2	FC	HS – 305	Industrial Economics and Management	3	0	0	3	40	60	100
3	PC	CE-301	Mechanics of Solids	3	2	0	4	40	60	100
4	PC	CE-302	Mechanics of Fluids - I	3	1	0	4	40	60	100
5	PC	CE-303	Engineering Surveying–I	3	0	0	3	40	60	100
6	PC	CE-304	Building Materials	2	2	0	3	40	60	100
7	OE	-	Open Elective-I	2	0	0	2	40	60	100
Labs:										
1	PC	CE-307	Building Material Testing Lab	0	0	2	1	30	20	50
2	PC	CE-308	Fluid Mechanics Lab	0	0	2	1	30	20	50
3	PC	CE-309	Surveying Lab – I	0	0	3	2	30	20	50
			Total	16	7	7	24+2			

OPEN ELECTIVE – I										
S. N.	**Cat.**	**Subject Code**	**Title**	**Teaching Hours Per Weak**			**Credits**	**Examination**		
				L	**T**	**P/D**	**C**	**I.A Marks**	**ESE Marks**	**Total Marks**
1	OE	HS-306	Sociology & Elements of Indian History for Engineers	2	0	0	2	40	60	100
2	OE	HS-307	German Language – I	2	0	0	2	40	60	100
3	OE	HS-308	French Language - I	2	0	0	2	40	60	100

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SCHEME OF TEACHING AND EXAMINATION B.TECH CIVIL ENGINEERING SEMESTER –IV										
S. N.	**Cat.**	**Subject Code**	**Title**	**Teaching Hours Per Weak**			**Credits**	**Examination**		
				L	**T**	**P/D**	**C**	**IA**	**ESE**	**Total**
1	FC	MA-401	Optimization and Calculus of Variations	2	2	0	3	40	60	100
2	FC	HS-409	Human Values and Professional Ethics	2	2	0	3	40	60	100
3	PC	CE-401	Structural Analysis –I	3	2	0	4	40	60	100
4	PC	CE-402	Geotechnical Engg. –I	3	1	0	4	40	60	100
5	PC	CE-403	Engineering Surveying –II	3	0	0	3	40	60	100
6	PC	CE-404	Building Planning and Construction	2	2	0	3	40	60	100
7	OE	-	Open Elective – II	2	0	0	2	40	60	100
Labs:										
1	PC	CE-407	Geotechnical Engg. Lab-I	0	0	2	1	30	20	50
2	PC	CE-408	Surveying Lab - II	0	0	3	2	30	20	50
3	MC	CE-410	Computer Aided Building Drawing Lab	0	0	2	1	30	20	50
			Total	15	9	7	24+2			

OPEN ELECTIVE – II										
S. N.	**Cat.**	**Subject Code**	**Title**	**Teaching Hours Per Weak**			**Credits**	**Examination**		
				L	**T**	**P/D**	**C**	**I.A**	**ESE**	**Total**
1	OE	HS-410	Law for Engineers	2	0	0	2	40	60	100
2	OE	HS-411	German Language – II	2	0	0	2	40	60	100
3	OE	HS-412	French Language - II	2	0	0	2	40	60	100

SCHEME OF TEACHING AND EXAMINATION
B.TECH CIVIL ENGINEERING

SEMESTER – V

S. N.	Categ.	Subject Code	Title	Teaching Hours Per Weak			Credits	Examination		
				L	T	P/D		IA Marks	ESE Marks	Total Marks
1	PC	CE-501	Limit State Design of Concrete Structures - I	2	2	0	3	40	60	100
2	PC	CE-502	Structural Analysis - II	3	1	0	4	40	60	100
3	PC	CE-503	Geotechnical Engg. - II	2	2	0	3	40	60	100
4	PC	CE-504	Mechanics of Fluid - II	3	1	0	4	40	60	100
5	PC	CE-505	Environmental Engg. - I	3	0	0	3	40	60	100
6	PC	CE-506	Transportation Engg. - I	3	1	0	4	40	60	100
7	OE	-	Open Elective - III	2	0	0	2	40	60	100
Labs:										
1	PC	CE-511	Transportation Engg. Lab	0	0	2	1	30	20	50
2	PC	CE-512	Environmental Engg. Lab	0	0	2	1	30	20	50
3	PC	CE-513	Computer Aided Design Practice Lab-I	0	0	2	1	30	20	50
			Total	18	7	6	24+2			

Open Elective – III (For Students of Other Departments)

S. N.	Cat.	Subject Code	Title	Teaching Hours Per Weak			Credits	Examination		
				L	T	P/D	C	I.A	ESE	Total
1	OE	CE -508	Element of Civil Engineering	2	0	0	2	40	60	100
2	OE	CE -509	Optimization Methods in Engineering	2	0	0	2	40	60	100

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3	OE	CE -510	Environmental Impact Assessment	2	0	0	2	40	60	100

SCHEME OF TEACHING AND EXAMINATION
B.TECH CIVIL ENGINEERING

SEMESTER – VI

S. N.	Categ.	Subject Code	Title	Teaching Hours Per Weak			Credits	Examination		
				L	T	P/D		IA Marks	ESE Marks	Total Marks
1	PC	CE-601	Design of Concrete Structures-II	3	1	0	4	40	60	100
2	PC	CE-602	Transportation Engg. - II	2	2	0	3	40	60	100
3	PC	CE-603	Environmental Engg. - II	2	2	0	3	40	60	100
4	PC	CE-604	Hydrology and Water Resources Engg.	3	1	0	4	40	60	100
5	PC	CE-605	Engineering Geology and Rock Mechanics	3	1	0	4	40	60	100
6	PC	CE-606	Concrete Technology	3	0	0	3	40	60	100
7	PE	-	Programme Elective – I	3	0	0	3	40	60	100
Labs:										
1	PC	CE-611	Engineering Geology and Rock Mechanics Lab.	0	0	2	1	30	20	50
2	PC	CE-612	Concrete Technology Lab.	0	0	2	1	30	20	50
3	PC	CE-613	Seminar	0	0	2	1	50	50	100
			Total	19	7	6	24+3			

PROGRAMME ELECTIVE- I

S. N.	Cat.	Subject Code	Title	Teaching Hours Per Weak			Credits	Examination		
				L	T	P/D	C	I.A	ESE	Total
1	PE	CE-608	Remote Sensing and Applications of GIS	3	0	0	3	40	60	100
2	PE	CE-609	Hydraulic Machines	3	0	0	3	40	60	100
3	PE	CE-610	Energy Efficient Buildings	3	0	0	3	40	60	100

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NOTE: The student has to undergo 4 - 6 weeks Industry Training after 6th Semester during the summer vacation relevant to his/her stream.

SCHEME OF TEACHING AND EXAMINATION
B.TECH CIVIL ENGINEERING

SEMESTER – VII

Sr. No.	Categ.	Subject Code	Title	Teaching Hours Per Weak			Credits	Examination		
				L	T	P/D		I. A Marks	ESE Marks	Total Marks
1	PC	CE-701	Limit State Design of Metal Structures	3	2	0	4	40	60	100
2	PC	CE-702	Quantity Surveying and Valuation	2	2	0	3	40	60	100
3	PC	CE-703	Irrigation and Design of Hydraulic Structures	3	1	0	4	40	60	100
4	PC	CE-704	Construction Engineering and Management	2	2	0	3	40	60	100
5.	PE	-	Programme Elective-II	3	0	0	3	40	60	100
Labs:										
1	MA	CE-711	Project Work -I	0	0	4	2	50	50	100
2	MA	CE-712	Industrial /Practical Training(Viva-Voce)*	0	0	0	2	50	50	100
3	MA	CE -713	Computer Aided Design Practice Lab-II.	0	0	3	2	30	20	50
			Total	13	7	7	20+3			

PROGRAMME ELECTIVE- II

S. N.	Cat.	Subject Code	Title	Teaching Hours Per Weak			Credits	Examination		
				L	T	P/D	C	I.A	ESE	Total
1	PE	CE-708	Municipal Solid Waste Management	3	0	0	3	40	60	100
2	PE	CE-709	Bridge Engineering	3	0	0	3	40	60	100
3	PE	CE-710	Finite Element Method	3	0	0	3	40	60	100

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* The student will be evaluated on the basis of Industrial /Practical Training.

SCHEME OF TEACHING AND EXAMINATION B.TECH CIVIL ENGINEERING										
SEMESTER – VIII										
S. N.	**Categ.**	**Subject Code**	**Title**	**Teaching Hours Per Weak**			**Credits**	**Examination**		
				L	**T**	**P/D**	**C**	**I. A Marks**	**ESE Marks**	**Total Marks**
1	MC	CE-808	Project Work - II	0	0	16	8	50	50	100
2	PE	-	Program Elective - III	3	0	0	3	40	60	100
3	PE	-	Program Elective - IV	3	0	0	3	40	60	100
			Total	0	0	16	8+ 6			
OR										
4	MC	CE-809	Industrial Project	0	0	16	8	50	50	100
			Total	0	0	16	8			

PROGRAMME ELECTIVE- III										
S. N.	**Cat.**	**Subject Code**	**Title**	**Teaching Hours Per Weak**			**Credits**	**Examination**		
				L	**T**	**P/D**	**C**	**I.A**	**ESE**	**Total**
1	PE	CE-801	Highway Pavement Design	3	0	0	3	40	60	100
2	PE	CE-802	Ground Water Hydrology	3	0	0	3	40	60	100
3	PE	CE-803	Water Power Engineering	3	0	0	3	40	60	100

PROGRAMME ELECTIVE- IV										
S. N.	**Cat.**	**Subject Code**	**Title**	**Teaching Hours Per Weak**			**Credits**	**Examination**		
				L	**T**	**P/D**	**C**	**I.A**	**ESE**	**Total**
1	PE	CE-804	Design of Pre-stressed Concrete Structures	3	0	0	3	40	60	100
2	PE	CE-805	Design of Earthquake Resistant Structures	3	0	0	3	40	60	100

3	PE	CE-806	Transportation System Planning	3	0	0	3	40	60	100

Note: Industrial Project of one semester is to be carried out by the student exclusively in industry/start-up/ organization under the joint supervision of faculty advisors from institution as well as from the industry.

SEMESTER-III

MA -301: PROBABILITY AND STATISTICS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Probability and Random Variables:** Introduction, Basic concepts–Sample space, Events, Counting sample space, Conditional Probability and Independence, Permutations and Combinations, Rules of Probability, Bayes' Theorem. Random Variables – Concept of Random Variable, Percentiles, Probability Distributions – Discrete & Continuous, Mean, Variance and Covariance of Random Variables, Chebychev's inequality.	6
II	**Standard Probability Distributions:** Discrete distributions- Uniform, Binomial, Multinomial, Hyper geometric, Poisson, Negative Binomial, Poission; Continuous distributions - Normal, Exponential, Gamma, Weibull and Beta distributions and their properties -Function of Random variables.	6
III	**Sampling Distributions:** Random sampling, Sampling Distributions of Means, Estimation, Properties of point estimators, Confidence interval, Maximum likelihood and Bayes estimators, Prediction intervals.	6
IV	**Testing of Hypothesis:** Sampling distributions – testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions, tests for independence of attributes and Goodness of fit. **Linear Correlation and Regression Analysis:** Introduction, Linear Regression	6

	model, Regression coefficient, Lines of correlation, Rank correlation.	

Text Books:

1. Gupta, S.C, and Kapur, J.N., "***Fundamentals of Mathematical Statistics",*** Sultan Chand, Ninth Edition, New Delhi,1996.
2. Johnson. R. A., ***"Miller & Freund's Probability and Statistics for Engineers",*** Sixth Edition, Pearson Education, Delhi, 2000.
3. Douglas C. Montgomery and George C. Runger, ***"Applied Statistics and Probability for Engineers***", 5th Edition, 2011.

Reference books:

1. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, ***"Probability and Statistics for Engineers and Scientists",*** Seventh Edition, Pearson Education, Delhi, 2002.
2. Lipschutz. S and Schiller. J, "***Schaum's outlines - Introduction to Probability and Statistics***", McGraw-Hill, New Delhi, 1998.
3. S. M. Ross, "***Introduction to Probability and Statistics for Engineers and Scientists***" 4th edition.

HS -305: INDUSTRIAL ECONOMICS AND MANAGEMENT

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction to Engineering Economics** - Technical efficiency, economic efficiency - cost concepts: elements of costs, opportunity cost, sunk cost, private and social cost, marginal cost, marginal revenue and profit maximization. **Supply and Demand:** Determinants of demand, law of demand, determinants of supply, law of supply, market equilibrium - elasticity of demand - types of elasticity, factors affecting the price elasticity of demand. **National Income Concepts:** GDP and GNP, per capita income, methods of measuring national income. Inflation and deflation:	**8**
II	**Value Analysis** - Time value of money - interest formulae and their applications: single-payment compound amount factor, single-payment present worth factor, equal-payment series compound amount factor, equal-payment series sinking fund factor, equal-payment series present worth factor, equal-payment series capital recovery factor, effective interest rate. **Investment Analysis:** Payback period—average annual rate of return, net present value; Internal rate of return criteria, price changes, risk and uncertainty.	**8**
III	**Principles of Management:** Evolution of management theory and functions of management organizational structure - principle and types - decision making - strategic, tactical & operational decisions, decision making under certainty, risk & uncertainty and multistage decisions & decision tree. **Human Resource Management:** Basic concepts of job analysis, job evaluation, merit rating, wages, incentives, recruitment, training and industrial relations.	**8**
IV	**Financial Management**: Time value of money and comparison of alternative	**8**

	methods; costing – elements & components of cost, allocation of overheads, preparation of cost sheet, break even analysis - basics of accounting - principles of accounting, basic concepts of journal, ledger, trade, profit & loss account and balance sheet. **Marketing Management:** Basic concepts of marketing environment, marketing mix, advertising and sales promotion. **Project Management:** Phases, organization, planning, estimating, planning using PERT & CPM.	

Text Books:

1. Panneer Selvam, R, "***Engineering Economics***", Prentice Hall of India Ltd, New Delhi.
2. Dwivedi, D.N., "***Managerial Economics****, 7/E"*, Vikas Publishing House.

Reference Books:

1. Sullivan, W.G, Wicks, M.W., and Koelling. C.P., ***"Engg. Economy 15/E***", Prentice Hall, New York, 2011.
2. Chan S. Park, ***"Contemporary Engineering Economics***", Prentice Hall of India, 2002.
3. F. Mazda, "***Engg. Management"***, Addison Wesley, Longman Ltd., 1998.
4. O. P. Khanna, "***Industrial Engg. and Management"***, Dhanpat Rai and Sons, Delhi, 2003.
5. P. Kotler, "***Marketing Management, Analysis, Planning, Implementation and Control"***, Prentice Hall, New Jersey, 2001.
6. VenkataRatnam C.S & Srivastva B.K, "***Personnel Management and Human Resources"***, Tata McGraw Hill.
7. Prasanna Chandra, "***Financial Management: Theory and Practice"***, Tata McGraw Hill.
8. Bhattacharya A.K., "***Principles and Practice of Cost Accounting"***, Wheeler Publishing.
9. Weist and Levy, "***A Management guide to PERT and CPM"***, Prantice Hall of India.
10. Koontz H.,O'Donnel C.,& Weihrich H, ***Essentials of Management***, McGraw Hill.

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CE-301: MECHANICS OF SOLIDS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	2	0	4	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Stresses and Strains:** Introduction, Properties of Materials, Stress, Strain, Hook's law, Poisson's Ratio, Stress – Strain Diagram for structural steel and non-ferrous materials, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections, elongation due to self – weight; Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants, Thermal stresses (including thermal stresses in compound bars). **Compound Stresses:** Introduction, Stress components on inclined planes, General two-dimensional stress system, Principal planes and stresses, Mohr's circle of stresses.	9
II	**Bending Moment and Shear Force Diagrams for Statically Determinate Beams:** Determinate beams, Type supports and loading, Shear force and Bending moment, Sign convention, SF and BM diagrams for cantilevers, simply supported and overhanging beams under point loads, UDL, UVL and Couples. **Bending and Shear Stresses in Beams:** Introduction – Bending stress in beam, Assumptions in simple bending theory, Derivation of Bernoulli's equation, Modulus of rupture, Section modulus, Flexural rigidity, Expression for horizontal shear stress in beam, Shear stress diagram for rectangular, symmetrical 'I' and 'T' section (Flitched beams not included).	9
III	**Torsion of Circular Shafts:** Introduction – Pure torsion-torsion equation of circular shafts, Strength and stiffness, Torsional rigidity and polar modulus, Power transmitted by shaft of solid and hollow circular sections. **Transverse Deflection of Beams:** Definitions of slope, deflection, Elastic curve - derivation of differential equation of flexure, Sign conventions, relationship between moment, slope and deflection, transverse deflection in determinate beams using	8

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	method of Successive integration.	
IV	**Thin Cylinders and Spheres:** Stresses in cylinders and spheres subjected to internal pressures. **Columns and Struts**: Introduction – Short and long columns, Euler's theory on columns, effective length, slenderness ration, radius of gyration, buckling load, assumptions, derivations of Euler's Buckling load for different end conditions, Limitations of Euler's theory, Rankine Gordon's empirical formula, problems.	**8**

Text Books:

1. Popov, E. P., *"**Engineering Mechanics of Solids**",* SI Version, Prentice Hall, New Delhi.
2. Timoshenko, S. P. and Young, D. H., *"**Elements of Strength of Materials**",* East West Press, New Delhi.
3. Subramanyam, *"**Strength of Materials**",* Oxford University Press, Edition, 2008

Reference Books:

1. Shames, I. H. Pitarresi, J. M., "***Introduction to Solid Mechanics***," Prentice-Hall, NJ.
2. NPTEL courses, *http://nptel.iitm.ac.in/courses.php*, web and video courses on Strength of Materials by Sharma, S. C., and Harsha, S. P.
3. M.L. Gambhir, ***Fundamentals of structural Mechanics and analysis***, Printice Hall India.
4. Beer, P. F. and Johson, E. R., "***Mechanics of Materials***", SI Version, McGraw Hill, NY.
5. Patel, A. H. and Singer, F. L., "***Strength of Materials***", Harper Collins, New Delhi.

CE-302: MECHANICS OF FLUIDS-I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Fluid Properties:** Introduction of fluid, system of units, Fluid properties -Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension& Capillarity, fluid as a continuum, Newton's law of viscosity, Capillary rise in a vertical tube and between two plane surfaces, vapour pressure of liquid, compressibility and bulk modulus, surface tension- pressure inside a water droplet, pressure inside a soap bubble, Numerical problems. **Fluid Statics:** Definition of pressure, Variation of pressure with depth, Pascal's law, Types of pressure, Introduction to pressure measurements of pressure using simple, differential &inclined manometers, Introduction to mechanical and electronic pressure measuring devices - Transducers, Hydrostatic forces on plane and curved surface, centre of pressure; Buoyancy, equilibrium, metacentre, meta centric height & its determination; Stability of floating & submerged bodies.	9
II	**Kinematics of Flow:** Kinematics of fluid flow, scalar, vector and tensor quantities, classification of fluid flow, methods of describing fluid motion, fundamentals of flow visualization, discharge or rate of flow, three-dimensional continuity equation in Cartesian coordinate, stream line, potential function, stream function, orthogonally of streamlines and potential lines. **Dynamics of Flow**: Surface and body forces, Euler's equations of motion along a steam line,Bernoulli's equation and its applications–Venturimeter, Orifice meter and Pitot tube; Kinetic energy correction factor; Momentum equation, application of momentum equation - forces on plates and pipe bends; Navier- Stokes equation (explanation only).	9
III	**Flow Measurement**: Introduction, Orifices - classification, hydraulic coefficients, Time for emptying tanks by orifices; Mouthpiece - classification, Borda's mouthpiece; Notches & Weirs –Introduction, classification, discharge over rectangular, triangular, trapezoidal notches, Cippoletti notch, broad crested weirs, relative error and sensitivity, Concept of proportional weir, advantages of proportional weirs, concept of	9

	geometrically simple weirs. **Dimensional Analysis and Similitude:** Dimensional analysis - Rayleigh's method, Buckingham π-theorem; Ssignificance and use of dimensionless numbers in experimental investigation, Similitude -geometric, kinematic and dynamic similarities; Model testing- model laws, undistorted and distorted models.	
IV	**Flow through Pipes:** Introduction**,** Major and minor energy losses,Darcy-Weisbach equation for head loss due to friction in a pipe,hydraulic gradient and total energy lines, pipes in series and parallel, equivalent pipes;Pipe Networks - Hardy Cross method, Numerical problems. **Power transmission through pipe:** Flow through nozzle at end of pipe, water hammer phenomenon.	**8**

Text Books

1. Modi, P. M. and S. M. Seth, "***Hydraulics and Fluid Mechanics"***, Standard Book House.
2. Dr. R.K. Bansal, "***A Text book of Fluid Mechanics and Hydraulic Machines"***, Laxmi Publications, New Delhi.
3. R.K.Rajput, A Text Book of "***Fluid Mechanics & Hydraulic Machines"***, S.Chand& Co, New Delhi, 2006.

Reference Books

1. Douglas, J.F., Gasiorek, J.M .and Swaffield, J.A., "***Fluid Mechanics 4thEdn***.", Pearson Education India.
2. Arora, K.R., "***Fluid Mechanics, Hydraulic and Hydraulic Machines"***, Standard Publishers and Distributors, New Delhi.
3. Frank M. White, "***Fluid Mechanics (Sixth Edition)",*** Tata McGraw-Hill, New Delhi (2008).
4. Streeter, "***Fluid Mechanics"***, Wylie, Bedford New Delhi, 2008 (Ed).

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CE-303: ENGINEERING SURVEYING–I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
3	0	0	3	40	60	100	3 hrs

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COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction:** Classification of surveys -reconnaissance – principles-provision of control -conventional signs. Chain survey: Instruments -principles of chain survey -field book -plotting -tie line and check line -chaining and ranging -obstacles -chaining on sloping ground -errors-uses of cross staff and optical square. **Compass Survey:** Prismatic compass –surveyor's compass -whole circle and reduced bearing-true and magnetic bearing -dip and declination -local attraction -traversing -plotting -error of closure -graphical and analytical adjustments.	**8**
II	**Plane Table Surveying:** Definitions, uses and advantages, temporary adjustments. Different methods of plane table surveying; Two point and three point problems. Errors in plane table survey. **Leveling:** Definition of level surfaces -mean sea level -reduced level -bench marks -leveling instruments -temporary and permanent adjustments -fly leveling -booking -reduction of levels -corrections for refraction and curvature -reciprocal leveling -longitudinal leveling and cross sectioning -contour survey -definition -characteristics of contour -uses of contour -methods of contouring -direct and indirect interpolation – plotting.Computation of volume bytrapezoidal and prismoidal formula, volume from spot levels, volume from contour plan; Trigonometric leveling considering refraction and curvature correction, axis signal correction.	**9**
III	**Theodolite Surveying:** Various parts andaxis of transit, technical terms, temporary adjustments. Measurement of horizontal and vertical angles -method of repetition and reiteration; Theodolite traverse - Different methods of running theodolite traverses, Gales' traverse table, balancing of traverse by Bow-Ditch's transit and modified transit rules; Problems on one-plane and two-plane methods, omitted measurements, errors in theodolite survey. **Setting out Works:** General horizontal and vertical control, setting out of foundation	**9**

	plan for load bearing and framed structure, batter board, slope and grade stakes, setting out with theodolite; setting out of sewer line, culvert, use of laser for works; setting out center line for tunnel, transfer of levels to underground work project / route survey for bridge, dam and canal; checking verticality of high rise structures.	
IV	**Areas of Figures:** Area of an irregular figure by Trapezoidal rule, average ordinate rule, Simpson's 1/3 rule, various coordinate methods; Planimeter - types of planimeter including digital planimeter, area of zero circle, use of planimeter. **Curves**: Types of curves, elements of a curve, simple curves; different methods for setting out of simple curves –linear and angular methods; transition curves, vertical curves–types, characteristics and setting out; Methods of setting out super elevation.	**8**

Text Books:

1. N.N.Basak, "***Surveying and Leveling"***, 1stedition,Tata McGraw Hill.
2. A Banniister, S. Raymond and R Baker, "***Surveying"***, seventh edition, Pearson.

Reference Books:

1. Kanetkar and Kulkarni, "***Surveying and Leveling"***, Vol I & II, 24th edition, Pune VidyarthiGriha, Pune.
2. R.Agor, "***Surveying",*** Khanna Publishers.

CE-304: BUILDING MATERIALS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Stones and Bricks:** Physical and mechanical properties of construction materials, commonly used stones - Artificial, decorative and cladding stones, Tests for stones. Bricks - Classification and testing of bricks, fire bricks. Building blocks- solid, hollow and paving blocks- types and applications. Lime –types and applications. Pozzolanic materials – fly ash, rice husk ash and GGBFS, Industrial wastes for concrete making. **Materials for Floors and Walls:** Ceramic, terrazzo and clay tiles – types and uses; Materials of finish for residential, commercial and industrial floors. Materials of wall finish – interior and exterior, wall panelling materials, materials for architectural finishes.	**8**
II	**Materials for Building Services**: Timber-Market forms, seasoning and various products; Structural Steel and Aluminium –Roofing material, physical descriptions of asbestos sheets, GI sheets, tubes and light weight roofing materials; Modern materials –Neoprene, decorative panels and laminates, architectural glass and ceramics, PVC, polymer base materials, fibre reinforced plastics.	**7**
III	**Bitumen and Bituminous Products:** Pavement grade bitumen – asphalt, cut back bitumen, bituminous emulsion, mastic bitumen, bituminous felt; Joint filler compound – Joint sealant compound, anti-stripping compound, Polymer modified bitumen, latex modified bitumen and crumb rubber modified bitumen.	**7**
IV	**Modern Materials:** Glass, Ceramics, and Sealants for joints; Sheets for pitched roof coverings; Fibre glass reinforced plastic; Clay products – Refractories; Composite materials –Types, application of laminar composites; Fibre textiles- Mats and pads for earth reinforcement; Polymers and resins for building repair.	**7**

Text Books:

1. Surendra Singh, "***Building Materials"***, Vikas Publishing Company, New Delhi, 2002.
2. Rajput,R.K., "***Engineering Materials"***, S.Chand& Co. Ltd., New Delhi, 2000.

Reference Books:

1. Khanna, S.K., Justo, C.E.G, "***Highway Engineering"***, Nem Chand & Bros, Roorkee, 2007.
2. Kadiyali, L. R, "***Highway Engineering"***, Khanna Publishers, New Delhi, 2007

HS-306: SOCIOLOGY & ELEMENTS OF INDIAN HISTORY FOR ENGINEERS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction to sociological concepts**- structure, system, organization, social institution, Culture social stratification (caste, class, gender, power). **Understanding social structure and social processes -** Perspectives of Marx and Weber.	**6**
II	**Political economy of Indian society** - Industrial, Urban, Agrarian and Tribal society. **Social change in contemporary India** - Modernization and globalization, Secularism and communalism.	**6**
III	**Introduction to Elements of Indian History -** What is history? ; History Sources - Archaeology, Numismatics, Epigraphy and Archival research. **Indian history and periodization -** evolution of urbanization process: first, second and third phase of urbanization.	**6**
IV	**From feudalism to colonialism -**the coming of British; Modernity and struggle for independence. **Issues and concerns in post-colonial India (upto 1991) -** Issues and concerns in post-colonial India 2ndphase (LPG decade post 1991)	**6**

Text Books:

1. Desai, A.R. (2005), "***Social Background of Indian Nationalism"***, Popular Prakashan.
2. Giddens, A (2009), "***Sociology, Polity"***, 6thEdition.
3. Chandoke, Neera & Praveen Priyadarshi (2009), "***Contemporary India: Economy, Society and Politics",*** Pearson.

Reference Books:

1. Guha, Ramachandra (2007), "***India After Gandhi"***, Pan Macmillan.
2. Haralambos M, RM Heald, M Holborn (2000), "***Sociology",*** Collins.
3. Sharma R. S..(1965), "***Indian feudalism"***, Macmillan.
4. Gadgil, Madhab & Ramchandra Guha (1999,) "***This Fissured Land: An Ecological History of India"***, OU Press.

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HS-307: GERMAN LANGUAGE – I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Wichtige Sprachhandlungen:** Phonetics – Sichbegrüßen - Sich und and erevorstellenformell / informell - Zahlen von 1 bis 1 Milliarde – verstehen & sprechen. **Grammatik:** regelmäßigeVerbenimPräsens - "sein" und habenimPräsens - PersonalpronomenimNominativ.	**6**
II	**WichtigeSprachhandlungen:** Telefon Nummernverstehen und sprechenUhrzeitenverstehen und sagenVerneinung "nicht und kein" (formell und informell) **Grammatik**: Wortstellung – Aussagesatz – W-Frage und Satzfrage (Ja/NeinFrage) Nomenbuchstabieren und notierenbestimmter und unbestimmterArtikelundNegativartikelim Nom. &Akkusativ	**6**
III	**WichtigeSprachhandlungen:** Tageszeitenverstehen und überTerminesprechen-Verabredungenverstehen - AufgabenimHaushaltverstehen **Grammatik:** PersonalpronomenimAkkusativ und Dativ - W-Fragen "wie, wer, wohin, wo, was usw.-Genitivbei Personennamen - ModalverbenimPräsens "können, müssen,möchten"	**6**
IV	**WichtigeSprachhandlungen:** Sichaustauschen, was man kann, muss – BezeichnungenLebensmittel – Mengenangabenverstehen – PreiseverstehenundEinkaufzettelschreiben **Grammatik:**Wortstellung in SätzenmitModalverben – Konnektor "und" – "noch"-kein-------mehr – "wieviel, wieviele, wie alt, wielange" – PossessivartikelimNominativ.	**6**

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V	**WichtigeSprachhandlungen:** Freizeitanzeigenverstehen – Hobbysund Sportarten Anzeigenfür Freizeitpartnerschreibenbzw. daraufantworten –Vorlieben und Abneigungenausdrucken **Grammatik:** Verbenmit Vokalwechselim Präsens – ModalverbenimPräsens“dürfen, wollen und mögen - “haben und sein” imPräteritum – regelmäßigeVerbenimPerfekt – Konnektoren “denn, oder, aber.	**6**

Text Books:

1. Studio d A1. Deutsch alsFremdsprache with CD.(Kursbuch und Sprachtraining).

Reference Books:

1. German for Dummies
2. Schulz Griesbach

HS-308: FRENCH LANGUAGE – I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Grammar and Vocabulary:** Usage of the French verb "se presenter", a verbof self-introduction and how to greet a person- "saluer". **Listening and Speaking:** The authentic sounds of the letters of the French alphabet and the accents that play a vital role in the pronunciation of the words. **Writing:** Correct spellings of French scientific and technical vocabulary. **Reading:** Reading of the text and comprehension – answering questions.	**6**
II	**Grammar and Vocabulary:** Definite articles, "prepositions de lieu" subject pronouns. **Listening and Speaking:** Pronunciation of words like Isabelle, presentezandla liaison – vousetes, vousappelez and role play of introducing each other –group activity. **Writing:** Particulars in filling an enrolment / registration form. **Reading Comprehension:** reading a text of a famous scientist and answering questions.	**6**
III	**Grammar and Vocabulary:** Verb of possession "avoir' and 1st group verbs"er", possessive adjectives and pronouns of insistence- moi, lui..and numbers from 0 to 20. **Listening and Speaking: N**asal sounds of the words like feminine, ceinture, parfum and how to ask simple questions on one's name, age, nationality, address mail id and telephone number. **Writing:** Conjugations of first group verbs and paragraph writing on self – introduction and introducing a third person. **Reading Comprehension:** reading a text that speaks of one's profile and answering questions	**6**
IV	**Grammar and Vocabulary:** Negative sentences, numbers from 20 to 69, verb"aimer"and seasons of the year and leisure activities.	**6**

	Listening and Speaking: To express one's likes and dislikes and to talk of one's pastime activities (sports activities), je fais du ping-pong and nasalsounds of words – janvier, champagne. **Writing-**Conjugations of the irregular verbs: faire and savoir and their usage. Paragraph writing on one's leisure activity- (passé temps favori). **Reading:** a text on seasons and leisure activities – answering questions.	
V	**Grammar and Vocabulary:** les verbes de direction- to ask one's way and to give directions, verbes- pouvoir and vouloir and 2nd group verbs, a droite, lapremiere a gauche and vocabulary relating to accommodation. **Listening and Speaking:** To read and understand the metro map and henceto give one directions – dialogue between two people. **Writing:** Paragraph writing describing the accommodation using the different prepositions like en face de, derriere- to locate. **Reading Comprehension:** A text / a dialogue between two on location and directions- ouest la poste/ la pharmacie, la bibliotheque?.....	**6**

Text Book:

1. Tech French

Reference Books:

1. French for Dummies.
2. French made easy-Goyal publishers
3. Panorama

CE-307: BUILDING MATERIAL TESTING LAB

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam/ Viva**	**Total**	
0	0	2	1	30	20	50	3 hrs

Note: At least two tests must be conducted for each construction material.

List of experiments for different construction materials:	
1.	Tests on cement - Fineness, Normal consistency, Setting time, Soundness, Compressive strength.
2.	Test on bricks: Water absorption, Efflorescence, Compressive strength.
3.	Tests on aggregate: Physical Properties - Grain size distribution, Specific gravity, Density, Void ratio, bulking of sand; Aggregate crushing value.
4.	Properties of fresh concrete: workability tests - Flow &Vee-bee tests, Slump & Compaction factor test.
5.	Tests on Timber: Compressive strength –parallel to grain & perpendicular to grain, Bending tests
6.	Test on tiles: Transverse strength, Water Absorption of Flooring tiles and Roofing tiles.

CE-308: FLUID MECHANICS LAB

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam/ Viva**	**Total**	
0	0	2	1	30	20	50	3 hrs

Note: At least eight to nine experiments must be performed.

List of experiments:	
1.	To verify Bernoulli's theorem**.**
2.	To verify the momentum equation using the experimental set up on impact of jet.
3.	To determine the coefficient of discharge of Venturimeter.
4.	To determine the coefficient of discharge of Orifice meter.
5.	To determine the coefficient of discharge of Rectangular Notch.
6.	To determine the coefficient of discharge of Triangular Notch
7.	To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice and mouth piece.
8.	To determine the variation of friction factor 'f' for turbulent flow in commercial pipes.
9.	To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
10.	To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.

CE-309: SURVEYING LAB - I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam/ Viva	Total	
0	0	3	2	30	20	50	3 hrs

Note: At least eight experiments must be performed.

List of experiments:	
1.	Chain & Compass Traversing -Traversing and plotting of Details.
2.	Plane table Survey - Method of Radiation and intersection.
3.	Plane table Survey - Solving Two Point and Three Point Problems
4.	Plane table Survey – Traverse
5.	Leveling - Fly leveling, Longitudinal and cross sectioning and Contour surveying.
6.	Setting out of foundation plan for load bearing and framed structure.
7.	Setting out of sewer line, culvert.
8.	Setting out center line for tunnel, transfer of levels to underground work Project.
9.	Checking verticality of high rise structures.
10.	Theodolite: temporary adjustments, measurement of horizontal and vertical angles.
11.	Theodolite traversing.
12.	Study of Minor instruments: Planimeter, pantagraph, clinometer, hand levels, Quick setting level, CylonGhat Tracer, Sextent, etc.

SEMESTER-IV

MA-401: OPTIMIZATION AND CALCULUS OF VARIATIONS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction:** A survey of some simplified examples of common real world situations leading to optimization problems, basic formulation and theory of optimization problems. **Linear programming:** Linear programming (optimization of linear functions subject to linear constraints): basic theory; simplex method; duality, practical techniques.	6
II	**Linear programming:** Basic LPP - solution techniques (Simplex, Artificial Basis), Complimentary Slackness Theorem, Fundamental theorem of Duality, degenerate solutions, cycling; Applications - elements of dynamic programming including Hamiltonian, Bellman's optimality principle. **Transportation and Assignment Problems:** Solution of a balanced transportation problem, degeneracy in transportation problems and alternate solutions, Mathematical problems in formulation of assignment problems.	7
III	**Nonlinear programming:** Nonlinear programming (optimization of nonlinear functions subject to constraints) with Lagrange multipliers, Karush-Kuhn-Tucker optimality conditions, convexity, duality. **Approximation methods for nonlinear programming:** Line search methods, gradient methods, conjugate gradient methods; Networking techniques – PERT and CPM.	6
IV	**Calculus of Variations:**Basic definitions - functionals, extremum, variations, function spaces; Necessary conditions for an extremum, Euler-Lagrange Equation, convexity and it's role in minimization, minimization under constraints; Existence and	6

	nonexistence of minimizers; Applications - Isoperimetric problems, Geodesics on the surface.	

Text Books:

1. C. B. Gupta, "***Optimization Techniques in Operation Research,"*** I. K. International Publishing House Pvt. Ltd.
2. A. S. Gupta, "***Calculus of Variations and Applications"***, PHI Prantice hall India.
3. Mukesh Kumar Singh, "***Calculus Of Variations",*** Krishna Prakashan Media (P) Ltd.
4. J. K. Sharma, Operations Research ***"Problems and Solutions***, Macmillian Pub.

Reference books:

1. I. M.Gelf and S. V. Fomin, "***Calculus of Variations"***, Dover Publications IncMineola, New York.
2. Purna Chand Biswal, "***Optimization in Engineering***", Scitech Publications India Pvt. Ltd.
3. B. S. GREWAL, "***Higher Engineering Mathematics",*** Krishna Publications.
4. G. Hadly, "***Linear Programming"***, Narosa Publishing House.
5. KantiSwarup, P. K. Gupta and Manmohan, "***Operations Research",*** Sultan Chand & Sons.

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HS-409: HUMAN VALUES AND PROFESSIONAL ETHICS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction –Need and Basic Guidelines** 1. Understanding the need , basic guidelines, content and process of value Education 2. Self-Exploration – purpose, content and process, 'Natural Acceptance' and Experiential Validation – as the mechanism for self-explanation.	6
II	**Process for Value Education** 1. Continuous Happiness and Prosperity – A look at basic Human Aspirations. 2. Right Understanding, Relationship and Physical Facilities – basic requirements for fulfillment of aspirations of every human being with their correct priority. 3. Understanding Happiness and prosperity – A critical appraisal of the current scenario. 4. Method to fulfill the human aspirations; understanding and living in harmony at various levels.	7
III	**Harmony in Human Beings** 1. Understanding human being as a co-existence of the self and the body. 2. Understanding the needs of Self ('I') and 'Body' – Sukh and Suvidha. 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and	7

	enjoyer)	
IV	**Harmony in Myself and body** 1. Understanding the characteristics and activities of 'I' and harmony in 'I' 2. Understanding the harmony of I with the Body: Sanyam and Swasthya: correct appraisal of Physical needs, meaning of Prosperity in detail.	**6**
V	**Harmony in Family, Society and Nature** 1. Understanding harmony in the family, society and nature. 2. Understanding values in human relationship; meaning of Nyaya and Program for its fulfillment to ensure Ubhay-tripti. 3. Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.	**6**

Text Books

1. R R Gaur, RSangal and GP Bagaria, "***A Foundation Course in value Education"***, Published by Excel Books (2009).
2. R R Gaur, R Sangal and G P Bagaria, "***Teacher's Manual (English)",*** 2009.

Reference Books

1. E.F. Schumacher, "***Small is Beautiful; a study of economics as if people mattered"***, Blond & Briggs, Bratain, 1973.
2. PL Dhar, RR Gaur, "***Science and Humanism",*** common wealth publishers, 1990.
3. A.N. Tripathy, "***Human values"***, New Age International Publishers, 2003.
4. E.G. Seebauer& Robert, L BERRY, "***Foundational of Ethics for Scientists & Engineers"***, Oxford University Press, 2000.
5. M. Govindrajran, S.Natrajan& V.S. Senthi Kumar, "***Engineering Ethics (including human Values)",*** Eastern Economy Edition, Prentice hall of India Ltd.
6. B.L. Bajpai, 2004, "***Indian Ethos and Modern Management"***, New Royal book Co; Lucknow, 2004, Reprinted 2008.

CE-401: STRUCTURAL ANALYSIS – I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	2	0	4	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction to Determinate Structures:** Statically determinate & indeterminate structures, static and kinematic indeterminacy, stability of structures, principle of superposition, Maxwell's reciprocal theorems; Computation of internal forces in statically determinate structures - plane truss, plane frame and grids. **Analysis of Statically Determinate Beams:** Deflection of statically determinate beams - Macaulay's Method, Moment Area Method, Conjugate Beam Method.	**9**
II	**Deflection of Beams, Frames and Plane Truss by Strain Energy:** Strain energy and complementary energy, strain energy due to axial loading, bending, transverse shear and torsion; applications to beams and frames; Clarke– Maxwell - Betti reciprocaltheorem. **Virtual Work:** Principal of virtual work, Unit load method, deflection of beams, frames and plane truss by unit load method.	**8**
III	**Analysis of Arches:** Three hinged circular and parabolic arches with supports at same and different levels, determination of normal thrust, radial shear and bending moment. **Analysis of Cables:** Analysis of cables under point loads and UDL, length of cables for supports at same levels and at different levels.	**8**
IV	**Moving loads and Influence Lines:** Introduction to moving loads - concept of influence lines - influence lines for reaction, shear force and bending moment in simply supported beams and over hanging beams; Muller Breslau principle - application to propped cantilevers - influence lines for forces in beams and trusses for different types of moving loads - concentrated load, uniformly distributed load shorter and longer than the span.	**8**

Text Books:

1. Reddy C S, ***"Basic structural Analysis"***, Tata McGrawHill, New Delhi.

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2. Wang C.K., "***Intermediate Structural Analysis"***, McGraw Hill, New Delhi.
3. M.L. Gambhir, "***Fundamentals of structural Mechanics and analysis"***, Printice Hall India

Reference Books:

1. Kinney S., "***Indeterminate Structural Analysis"***, Oxford & IBH
2. Coates, Coutie and Kong , "***Structural Analysis"***, ELBS Publishers
3. Timoshenko S.P.& Young D.H., "***Theory of Structures"***, McGraw Hill
4. Harry H West & Louis F Geschwindner, "***Fundamentals of Structural Analysis"***, Wiley India Publishers

CE-402: GEOTECHNICAL ENGINEERING – I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Introduction:** Introduction, origin and formation of soil, phase diagram, relationships and their inter - relationships; Determination of Index properties - specific gravity, water content, in-situ density, particle size analysis and sedimentation analysis, Atterberg's limits, relative density, thixotrophy, activity and sensitivity; Classification of soils as per BIS and HRB and their applications in construction of highways, earthen dams etc., BIS Plasticity chart and its practical application. **Soil Structure and Clay Mineralogy:**Single grained, honey combed, flocculent and dispersed structures; Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution; Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite and their application in Engineering.	**9**
II	**Flow Through Soil**s: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), permeability of stratified soils, seepage velocity, superficial velocity and coefficient of percolation, quick sand phenomena, capillary phenomena; Application problems with respect to the analysis of dams and sub-base of roads; Seepage analysis -Laplace equation, assumptions, limitations and itsderivation; Flow nets- characteristics and applications, flow nets for sheet piles and below the dam section. **Effective Stress:** Introduction, geostatic stresses, effective stress concept-total stress, effective stresseffect of water table, fluctuations of effective stress, effective stress in soils saturated by capillary action,neutral stress and impact of the effective stress in construction of structures.	
III	**Consolidation of Soils**: Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary	**8**

	consolidation, Terzaghi's theory of consolidation, final settlement of soil deposits, consolidation settlement - one- dimensional method, secondary consolidation. Primary and secondary compression for normally and over consolidated clays, consolidation of partially saturated soils, creep/secondary compression in soils.	
IV	**Shear Strength of Soils:** Concept of shear strength, typical response of soilsto shearing forces - Effects of increasing the normal effective stress, over consolidation ratio in soils, drainage of excess pore water pressure, cohesion, tension and cementation; Mohr-Coloumb theory, concept of pore pressure, total and effective shear strength parameters, factors affecting shear strength of soils;Measurement of shear strength –Direct shear test, Unconfined compression test, Triaxial compression tests, Vane shear test, Test under different drainage conditions, Total and effective stress paths. **Stability of Slopes**: Introduction, different factors of safety, types of slope failures, analysis of finite and infinite slopes, Swedish circle method, friction circle method, stability numbers and charts	**9**

Text Books:

1. Braja, M. Das (2002), Fifth Edition, "***Geotechnical Engineering",*** Thomson Business Information India (P) Ltd., India.
2. Punmia B C, ***"Soil Mechanics and Foundation Engineering",*** Laxmi Publications.

Reference Books:

1. Taylor, ***"Fundamentals of Soil Engineering",*** John Wiley & Sons
2. Holtz R.D., ***"An Introduction to Geotechnical Engineering"***, Prentice Hall, NJ
3. Craig R.F., ***"Soil Mechanics",*** Chapman & Hall.
4. T.W. Lambe and R.V. Whitman, ***"Soil Mechanics"***, John Wiley & Sons, 1969.

CE-403: ENGINEERING SURVEYING –II

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Tacheometric Surveying:** Classification, principal of stadia method, theory of anallatic lens, distance and elevation formulae, tangential method, errors in stadia surveying.	5
II	**Simple, Compound, Reverse Curves and Vertical Curves:** • Simple Curves: Elements of simple curves, methods of curve ranging, obstacles in setting out curves. • Compound Curves: Elements of compound Curves, setting out the curve. • Reverse Curves: Elements of reverse Curves, setting out the curve. • Vertical Curves: Elements of vertical curves, types, tangent correction, location of highest or lowest point. **Transition Curves:** Elements of transition curves, super elevation, length of transition curve, Ideal transition curve, characteristics of transition curve, setting out the transition curve.	7
III	**Geodetic Surveying and Triangulation Adjustment Geodetic Surveying:** Classification of triangulation survey, inter - visibility of stations, field work, reduction to centre, base line measurement, corrections. **Triangulation Adjustment:** Definitions, weighted observations, principal of least square, laws of weights, station adjustment and figure adjustment (Triangle only). **Photographic Surveying:** Basic definitions, terrestrial and aerial photography, scale of Aerial photo relief, tilt and height displacements, heights from relief displacement andparallax measurements, flight planning, study of photo theodolite and stereoscope.	8

IV	**Advanced Techniques in Surveying:** Total station, electromagnetic distance measurement (EDM). **Remote Sensing:** Introduction, definitions, remote sensing systems, advantages, basic principles, energy interaction in the atmosphere and with targets, Indian remote sensing satellite series and their characteristics. **GIS & GPS:** Components of geographical information system (GIS),advantages, function of GIS, raster and vector data, advantages and disadvantages, global positioning system.(GPS),Introduction, definitions, GPS receivers, antenna, errors in GPS, advantages of GPS.	**7**

Text Books:

1. B.C.Punmiya, "***Surveying and Leveling"***, Laxmi Publication
2. N.N.Basak, "***Surveying and Leveling"***, Tata McGraw Hill
3. Kanetkar & Kulkarni, "***Surveying & Levelling".***
4. Dr. M. AnjiRddy, "***Remote sensing & G.I.S".***

Reference Books:

1. R Agor, "***Surveying",*** Khanna Publishers
2. Lo C.P.Yeung A K W, "***Concepts and Techniques of GIS"***, Prentice Hall, India
3. Kang-tsung Chang, "***Introduction to GIS"***, Tata McGraw Hil

CE-404: BUILDING PLANNING AND CONSTRUCTION

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**PLANNING ASPECTS & REGULATIONS:** Functional Planning of buildings: General aspects to consider for planning, bye-laws and regulations, Selection of site for building construction, Principles of planning, Orientation of building and its different elements, Components of building.	7
II	**Masonry:** Definitions of terms used in masonry, Materials used, Stone masonry, Brick masonry, Different bonds used for brick masonry, Composite masonry. **Floors and Roofs:** Components of a floor, materials used for floor construction, Different types of flooring, Ground floor and upper floors, Types of roofs, Basic roofing elements and Roof coverings.	7
III	**Doors and Windows:** Location of roofs and windows, Definition of technical terms, Size of doors and windows, Door frames, Types of doors and windows, Ventilators, Fixtures and fastenings. **Damp proofing, Fire protection and Thermal insulation:** Causes and effect of dampness on buildings, Materials and methods used for damp proofing; Fire hazards, Grading of buildings according to fire resistance, Fire resisting properties of common building materials, Fire resistant construction; General methods of thermal insulation and thermal insulating materials.	8
IV	**Building Services:** Integration of services in buildings - water supply & plumbing layout for a residential building - elevators & escalators - planning & installation – basic components of the electrical system for a residence - typical electrical layout diagram. Lay out of external services -water supply- sewage disposal-electrical cabling.	6

Text Books:

1. Varghese P. C. "***Building Construction"***, PHI Learning Pvt. Ltd., 2008.
2. Punmia B. C., Jain A. J. and Jain A. J. "***Building Construction"***, Laxmi Publications, 2005.
3. Arora S. P. and Bindra S. P. "***The text book of Building Construction"***, Dhanpat Rai Publications, 2010.

Reference Books:

1. Joseph De chiara & John Callendar – ***"Time saver standards for building types",*** III Edition - McGraw Hill, 1990.
2. National Building Code, "***Bureau of Indian Standars***", New Delhi, 2005.

HS-410: LAW FOR ENGINEERS

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Constitutional Law:** Nature of Indian Constitution (features), fundamental rights, duties and directive Principles of State Policy (DPSP's), forms of Governments, structure of Government of India, role and responsibility of executive, legislature/parliament and judiciary, nature of Indian federal system, center state and relations. Basic structure of the Indian constitution, basic features of the Indian, constitutional amendments – Golak Nath, Keshwananda Bharti, Maneka Gandhi (1978) and S.R. Bommai case (1994), (floor test).	6
II	**Law of contract:** General principles of Indian Contract Act, 1862, kinds of Government contracts and dispute settlement, standard and printed form of contract, essential elements of valid contract proposal, acceptance communication and revocation thereof, relevance of time in contractual obligation. Main objectives of Arbitrates and Conciliation Act-1996, tort and law of tort, general principles of tort law, classifications of torts: property vs. person.	6
III	**Administrative Law:** Evolution, nature and its scope, conceptual objection against growth of administrative rule of law and separation of power, clarification of administrative actions, judicial review of administrative actions, exclusion of judicial review and concept of "Ombudsman";Right to Information Act, 2005 (Sub Section 1 - 20) **Environmental Law:** Definition, meaning and its nature, environmental (Protection) Act-1986, Water (Preservation and Control of Pollution) Act-1974, Air (Prevention and Control of Pollution) Act-1981; Environmental pollution, overall remedies and procedures.	8
IV	**Human Rights:** Legality of human rights, universal declaration of human rights, 1948, difference between civil and political rights, individual and human rights - human rights of child, weaker section of society, prisoners, and refugees, International Human Rights Commission.	6

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Text Books:

1. D.D. Basu, "***Shorter Constitution of India"***, Prentice Hall of India, (1996).
2. Meena Rao, "***Fundamental concepts in Law of Contract"***, 3rd Edn. Professional Offset, (2006).
3. H.O. Agarwal, "***International Law and Human Rights"***, Central Law Publications, (2008).

Reference Books:

1. H.M. Seervai, "***Constitutional Law of India"***, Tripathi Publications, (1993).
2. S.K. Kapur, "***Human Rights under International Law and Indian Law"***, Central Law Agency, (2001).
3. Neelima Chandiramani, "***The Law of Contract: An Outline"***, 2nd Edn. Avinash Publications Mum.
4. Avtarsingh, "***Law of Contract"***, Eastern Book Co., (2002).
5. Anson W.R, "***Law of Contract"***, Oxford University Press.

HS-411: GERMAN LANGUAGE – II

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
2	0	0	2	40	60	100	3 hrs
Prerequisite							
HS 302: GERMAN LANGUAGE - I							

COURSE CONTENTS:

Unit	Contents	No. of hours
I	Wichtige Sprachhandlungen: Zimmersuche, Möbel **Grammatik**: VerbenmittrennbarenVorsilbenim Präsens und Perfekt. Verbenmittrennbaren Vorsilben und Modalverbenim Präsens. Verbenmituntrennbaren Vorsilbenim Perfekt. Unregelmäßige undgemischte VerbenimPerfekt.	**6**
II	Wichtige Sprachhandlungen: Kleidung ,Farben, Materialien. **Grammatik:** formelleImperativsätzemit "Sie" informelleImperativsätzeVorschlägemit "wir" – "sollen/wollenwir" - Sollich? Modalpartikeln "doch""mal" "doch mal.	**6**
III	WichtigeSprachhandlungen: Sehenswürdigkeite (Prater, BrandenburgerTör,Kolossium, Eifeltürm) **Grammatik:**OrtsangabenmitAkk. undDativ "alle","man" Indefinitepronomen"etwas", "nichts".	**6**
IV	WichtigeSprachhandlungen: Essen und TrinkenimRestaurant, Partyvorbereitung und Feier. **Grammatik:** NomenausAdjektivennach "etwas"und "nichts" NomenausdemInfinitiv von Verben, zusammegesetzteNomen und ihreArtikel. Adjektiveim Nom.und Akk.nachunbestimmten Artikel, Negativartikel und Possessivartikel.	**6**

Text Book:

1. Studio d A1. Deutsch alsFremdsprache with CD.(KursbuchundSprachtraining).

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Reference:

1. German for Dummies
2. Schulz Griesbach

HS-412: FRENCH LANGUAGE - II

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs
Prerequisite							
HS 303: FRENCH LANGUAGE - I							

COURSE CONTENTS:

Unit	Contents	No. of hours
I	**Grammar and Vocabulary**: The second group verbs: Finir, rougir, grossir, grandir. "Les preposition de temps": à, en, le, de 7h à 8h, jusqu' à, vers. Listening and Speaking – the semi- vowels: Voilà, pollutant. Writing - thedays of the week, months, technical subjects, time, "les spécialitésscientifiques et l' annéeuniversitaire, paragraph writing about time table. **Reading:** Reading of the text and comprehension – answering questions.	**6**
II	**Grammar and Vocabulary**: The adjectives, the nationality, feminine & masculinenoun forms "les métiersscientifiques". Listening and Speaking – Vowels: soirée, année, près de, très. Writing: Countries name, nationality, "les métiersscientifiques", numbers from:69 to infitive and some measures of unit. Reading Comprehension: reading a text.	**6**
III	**Grammar and Vocabulary:** near future, The demonstrative adjectives, Express the aim by using the verb, Listening and Speaking –"La liaison interdite – enhaut". Writing – some scientific terms, French expressions to accept an invitation. Sentence framing. Reading Comprehension – reading a text.	**6**
IV	**Grammar and Vocabulary:**the verbs: manger, boire, the partitive articles **Listening and Speaking:** "le 'e' caduc Writing- the food, the ingredients, fruits, vegetables, expression of quantity, paragraph writing about food habits. Reading – reading a text.	**6**

Text Book:

1. Tech French

Reference Book:

1. French for Dummies.
2. French made easy: Goyal publishers.
3. Panorama.

CE-407: GEOTECHNICAL ENGG. LAB –I

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
0	0	2	1	30	20	50	2 hrs

Note: A minimum eight practical's to be performed out of following:

1.	Field Density using Core Cutter method.	
2.	Field Density using Sand replacement method.	
3.	Natural moisture content using Oven Drying method.	
4.	Field identification of Fine Grained soils.	
5.	Specific gravity of Soil grains.	
6.	Grain size distribution by Sieve Analysis.	
7.	Grain size distribution by Hydrometer Analysis.	
8.	Consistency limits by Liquid limit, Plastic limit and Shrinkage limit.	
9.	Permeability test using Constant Head test method / Falling Head method.	
10.	Compaction test: Standard Proctor test/ Modified Proctor test.	
11.	Relative density.	
12.	Consolidation Test.	
13.	Triaxial Test (UU)	
14.	Direct Shear Test.	
15.	Unconfined Compression Strength Test.	
16.	California Bearing Ratio.	

CE-408: SURVEYING LAB –II

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
0	0	3	2	30	20	50	2 hrs

Note: A minimum eight practicals to be performed out of following List:

List of Experiments:		
1.	Determination of constants of Tacheometer	
2.	Determination of elevation of points by Tacheometric surveying	
3.	Determination of elevation of points and horizontal distance between them by Tacheometric survey.	
4.	Determination of gradient of given length of road by Tacheometric survey.	
5.	Setting out of simple circular curve by offsets from chord produced and Rankinemethod.	
6.	Setting out of simple transition curve by tangential angle method	
7.	Use of Total Station.	
8.	Study of Toposheets.	
9.	SURVEY PROJECT: Survey project should be carried out for minimum 2 days in any one of the following areas:	
	(a)	Road Project.
	(b)	Irrigation Project (canal alignment, watershed demarking, contouring)
	(c)	Water Supply Project.

After completion of survey, students have to complete profile, cross-section and volume calculation (Cut & Fill) using appropriate software wherever required.

CE-410: COMPUTER AIDED BUILDING DRAWING LAB

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
0	0	2	1	30	20	50	2 hrs

Note: A minimum six drawings must be made out of following list:

List of Drawings:	
1.	Getting started with AutoCAD.
2.	Understanding the basic commands.
3.	Executing Electric drawings.
4.	Executing Mechanical drawings.
5.	Drawing a civil engineering structures with design notations.
6.	Drawing various building plans and elevations.
7.	Drawing panelled doors, glazed windows and ventilators in wood.
8.	Drawing roof truss in structural steel sections
9.	Executing a spiral stair case in 3D.

Reference Books:

1. AutoCAD Manual.
2. Balagopal T.S. Prabhu, Building drawing and detailing, Spades Publishers
3. Shah & Kale, Building Drawing, Tata McGraw Hill
4. B.P. Verma, Civil Engineering Drawing and housing Planning, Khanna Publishers

SEMESTER-V

CE-501: LIMIT STATE DESIGN OF CONCRETE STRUCTURES – I

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

Note: ***Code of practice for Plain and Reinforced Concrete,*** IS 456-2000 is permitted in the examination.

COURSE OBJECTIVE:

To introduce different types of philosophies for the design of basic structural components such as beams, slabs, columns, footings which form part of any structural system with reference to Indian standard code of practice.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Reinforced Concrete Materials:** Cement, classification and composition of cement, aggregate, water, water-cement ratio, admixtures, grades of concrete and characteristic strength. Design of concrete mixes and acceptability criterion. Reinforcing steel – types, sizes and grades. Introduction to Loading codes. **Methods of Design of Concrete Structures:** Design philosophies of working stress method, ultimate load method and limit state method (LSM), advantages of limit state method, limit states, partial safety factors for materials and loads, design stress-strain curve for concrete and steel.	7
II	**Limit State Design for Flexure:** Assumptions for limit state of collapse due to flexure, analysis and design of singly and doubly reinforced rectangular and flanged beams, stress blocks parameters, ultimate and limiting moment of resistance, limiting percentage tensile steel, and curtailment of tension reinforcement. Design of slabs – cover, effective span to depth ratio, design shear strength of concrete in slabs, deflection control, one-way and two-way actions of slabs, and design of one-way, two-way and continuous slabs subjected to uniformly distributed loads for various boundary conditions.	8

III	**Limit State Design for Shear:** Distribution of shear stress in beams, nominal shear stress, critical sections for shear design, design shear strength and design of shear reinforcement. **Limit State Design for Torsion:** Torsional stiffness, design strength in torsion, torsional shear stress and design for torsional reinforcement. **Limit State Design for Bond:** Introduction, bond stress, anchorage, development length, bond failure, bond strength, anchoring of reinforcement and reinforcement splicing.	**6**
IV	**Limit State Design of Stair Cases:** Types, geometrical configurations, structural classifications, loads, design of simple staircases – straight (with and without intermediate landing), quarter turn and dog legged stairs. **Limit State Design of Compression Members:** Types of columns – braced and unbraced columns, effective length, minimum eccentricity, design of short rectangular and circular columns for axial load and axial load with uniaxial bending. Use of design charts. Slender columns.	**8**

Text Books:

1. A. K. Jain, "***Reinforced Concrete-Limit State Design"***, Nem Chand & Bros., Roorkee.
2. P.C. Varghese, "***Limit State Design of Reinforced Concrete",*** Prentice Hall of India Pvt. Ltd., New Delhi.
3. S. UnnikrishnaPillai& D. Menon, "***Reinforced Concrete Design",*** (Third edition), Tata McGraw Hill,.

Reference Books:

1. B. P. Huges, "***Limit State Theory for Reinforced Concrete Design"***, Pitman.
2. Shah &Karve, "***Limit State Theory &Design of Reinforced Concrete (I.S. 2000-456)"***, Structures Publications, Pune.
3. M. L. Gambhir, "***Fundamentals of Reinforced Concrete Design"***, Printice Hall of India, Pvt. Ltd., New Delhi.
4. IS Codes (latest): IS: 456, IS: 875(all parts), IS: 13920& SP: 16.

CE-502: STRUCTURAL ANALYSIS – II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce different methods of analysis for structural components. At the end of the course the student will be able apply these methods to analyse indeterminate structural components.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Force Methods**: Introduction, method of consistent deformation, Castigliano's theorems, analysis of statically indeterminate beams, trusses and frames. **Influence Line Diagram for Indeterminate Structures:** Influence lines for indeterminate beams and trusses, Muller-Breslau Principles and qualitative plot of influence lines, influence lines for reaction, shear and bending moment in beams.	**8**
II	**Slope-Deflection Method:** Introduction, degrees of freedom, slope and deflection equations. Application to beams including settlement of supports, analysis of single bay-single storey portal frames including side sway. **Moment Distribution Method:** Introduction, stiffness and carry over factors, distribution factors, analysis of continuous beams with and without sinking of supports, single bay-single storey portal frames including sway.	**6**
III	**Approximate Methods:** Introduction, substitute frame analysis by two cycle method. Assumptions in approximate analysis, application of approximate methods of analysis to building frames by portal and cantilever method (up to two bays and two storeys only).	**4**
IV	**Flexibility Method:** Fundamental concepts, co-ordinates, general procedure, analysis of beams, rigid jointed plane frames and trusses (involving not more than three unknowns).	**10**

	Stiffness Method: Fundamental concepts, member coordinates, element and global stiffness matrices, transformation of stiffness matrices, load vectors and displacement vectors.Analysis continuous beams, pin-jointed plane frames, and rigid jointed plane frames (Involving not more than three unknowns).	

Text Books:

1. R. C. Hibbeler, "***Structures Analysis"***, Pearson Prentice Hall.
2. B.C. Punmia, "***Strength of Materials and Mechanics of Solids"***, Vol-II, Laxmi Publications, New Delhi.

Reference Books:

1. Vazirani & Ratwani, "**Analysis of Structures"**, Khanna Publications.
2. Pandit and Gupta, "**Structural Analysis (Matrix Approach)"**, Tata McGraw Hill, New Delhi.
3. C. S. Reddy, "**Structural Analysis"**, Tata McGraw Hill, New Delhi.

CE-503: GEOTECHNICAL ENGINEERING–II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To impart knowledge and skill necessary for soil investigations, understand earth pressure theories, safe bearing capacity and settlement of soils, shallow foundation and deep foundation (pile foundation only).

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Soil Exploration and Soil Sampling:** Planning for sub-surface exploration, depth and spacing of exploration, methods of exploration, field testing. Geo-physical Exploration Methods: seismic refraction and electrical resistivity method. Methods of Boring: auger boring, wash boring, percussion boring and rotary drilling.Preparation of bore-log and soil investigation report. Soil Sampling: Disturbed and undisturbed soil samples, features of sampler affecting soil disturbance.	**7**
II	**Earth Pressure in Soils:** Types of earth pressures, active and passive earth pressure, Coloumb's wedge theory and Culmanns graphical construction for active and passive earth pressure.	**5**
III	**Shallow Foundations:** Types of shallow foundations, factors effecting locations of foundation, design considerations of shallow foundations, foundations on expansive soils. **Bearing Capacity of Soil:** Introduction, safe bearing capacity and allowable bearing pressure, estimation of ultimate bearing capacity based on Terzagis's theory, in-situ tests such as static and dynamic cone penetration tests, and palte test.general and local shear failure conditions, allowable bearing pressure based on N-values, bearing capacity from plate load tests.	**8**
IV	**Deep Foundations:** Types of deep foundations and load transfer mechanism. Pile foundations– classification, pile load carrying capacity from static &dynamic formulae	**8**

	(ENR and Hiley), pile load test, group action of piles and negative skin friction. **Settlement Analysis:** Causes of settlement, computation of settlement, allowable settlement, measures to reduce settlement, introduction foundations on expansive and collapsible soils.	

Text Books:

1. B.C.Punmia, ***"Soil Mechanics and Foundation Engg.",***Laxmi Publications.
2. K.R.Arora, ***"Soil Mechanics and Foundation Engg.",*** Standard Publishers, New Delhi

Reference Books:

1. Murthy, V.N.S, ***"Textbook of Soil Mechanics and Foundation Engineering",*** CBS Publishers and Distributors, New Delhi.
2. K. Terzaghi& R.B. Peck,***"Soil Mechanics in Engineering Practice",*** Wiley Publishers.
3. N.V. Nayak, ***"Foundation Design Manual"***,DhanpatRai Publications, New Delhi.
4. GopalRanjan&Rao, ***"Basic &Applied Soil Mechanics",*** New Age international Publisher.
5. Das,.B.M., ***"Principles of Foundation Engineering"***, Thomson Books.

CE-504: MECHANICS OF FLUIDS – II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce viscous flow and boundary layer theories, flow in open channels and its characteristics and hydraulic machinery.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Viscous Flow:** Reynolds number and Reynolds experiment, flow of viscous fluid through circular pipe - Hagen Poiseuille formula. Flow of viscous fluid between two parallel fixed plates. **Boundary Layer Theory:** Introduction, development of boundary layer over a flat plate, boundary layer thickness, moment integral equation, boundary layer over rough surface, drag on a flat plate due to laminar and turbulent boundary layer, boundary layer separation and its control.	8
II	**Uniform Flow in Open Channels:** Characteristics of uniform flow, Chezy's and Manning's formulae, uniform flow computations, most efficient channel sections, Manning's roughness coefficient and equivalent roughness. **Depth-Energy Relationships:** Specific energy, specific force, specific energy and specific force diagrams, critical depth, critical flow computations.	8
III	**Gradually Varied Flow:** Theory and analysis of gradually varied flow in prismatic channels, classification of surface profiles. **Rapidly Varied Flow in Open Channels:** Theory of hydraulic jump, application of momentum equation to hydraulic jump in rectangular channel - length, height and location of jump in rectangular channel. Energy dissipation.	8

IV	**Turbo machinery:** Application of momentum principle, impact of jets on plane and curved plates. **Turbines:** Types, Study of Pelton, Kaplan and Francis turbines, velocity triangles, efficiency, work done, specific speed, unit quantities, performance of turbines, governing of turbines. **Pumps:** Centrifugal pumps – classification, blade angle, velocity triangle, efficiency, specific speed, characteristic curves.Reciprocating Pumps- Principle of working, slip, work done, frictional resistance and separation.	**9**

Text Books:

1. K. Subramanya, ***"Open Channel Flow",*** Tata McGraw Hill, New Delhi.
2. P. N. Modi and S.M. Seth, ***"Hydraulics, Fluid Mechanics and Hydraulic Machines",*** Standard Book Home, New Delhi.
3. R.K. Rajput, ***"Text Book of Fluid Mechanics and Hydraulic Machinery",*** S. Chand & Company, New Delhi.

Reference Books:

1. J.F., Douglas, J.M, Gasiorek, and J.A. Swaffield, ***"Fluid Mechanics",*** Pearson Education India, 2002.
2. Das M.M. Das, "***Fluid Mechanics and Turbimachines",*** Prentice Hall of India (P) Ltd New Delhi.
3. K.R. Arora, ***"Fluid Mechanics, Hydraulic and Hydraulic Machines,"*** Standard Publishersand Distributors, New Delhi.

4 VenTe Chow, ***"Open Channel Hydraulics",*** Tata McGraw Hill.

CE-505: ENVIRONMENTAL ENGINEERING– I

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

Students shall be imparted knowledge of Environmental Engineering using basic principles of Fluid mechanics, Biological and Chemical Science to develop basic and empirical equations for Environmental Engineering Applications.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Sources of Water:** Types of sources—surface and ground Surface Water Sources: investigations for reservoir planning, determination of storage capacity and yield from reservoir. Intakes structures for surface water sources—lakes, streams and rivers, impounding reservoir and canal. Ground Water Sources: Types of aquifer and aquifer parameters, well hydraulics and Darcy's law. Rain water harvesting.	8
II	**Water Quantity/Demand:** Population forecast—arithmetic, incremental and geometric methods. **Estimation of Water Requirement:** Design period, per capita consumption, factors affecting per capita demand and fluctuations in demand pattern. **Quality of Water:** Common impurities of water, physical, chemical and biological characteristics of water, IS and WHO water quality standards, water borne diseases, water pollution, role of regulatory bodies &local bodies. Water Act 1974.	8

III	**Water Purification:** Objective of water treatment, unit operations, introduction to physical, chemical and biological processes. Mixing, aeration, sedimentation, coagulation, flocculation and filtration–slow and rapid sand filters. **Softening of Water:** Definition, methods of removal of hardness by lime soda process and zeolite process, RO & Membrane technique. **Disinfection of Water:** Chlorination, chlorine demand, residual chlorine, use of bleaching powder, UV irradiation treatment.	**8**
IV	**Conveyance of Water:** Conveyance of water, pumping stations. **Distribution of Water:** Methods of distribution–direct supply from mains, direct pumping, hydro-pneumatic systems, overhead tanks distribution—pipes, laying of mains and pipes, jointing, backflow prevention, inspection and testing after installation. **Plumbing Services:** Terminology used for home plumbing systems and distribution of water for multi-story buildings.	**8**

Text Books:

1. Garg, S. K, ***"Environmental Engineering",*** Vol. I, Khannan Publishers, New Delhi.
2. Duggal, K. N, ***"Elements of Environmental Engineering",*** S. Chand & Company Ltd., New Delhi.
3. S.M. Patil***,"Plumbing Engineering - Theory, design and Practice"***.

Reference Books:

1. Paneerselvam, R, ***"Environmental Engineering",*** Vol. I, SPGS Publishers Chennai.
2. Hammer, M. J. ***"Water and Wastewater Technology",*** Prentice Hall.
3. Peavy, H. S.,Rowe, D. R. and G. Tchobanoglous, ***"Environmental Engineering",*** McGraw-Hill Publishing Co., Delhi.
4. ***"Manual on Water Supply and Treatment,"*** CPHEEO, Ministry of Urban Development, Government of India, New Delhi.

CE-506: TRANSPORTATION ENGINEERING – I

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce the elements related to highway engineering. The subject knowledge of traffic engineering, geometric design and pavement design shall be imparted along with highway material and construction.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Highway Planning and Alignment:** Significance of highway planning, history of highway development in India, classification of highways, factors affecting highway alignment, engineering surveys for alignment –conventional and modern methods. **Traffic Engineering:** Introduction, traffic characteristics, traffic studies, traffic flow characteristics, traffic control devices - roadway delineators, hazard markers, object marker, speed breakers and rumble strips etc., Traffic signs and road markings.	8
II	**Geometric Design of Highways:** Typical cross-sections of highway, cross sectional elements – payment structure, camber, width of carriageway, width of formation, road margins, widening of pavements at horizontal curves, right of way, super elevation, design speed and sight distances. Design of horizontal and Vertical alignments, IRC specifications.	8
III	**Highway Materials:** Sub grade soil, stone aggregates, binding materials (bitumen, emulsion tar and cut back). Introduction to modified binders and Geo-synthetics. **Design of Highway Pavements:** Flexible pavement and their design, IRC: 37-2012 method of design, rigid pavement and their design.	8
IV	**Highway Construction:** Construction practices including modern materials, construction of Water Bound Macadam and Soil Stabilized Roads. Use of Glass, Fiber,	8

	Plastic, Geo-textiles and Geo-grids. Strengthening of existing pavements–types of overlays, design of different types of overlays. **Highway Evaluation:** Pavement distress in flexible and rigid pavements. Pavement evaluation - roughness, present serviceability index, skid resistance, evaluation by deflection measurement.	

Software Required: Introduction to MX Roads software.

Text Books:

1. Khanna, S. K., and Justo C.E.G., ***"Highway Engineering",***Nem Chand & Bros.
2. Kadiyali, L. R., ***"Traffic Engineering and Transport Planning",***Khanna Publishers.

Reference Books:

1. Chakraborthy P. and A. Das,***"Principles of Transportation Engineering",*** Prentice Hall of India.
2. Morlok, E.R., ***"An Introduction to Transportation Engineering and Planning",*** McGraw Hill, NY.
3. Hay, W.W., ***"Introduction to transportation Engineering",*** John Wiley & Sons, NY.
4. Papacostas C.S., ***"Fundamentals of Transportation Engineering",*** Prentice Hall of India.

CE - 508: ELEMENTS OF CIVIL ENGINEERING

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE OBJECTIVE:

The course aims to make all engineering students aware of the properties and applications of different types of construction materials used in structures.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Bricks:** Manufacturing of bricks, Classification of bricks , Properties and uses of First Class, Second Class, Third Class and Over burnt bricks , Characteristics of good brick , Size and weight of a standard brick , Composition of brick earth , Test for burnt clay bricks, Fire bricks, its properties, uses and availability , Applications of bricks, Bonds in Bricks Masonry.	8
II	**Cement:** Uses of cement Composition of Portland cement ,Setting and hardening of cement , Types of cement, their properties and uses , Ordinary Portland Cement (OPC) , Rapid Hardening Cement ,High Alumina Cement , White Cement , Coloured Cement , Pozzolana Portland Cement , Sulphate Resisting Cement , Storage of Cement **Mortar:** Function of mortar ,, Preparation of cement mortar, lime mortar, lime cement mortar and their , Proportion of mortar for different building works Different types of sand , Bulking of Sand	8
III	**Concrete:** , Mixing, placing and uses of lime concrete and cement concrete, aggregate and its grading ,Placing of concrete , Compaction of concrete , Curing of concrete 6.5 Reinforced cement concrete (RCC) , Necessity of providing reinforcement , Properties of RCC :Elasticity, Creep & Shrinkage- Modulus of elasticity- - Posisson's ratio- Creep of concrete- Factors influencing creep- Relation between creep & time- Nature of creep- Effects of creep- Shrinkage - types of shrinkage, Use of Concrete Blocks	8
IV	**Foundations:** Different types of foundations with reference to advantage of one over the other, Foundations of different types with reference to method of construction. Foundations for special circumstance. Machine foundations. **Special Treatments in Buildings:** Fire resistant, water resistant, thermal insulation,	8

	acoustical construction and anti-termite treatment in buildings.	

Text Books:

1. ***"Properties of Concrete"*** by A.M.Naville
2. ***"Building Materials"*** by S K Duggal
3. ***"Concrete Technology"*** by M.S.Shetty. - S.Chand& Co.

Reference Books:

1. ***"Engineering materials"*** by Rangwala
2. ***"Planning and Designing of residential building***" by YN Raja Rao, Y Subrahmanyam

CE-509: OPTIMIZATION METHODS IN ENGINEERING

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce the concept and methods of optimizations. At the end of the course, the students shall be able to use the different tool of optimization to practical problems.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Optimization problem formulation, optimization algorithms, applications and examples, different optimization methods available.	7
II	**Single Variable Optimization:** Optimization criteria, single variable optimization methods–exhaustive search method, Fibonacci search method, Golden search method, Newton Raphson method and Bisection method.	7
III	**Multi Objective Optimization:** Optimization criteria, different search methods─ unidirectional search method, direct search method, evolutionary optimization method, Powells conjugate direction method, Newton's method and variable metric method.	8
IV	**Specialized Methods:** Integer programming, geometric programming, simulated annealing, global optimization using steep descent method, simulated annealing.	8

Text Books:

1. Kalyanmoy Deb, ***"Optimization for Engineering design",*** Prentice Hall, India,.
2.

Reference Books:

1. Taha, ***"Operations Research",*** TMH.

CE-510: ENVIRONMENTAL IMPACT ASSESSMENT

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	0	2	40	60	100	3 hrs

COURSE OBJECTIVE:

The primary objective of the course is to familiarize the students with environmental impact analysis.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	Evolution of environmental impact assessment (EIA), EIA at project,regional and policy levels,strategic EIA, EIA process, screening and scoping criteria,rapid and comprehensive EIA,specialized areas - environmental health impact assessment and environmental risk analysis. Economic valuation methods and cost-benefit analysis.	**8**
II	Practical applications of EIA, EIA methodologies and baseline data collection.	**6**
III	Prediction and assessment of impacts on physical, biological and socio-economic environment. Environmental management plan, post project monitoring, EIA report and EIS, review process.	**6**
IV	Case studies on project, regional and sectoral EIA, legislative and environmental clearance procedures in India and other countries, siting criteria, CRZ, public participation, resettlement and rehabilitation.	**7**

Text Books:

1. B. M. Noble, ***"Introduction to Environmental Impact Assessment: A Guide to Principles and Practice",***. Oxford University Press, USA.
2. J. Glasson, ***"Introduction to Environmental Impact Assesment: Principles, and Procedures, Process, Practice and Prospects (The Natural and Built Environment Series)",***Routledge.

Reference Books:

1. P. Morris, ***"Methods of Environmental Impact Assessment (The Natural and Built Environment Series),"***Spon Press, USA.
2. R. K. Jain, L. V. Urban, G. S., Stacey, Harold, E. Balbach, ***"Environmental Assessment",*** McGraw-Hill Professional.
3. B. B. Marriott, ***"Environmental Impact Assessment: A Practical Guide",*** McGraw-Hill Professional.
4. D. P. Lawrence, ***"Environmental Impact Assessment: Practical Solutions to Recurrent Problems",*** Wiley-Interscience.

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CE- 511: TRANSPORTATION ENGINEERING LAB

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	20	30	50	2 hrs

Objectives

To conduct the major and minor tests on road aggregates and bitumen.

LIST OF EXPERIMENTS:

Practicals as per the topics in the syllabus for the course will be conducted in the laboratory. Following is the suggested list of practicals out of which a minimum of 7-8 experiments must be performed by a student during the semester:

1. Tests on Road Aggregates

a. Aggregate Crushing Value test
b. Los Angeles Abrasion test
c. Aggregate Impact test
d. Specific Gravity and Water absorption tests
e. Shape test (Elongation & Flakiness)
f. Stripping value of road aggregate

2. Tests on Bitumen

a. Penetration test
b. Softening point test
c. Specific gravity test
d. Viscosity test
e. Ductility test

3. **Field test:**

a. Traffic survey, Axle load survey and pavement condition survey.

Reference Books:

1. Khanna, S. K. and Justo, C. E. G., Highway Material Testing, Nem Chand Bros., Roorkee.
2. Relevant IS and IRS Codes

CE-512: ENVIRONMENTAL ENGINEERING LAB

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	20	30	50	2 hrs

Objectives

To conduct major tests on water and carry detailed analysis of water samples collected from field. After the course, the students shall be able to determine the quality of water samples.

LIST OF EXPERIMENTS:

Following is the suggested list of practicals out of which a minimum of 7 -8 experiments must be performed by a student during the semester:

To determine the following parameters for the given sample of water:-

1. color, pH and turbidity.
2. total Solids, Suspended Solids and Dissolved Solids.
3. concentration of Chlorides.
4. carbonate, bi-carbonate and hydroxide alkalinity.
5. hardness.
6. concentration of Fluorides.
7. concentration of Iron.
8. Optimum Alum Dose through Jar Test.
9. residual Chlorine.
10. chlorine Demand.
11. available Chlorine Percentage in a given sample of bleaching powder.
12. amount of Dissolved Oxygen (DO).
13. Biochemical Oxygen Demand (BOD) .
14. Chemical Oxygen Demand (COD).
15. Bacteriological quality of water: presumptive test, confirmative test and Determination of MPN.

Reference Books:

1. IS 10500 Indian Standards for drinking water.
2. IS 2490 Indian Standards for Industrial and sewage effluent discharge.

CE - 513: COMPUTER AIDED DESIGN PRACTICE LAB-I

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	2 hrs

Objectives

The objective of the course is to help students to acquire fundamental and working knowledge of STAAD.Pro, SAP and MATLAB so as to enable them perform computationally intensive tasks faster than with traditional programming languages such as C, C++, and FORTRAN. This course is also intended to explore the impact of these software packages in the industry and Academic.

List of Exercises:

Students shall complete the following exercise during the semester:

1. Concept of computer aided design and introduction of software packages used for analysis and design of structures including STAAD.Pro and SAP.
2. Model generation for a building, assigning material properties, loads, creating load combination, analysis and design of a double storied building frame using STAAD.Pro and check by any of analytical methods.
3. Introduction to MATLAB, MATLAB tool box and MATLAB functions.
4. Hands on Civil Engineering problems using MATLAB.

NOTE:

1. Students are supposed to document each exercise/tutorial.

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RECOMMENDED SOFTWARE PACKAGES:

The following packages or their equivalent are recommended for the above listed exercises:

AutoCAD, SAP, STAAD.Pro, MATLAB, Grapher/Sigmaplot, ANSYS, NISA.

SEMESTER-VI

CE-601: DESIGN OF CONCRETE STRUCTURES – II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

Note: ***Code of practice for Plain and Reinforced Concrete*** IS 456-2000 is permitted in the examination.

COURSE OBJECTIVE:

To introduce the design of concrete structures such as foundations, retaining walls, water retaining structures and basic philosophy of earthquake resistant design with reference to Indian standard code of practice.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Design of Footings:** Types of footings, safe bearing capacity of soil, depth of foundation, Indian standard code (IS: 456-2000) recommendations for footings – minimum cover, thickness at the edge of footing, bending moment, shear force, punching shear, tensile reinforcement, etc. Design of footings for walls, isolated columns, combined rectangular and trapezoidal footings.	9
II	**Design of Retaining Walls:** Types of retaining walls, stability of cantilever retaining walls. Design and detailing of cantilever and counter fort retaining walls with horizontal and sloping backfills.	8
II	**Design of Water Tank:** Classification of water tank, method of analysis, permissible stresses, codal provisions. Design of circular and rectangular under-ground water tanks using IS code method. Design of elevated water tank with Intze type of container, frame and shaft type of staging and foundation considering effect of earthquake and wind forces.	10

IV	**Introduction to Earthquake Resistant Design of Buildings:** Behavior of concrete and steel structures under earthquake loads, terminology used, general principles of earthquake resistant design - ductility, requirements and advantages of ductility, factors affecting ductility, design lateral forces, distribution of design forces along the height of building, seismic coefficient method. Detailing of reinforcement for ductility as per IS: 13920-1993 in beams, columns and beam-column connections; Special confining reinforcement.	**9**

Text Books:

1. A. K. Jain, ***"Reinforced Concrete-Limit State Design",***Nem Chand & Bros., Roorkee.
2. P.C. Varghese,***"Limit State Design of Reinforced Concrete",*** Prentice Hall of India Pvt. Ltd., New Delhi.
3. S. U. Pillai and DevdasMenon, ***"Reinforced Concrete Design",*** Tata McGraw Hill, New Delhi.

Reference Books:

1. Shah & Karve, ***"Limit State Theory & Design of Reinforced Concrete (I.S. 2000-456)" ,*** Structures Publications, Pune, 2014.
2. M. L. Gambhir, ***"Fundamentals of Reinforced Concrete Design",***Printice Hall of India, Pvt. Ltd., New Delhi.
3. N. Krishna Raju, "***Advanced Reinforced Concrete Design",*** CBS Publishers.
4. R. Karve and V. L. Shah, ***"Illustrated Design of Reinforced Concrete Buildings",*** Structures Publishers.
5. IS Codes (latest): IS: 456, IS: 875 (all parts), IS: 1893 (P - 1, 2), IS: 4326, IS: 13920, IS: 3370 (P - 1 to 4), SP: 16, SP: 34

CE-602: TRANSPORTATION ENGINEERING - II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce the elements related to railway engineering, airport engineering and intelligent transport systems.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction to Railway Engineering:** Role of railways in transportation system, railways and highways comparisons, classification of Indian railways, railway zones in India, railway gauges, creep, coning of wheels and traction resistance. **Permanent Ways:** Rail & rail joints (welding of rails, LWR, SWR, CWR), Sleepers, Ballast, Formation and its drainage, track fitting and fastening, Stresses in railway tracks.	7
II	**Geometric Design of Railway Tracks**: Alignment and grades, cross section and its elements (at filling & cutting), grade compensation, cant and cant deficiency, negative cant and widening of gauges on curves, curves used for railway track (horizontal and vertical curves), level crossing, points and crossing, stations and yards, signals and interlocking system. **Railway System in the Urban Area:** Surface railways, Elevated railways, Underground railway .	8

III	**Airport Overview:** Air transportation in India, classification of airports, airport terminology, outline of technical planning process, terminal area and building – terminal location, planning of terminal building, hangers and parking. **Runway Geometric:** Geometric design of runway & taxiway, visual aids – markings, lighting and signage, airport layout –runway orientation and runway length.	**9**
IV	**Runway Pavement Design:** Design of flexible and rigid pavement. **Intelligent Transport Systems (ITS):** Introduction, objectives, benefits, ITS tools - detectors, GPS, ITS Architecture, Components and Standards. ITS applications.	**6**

Text Books:

1. L.R. Kadiyali, ***"Traffic Engineering and Transportation Planning",*** Khanna Publishers
2. Saxena S.C. and Arora S. P., ***"A Course of Railway Engineering",*** DhanpatRai, New Delhi
3. Khanna and Arora, ***"Airport Planning & Design",*** Nemchand Bros, Roorkee

Reference Books:

1. Satish Chandra and Agarwal, M.M (2007) ***"Railway Engineering",***Oxford Higher Education, University Press New Delhi.
2. Agarwal, M. M. (1991). ***Indian Railway Track***, Sachdeva Press, New Delhi.
3. Horonjeff&Mcklerey, ***Planning & Design of Airport***
4. Rao G.V., ***Airport Engineering,*** Tata McGraw Hill.
5. http://www.abc.net.au/news/stories/2007/06/28/1964129.htm

CE-603: ENVIRONMENTAL ENGINEERING - II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce the importance and methods of sewage treatment and solid waste management with special attention to design and applications.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Wastewater and Wastewater Characteristics:** Wastewater composition,Physical Chemical and Biological characteristics of wastewater,significance of BOD, COD, BOD, estimations of wastewater and storm water. **Wastewater Collection and Conveyance:** Separate and combined systems, patterns of sewage collection systems.Types and shapes of sewers, sewer materials, hydraulics of flow in sewers.	6
II	**Primary Treatment of Sewage:** Anaerobic Processes- anaerobic digester, UASB reactor, septic tanks, Imhoff tank, sludge handling, disposal of effluent and sludge. **Secondary Treatment of Sewage:** Biological wastewater treatment systems - aerobic processes, activated sludge process and its modifications, trickling filter, RBC,Oxidation Ponds and Aerated lagoons.	7
III	**Design and Construction of Sewers:** Design of severs - design period, design flow for separate, storm and combined sewers, full flow and partial flow conditions, design of separate sewers using Manning's formula. Sever cconstruction: shoring, trenching, laying to grade, jointing and testing of sewers. **Sewer Appurtenances:** Plumbing system for buildings, One pipe and two pipe systems, sanitary fittings and appliances -traps, anti-syphonage, inspection chambers,	7

	intercepting traps, manhole, street inlets, storm water overflows, inverted siphons.	
IV	**Wastewater Disposal:** Wastewater disposal standards, methods of disposal, dilution, self-purification of surface water bodies (Streeter Phelp's equation, Oxygen sag curve), land disposal, sewage farming, deep well injection, soil dispersion systems. **Introduction to Solid Waste Management:** Generation, onsite storage, collection, separation, processing and disposal.	**7**

Text Books:

1. M. J. Hammer, "***Water and Wastewater Technology"***, Prentice Hall.
2. S. K. Garg, "**Sewage Disposal & Air Pollution"**, Khanna Publishers, New Delhi.
3. M. N. Rao& H. V.N.Rao, "**Air Pollution",** McGraw Hill Publication.

Reference Book:

1. Duggal . K.N., "**Elements of Environmental Engineering"**, S. Chand & Com. Ltd., New Delhi.
2. Metcalf & Eddy Inc., George Tchobanoglous, Franklin, L., Burton, H. D. Stensel, "***Wastewater Engineering: Treatment and Reuse".***
3. T. J. McGhee, E. W. Steel, "***Water Supply and Sewerage"***, McGraw-Hill College.
4. ***"Manual on Sewerage & Sewage Treatment"***, CPHEEO, Ministry of Urban Development, Government of India, New Delhi.

CE- 604: HYDROLOGY AND WATER RESOURCES ENGG.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce hydrological and meteorological processes namely precipitation, evaporation, infiltration, and runoff.

COURSE CONTENT:

UNIT	CONTENT	No. of Hrs.
I	**Introduction:** Hydrologic cycle, climate and water availability, water balances. **Precipitation and Evaporation:** Precipitation– forms, classification, variability, measurement, data analysis, evaporation and its measurement, evapotranspiration and its measurement, Penman Monteith method.	9
II	**Infiltration:** Factors affecting infiltration, estimation- Horton's equation and Green Ampt method, infiltration Indices. **Hyetograph and Hydrograph Analysis:** Runoff – drainage basin characteristics, hyetograph and hydrograph concepts, assumptions and limitations of unit hydrograph, derivation of unit hydrograph, S-hydrograph, flow duration curve.	8
III	**Reservoirs:** Types or reservoir,site selection, geological investigations, zones of storage, safe yield, reservoir capacity, reservoir sedimentation and control. **Hydrologic Analysis:** Design flood, flood estimation, frequency analysis, flood routing through reservoirs and open channels.	8
IV	**Ground Water Hydrology:** Zones of underground water, aquifers, aquifer parameters – porosity, specific yield, permeability, transmissibility and storage coefficient. Darcy's law, determination of discharge through unconfined and confined aquifers with steady flow	9

	conditions, Well hydraulics, types of wells, well construction and well development. **Drought Management and Water Harvesting:** Definition of drought, causes, measures for water conservation and augmentation, drought contingency planning, water harvesting – rainwater collection, small dams, runoff enhancement, runoff collection, ponds, tanks.	

Text Books:

1. K. Subramanya, **"*Engineering Hydrology",*** Tata McGraw Hill Pub. Co. New Delhi.
2. R.K.Sharmaand, T.K.Sharma,**"*Hydrology and Water Resources Engineering",*** Dhanpat Rai Publications,NewDelhi.

Reference Books:

1. K.G. Rangaraju, ***"Flow in Open Channels",*** Tata McGraw Hill Pub. Co. Ltd., New Delhi.
2. Rajesh Srivastava, ***"Flow through Open Channel",*** Oxford Publication.
3. V.T. Chow, ***"Applied Hydrology*** McGraw Hill International, New York.
4. D.K. Todd, "***Groundwater Hydrology"***, John Wiley and Sons.

CE- 605: ENGINEERING GEOLOGY AND ROCK MECHANICS

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce hydrological and meteorological processes namely precipitation, evaporation, infiltration, and runoff.

COURSE CONTENT:

Content:

UNIT	CONTENT	No. of Hrs.
I	**General Geology:** Importance of Engg. Geology applied to Civil Engineering Practices.Weathering - definition, types and effect. Geological works of rivers, wind, glaciers asagents of erosion, transportation and deposition. **Rocks & Minerals:** Minerals, their identification, igneous, sedimentary &metamorphic rocks.	7
II	**Structural Geology:** Brief idea about stratification, apparent dip, true dip, strike and in-conformities. Folds, faults & joints - definition, classification with regard to civil engineering. **Engineering Geology:** Geological considerations for projects like tunnels, highways, foundation, dams, and reservoirs.	7
III	**Rock Mechanics:** Need of rock mechanics, application areas of rock mechanics in civil engineering, classification of rock and rock masses, empirical methods of tunnel design. **Engineering Properties of Rocks and Laboratory Measurement:** Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen, rate of testing; Confining pressure, stress strain curves of typical rocks; failure theories, shear strength of intact and fissured rocks, effect of anisotropy, effect of saturation and temperature.	9

IV	**In-situ Determination of Engg. Properties of Rock masses:** Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test; Simple methods of determining in situ stresses, bore hole test. **Improvement in properties of Rock Masses:** Grouting for dams, caverns and tunnels. Rock reinforcement and rock bolting.	**7**

Text Books:

1. Parbin Singh, **"Engineering and General Geology",** 8th Edition, S K Kataria& Sons.
2. Chennkesavulu, n., ***"Engineering Geology",*** Mac-Millan, Publishers,India Ltd.

Reference Books:

1. Kesavvalu,***"Text Book of Engineering Geology"***, MacMillan India.
2. Harvey, J. C.,***"Geology for Geotechnical Engineers",*** Cambridge University Press.
3. Varghese,P. C.,***"Engineering Geology for Civil Engineering",*** PHI Learning & private Limited.
4. Krynine& Judd, "***principles of Engineering Geology &Geotechnics",*** CBS Publishers & Distribution.
5. Bell, F.G.,"***Fundamental of Engineering Geology Butterworths",*** Publications, New Delhi.
6. Gangopadhyay, S.,***"Engineering Geology",*** Oxford University press.

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CE- 606: CONCRETE TECHNOLOGY

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce hydrological and meteorological processes namely precipitation, evaporation, infiltration, and runoff.

COURSE CONTENT:

Content:

UNIT	CONTENT	No. of Hrs.
I	**Grades of Concrete:** Concrete for ordinary work, light weight concrete, high density concrete, workability, durability and strength requirements, effect of w/c ratio, acceptability criteria, laboratory testing of fresh and hardened concrete. **Concrete Mix Design:** Mix design for compressive strength by I.S. methods.	7
II	**High Performance Concrete:** Constituents of high grade concrete, various tests and application of high performance concrete. **Admixtures:** Plasticizers, retarders, accelerators and other admixtures, test on admixtures, chemistry and compatibility with concrete.	6
III	**Ready Mix Concrete:** Requirements of ready mix concrete, transit mixer details, mix design of RMC. **Concrete for Repairs and Rehabilitation of Structures**: Polymer concrete, fiber reinforced concrete, polymer impregnated concrete, polymer modified cement concrete and Ferro cement, different tests.	6
IV	**Non-Destructive Testing of Concrete:** Hammer test, ultrasonic pulse velocity test, load test, carbonation test, half cellpotentio-meter, corrosion of steel, core test and relevant provision of I.S. codes.	5

Text Books:

1. ***Concrete technology, theory and practice"***, M.S. Shetty

Reference Books:

1. ***Properties of concrete***, Neville, El, Society & Pub.
2. Relevant I.S. codes.
3. Special Publication of ACI on Polymer concrete and FRC.
4. Proceedings of International Conferences on Polymer Concrete and FRC.

CE - 608: REMOTE SENSING AND APPLICATIONS OF GIS

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To introduce the students to the basic concepts, principles of remote sensing, digital image processing, data types and the applications of remote sensing and GIS in various fields of civil engineering.

COURSE CONTENT:

UNIT	Content	No of hrs.
I	**Basic Concepts of Remote Sensing**: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. Spectral properties of water bodies, introduction to digital data analysis.	7
II	**Geographic Information System:** Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, theoretical framework for GIS. **Raster GIS, Vector GIS:** File management, spatial data – layer based GIS and feature based GIS mapping. Introduction to Arc-GIS.	7
III	**GIS Spatial Analysis:** Computational analysis methods (CAM), visual analysis methods (VAM), data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.	6
IV	**Applications of GIS in Civil Engineering:** Application areas of GIS in Water resources, Transportation, Construction, Environment and Surveying, Land use/land cover in water resources.	8

Text Books:

1. Narayana, L.R.A., "***Remote Sensing and its applications"*** University Press.
2. Anji Reddy, M. ***"Textbook of Remote Sensing and Geographical Information System"***, BS Publications, Hyderabad.
3. Burrough P.A. and Rachel A. McDonell, "***Principles of Geographical Information Systems",*** Oxford Publication.

Reference Books:

1. C.P.Lo and Albert, K.W. ***"Yonng, Concepts & Techniques of GIS***, Prentice Hall (India) Publications.
2. M.Anji Reddy,"***Remote Sensing and Geographical Information Systems"***, B.S.Publications.
3. KangTsungChang, "***Geographical Information Systems"***, TMH Publications & Co.
4. S.Kumar, ***"Basics of Remote sensing & GIS",***Laxmi Publications.

CE - 609: HYDRAULIC MACHINES

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

The objective of this course is to get exposure about the working principles, components, and functions of pumps and turbines.

COURSE CONTENT:

UNIT	Content	No of hrs.
I	**Impact of Jet on Vanes:** Impulse-momentum equation and its applications – Force exerted by a jet on stationary and moving flat, inclined and curved vanes –Force exerted by a jet on a series of curved vanes – Velocity triangles and expressions for work done – Problems.	8
II	**Centrifugal Pumps:** Classification of pumps – centrifugal, reciprocating submersible, rotary and vacuum pumps. Centrifugal Pumps: construction, working, and applications, performance – Characteristics, priming, work done and efficiencies. Reciprocating pump: component and working, discharge, work done, slip, indicator diagram, effect of acceleration and friction.	8
III	**Turbines:** Classification – Pelton, Francis and Kaplan turbines. Components, velocity triangles, work done & efficiency, specific speed, performance characteristics, selection of turbines, draft tube and governing of turbines.	8
IV	**Deep well pumps**: submersible, jet and airlift pumps, general principle of working(Numerical examples based only on velocity triangle are expected in the case of pumps and turbines).	**7**

Text Books:

1. Modi, P.N. and Seth, S.M, ***"Hydraulics and Fluid Mechanics",*** Standard Book House.

2. Bansal, R. K., ***"Fluid Mechanics and Hydraulic Machines",***Laxmi Publications.

Reference Books:

1. Rajput, R.K, ***"Fluid Mechanics and Hydraulic Machines",*** S.Chand and Company Ltd.

CE - 610: ENERGY EFFICIENT BUILDINGS

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

The objective of this course is to get exposure about the design and construction of energy efficient buildings.

COURSE CONTENT:

UNIT	Content	No of hrs.
I	**Introduction:** Fundamentals of energy, Energy Production Systems, Heating, Ventilating and Air Conditioning, Solar Energy and Conservation, Energy Economic Analysis, Energy conservation and audits, Energy use in Residential & Commercial buildings. **Environment:** Energy and Resource conservation - Design of green buildings, Evaluation tools for building energy, Embodied and operating energy, Peak demand, Comfort and Indoor air quality, Visual and acoustical quality, Airborne emissions and waste management.	8
II	**Design:** Natural building design consideration, Energy efficient design strategies, Contextual factors, Longevity and process Assessment -Renewable energy sources and design. Introduction to Sunpath Diagrams and Trombe wall. **Advanced building Technologies:** Smart buildings, Economies and cost analysis. **Services:** Energy in building design, Energy efficient and environment friendly building, Thermal phenomena, thermal comfort, Indoor Air quality, Climate, sun and Solar radiations.	8

III	**Energy Audit:** Types of energy audit, analysis of results, energy flow diagram, energy consumption/ unit production and identification of wastage. Priority of conservative measures - maintenance of management programme.	6
IV	**Energy Management:** Energy management of electrical equipment, Improvement of power factor, management of maximum demand, Energy savings in pumps,Fans - Compressed air systems, Energy savings in Lighting systems,Air conditioning systems - Applications.	7

Text Books

1. Moore, F., "***Environmental Control System",*** McGraw Hill, Inc.
2. Brown, G. Z., Sun, "***Wind and Light: Architectural design strategies"***, John Wiley.

References

1. Cook, J, Award "***Winning passive Solar Design"***, McGraw Hill.

CE- 611: ENGINEERING GEOLOGY AND ROCK MECHANICS LAB

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	2 hrs

COURSE OBJECTIVE:

To introduce students to different types of rocks and to find out the characteristics, suitability and engineering properties of various types of rocks. At the end of the course, the students will be able to conduct the various tests on the given specimen of the rock.

COURSE CONTENT:

Following is the suggested list of practicals out of which a minimum of 6 to 7 experiments must be performed by a student during the semester:

LIST OF EXPERIMENTS:

To conduct following tests on the given rock specimens:-

1. Void index test
2. Permeability test.
3. Uniaxial compressive strength test.
4. Point load test.
5. Brazilian Tensile strength test
6. Bending test.
7. Slake durability test.
8. Shear strength test.
9. Punching shear test.
10. Shear testing for discontinuities.
11. Rock toughness measurement.
12. Rock bolt pull out test.

CE - 612: CONCRETE TECHNOLOGY LAB

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	2	1	30	20	50	2 hrs

OBJECTIVE:

To expose students to different properties and uses of concrete in different situations. The students will learn the different testing techniques for concrete.

List of Exercises:

The students shall conduct 7-8 experiments during the semester. The list of experiments is suggested below:

1. Effect of w/c ratio on workability (slump cone, compaction factor, V-B test, flow table)
2. Effect of w/c ratio on strength of concrete.
3. Indirect tensile test on concrete.
4. Study of admixtures & their effect on workability and strength of concrete.
5. Modulus of rupture of concrete.
6. Permeability test on concrete.
7. Tests on polymer modified mortar / concrete.
8. Tests on fiber-reinforced concrete.
9. Flexure test on beam (central point load and two point load) (plotting of load deflection curve and finding value of E)
10. Non-destructive testing of concrete – some applications (hammer, ultrasonic).

CE 613: SEMINAR

Evaluation Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Evaluation
L	T	P/D	C	Sessional	End Semester Evaluation/ Viva	Total	
0	0	2	1	50	50	100	-

OBJECTIVE:

To measure as well as flourish the ability of the student to study a topic, in Civil Engineering, of current relevance, from technical literature and present a seminar on that topic.

PROCEDURE:

Individual students should be asked to choose a topic in any field of civil engineering, preferably from outside the B.Tech syllabus and give a seminar on that topic for about thirty minutes. It enables the students to gain knowledge in any of the technically relevant current topics and acquire the confidence in presenting the topic. The student will undertake a detailed study on the chosen topic under the supervision of a faculty member, by referring papers published in reputed journals and conferences. Each student has to submit a seminar report (in two copies), based on these papers; the report must not be reproduction of any original paper. A committee consisting of three/four faculty members (preferably specialized in various sub-fields of Civil Engineering) will evaluate the seminar. One of the two copies submitted by the student should be returned to him/her after duly certifying it by the staff in charge of the seminar and Head of the department and the other copy shall be kept in the departmental library.

Internal Continuous Assessment
As per ordinance

SEMESTER-VII

CE-701: LIMIT STATE DESIGN OF METAL STRUCTURES

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	2	0	4	40	60	100	3 hrs

Note: Code of practice for Plain and Reinforced Concrete IS 800-2007is permitted in the examination.

COURSE OBJECTIVE:

To introduce the students to limit state design of structural steel systems such as tension and compression members, beams, roof trusses, gantry girders as per provisions of current code (IS 800 – 2007) of practice.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Introduction:** Properties of structural steel, Indian standard specifications and sections, factor of safety, permissible and working stresses, Design philosophy - elastic and plastic methods - Introduction to Limit States Design (LSD). **Connections:** Bolted connections - bearing type and friction grip bolts. Welded connections, hanger connections, eccentrically loaded connections and splice connections. Design of bolted and welded connections.	**9**
II	**Tension Members:** Type of sections, net area, net effective sections for Angles and Tee in tension, design of tension members subjected axial loads and bending, use of lug angles. **Compression Members:** Modes of failure of a column, buckling failure, buckling strength of ideal columns, Euler's theory - effective length, slenderness ratio, design formula, I.S. Code formula. Design of single rolled steel section columns and built-up columns subjected to axial load, laced and battened columns.	**9**

III	**Flexural Members:** Behaviour of steel beams, limit state design of steel beams, web buckling and crippling, lateral torsion behavior of unrestrained beams, design approach for unrestrained beams, unsymmetrical sections and bi-axial bending, Built-up sections, shear behavior of transversely stiffened plate girder webs, provision of moment and shear capacity for plate girders and design of stiffeners. **Column Bases:** Introduction, slab base, gusseted base, column base subjected to moment, grillage foundation.	**9**
IV	**Tubular Structures:** Permissible stresses, tube columns and compression members, tube tension members, tubular roof trusses, joints in tubular trusses, tubular beams and purlins. **Aluminium Structures:** Permissible stresses, tension members, compression members, local buckling of compression members, design of beams and connections	**8**

Text Books:

1. Subramanian, N., ***"Design of Steel Structures",*** Oxford University Press, New Delhi.
2. Gambhir, M.L., ***"Fundamentals of Structural Steel Design",*** McGraw Hill Education India Pvt. Ltd.
3. Shiyekar, M.R., ***"Limit State Design in Structural Steel",*** Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition.

Reference Books:

1. Narayanan.R.et.al. ***"Teaching Resource on Structural Steel Design",*** INSDAG, Ministry of Steel Publications.
2. Duggal, S.K, ***"Limit State Design of Steel Structures",*** Tata McGraw Hill Publishing Company.
3. Bhavikatti, S.S., ***"Design of Steel Structures",*** By Limit State Method as per IS:800–2007, IK International Publishing House Pvt. Ltd.
4. Shah, V.L. and Veena Gore, ***"Limit State Design of Steel Structures",*** IS 800–2007 Structures Publications.
5. IS: 800-2007, General Construction in Steel – Code of Practice, Bureau of Indian Standards, New Delhi.

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CE-702: QUANTITY SURVEYING AND VALUATION

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	2	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

This subject covers the various aspects of estimating of quantities of items of works involved in buildings, roads, water supply and sanitary. It also covers the rate analysis, valuation of properties and preparation of reports and tender documents. At the end, the student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare a tender document. The student shall also be able to prepare value estimates.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Estimation of Quantities:** Types of estimates, methods of computing the quantities: centreline method, long wall and short wall method. Detailed estimate of compound wall, two room building up to plinth, single storey and two-storey (G+1) residential building with flat and pitched roof. Detailed estimate of RCC beam, slab and column with footing. Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc. Estimation of sanitary and water supply installations: septic tank, soak pit, water supply pipe line, sewer line, tube well, open well etc. Estimation of bituminous and cement concrete roads, retaining walls and culverts.	**9**
II	**Analysis of Rates:** Definitions, importance, purpose & factors affecting the rate analysis. Analysis of rates for earth work, mortars, brick masonry, stone masonry, cement concrete, cement mortar, plastering, different types of flooring, floor finish, color washing, distemper, varnish, painting, items for sanitary work, wood work. Analysis of rates for road works**:** bituminous painting, premix carpet, bituminous macadam, laying and consolidation of stone etc. Rate analysis of the special items such as carving works, Anti-termite treatment, etc. Study of schedule of rates (CWPD) and use of Computer Software.	6

III	**Specifications and Tenders:** Definition, purpose & importance of specifications, types of specifications, design and drafting of specifications. Specification writing for some useful items viz. Brick masonry, Excavation, Concrete, etc. Tenders, contracts and types of contract.	**5**
IV	**Valuation:** Definition of terms – cost, price, value, real estate, personal estate, mortgage, freehold property, lease-hold property, property income, gross income, net income, depreciation, obsolescence and escalation. **Types of values:** market value, book value, distress value, monopoly value, scraps value, salvage value, replacement value, speculative value. **Depreciation:** methods of calculating depreciation-Straight Line Method, Declining Balance Method, Sinking Fund Method, Quantity Survey Method. Valuation of real properties: Rental Method and Profit and Loss Method. Valuation of landed properties: Belting Method and Development Method. Rent Calculation: Types of rent, Procedure of fixing standard rent. Valuation table and their use.	**7**

Text Books:

1. Dutta, B.N., ***"Estimating and Costing in Civil Engineering",*** UBS Publishers & Distributors Pvt. Ltd..
2. Chakraborti, M,***"Estimating Costing",*** Specification and Valuation in Civil Engineering.

Reference:

1. Birdie, G.S., **"*A Text Book on Estimating and Costing*",**DhanpatRai and Sons, New Delhi.
2. Kohli, D.D and Kohli, R.C., **"A Text Book of Estimating and Costing (Civil)",** S.Chand & Company Ltd.
3. Rangwala, S.C.,**"*Elements of Estimating and Costing*",**Charotar Publishing House, Anand.
4. Rangwala, S.C, **"*Valuation of Real Properties*",**Charotar Publishing House,Anand.

CE-703: IRRIGATION AND DESIGN OF HYDRAULIC STRUCTURES

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	1	0	4	40	60	100	3 hrs

COURSE OBJECTIVE:

The purpose of this course is to learn about the irrigation engineering aspects andto obtain knowledge about operation and management of irrigation water.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Irrigation:** Irrigation, need, advantages and disadvantages and sources of irrigation. Irrigation methods, surface and subsurface method, pressurized irrigation, drip, sprinkler and lift irrigation.	9
II	**Soil-Water Relationship:** Field capacity, permanent wilting point, evapotranspiration and consumptive use, measurements, crop and cropping seasons, assessment of crop water requirement, net irrigation requirement, duty and delta relationship.	8
III	**Storage Head Works:** Types of dams, gravity dam - selection of site, forces acting on dams, drainage gallery, joints in dams, elementary profile, limiting height of gravity dam, high and low dam, practical profile of a high gravity dam, design methods and design by gravity analysis only; arch dam, design methods, design by cylinder theory only; spillways and their types.	9
IV	**Diversion Head Works:** Components, layout, design of surface and subsurface weirs and canal head regulator. **Canal Falls:** Types of canal falls, Design of Sarda type and glacis falls.	6

Text books:

1. Asawa, ***"Irrigation Engineering",*** Wiley Eastern Publication
2. Sathyanarayana Murthy, ***"Water Resources Engineering",*** Wiley Eastern
3. S. K Garg, ***"Irrigation Engineering and Hydraulics",***Khanna Publishers

Reference books:

1. Varshney R.S., ***"Theory & Design of Irrig. Structures",***Nem Chand
2. Punmia B.C., ***"Irrigation & Waterpower Engg.",***Laxmi Publications

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CE-704: CONSTRUCTION ENGINEERING AND MANAGEMENT

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
2	0	2	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To make the students familiar with the various facets of construction, planning and scheduling of projects, resource and material management, construction procedures and professional ethics.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Construction Procedures**: Different methods of construction, types of contract, tenders, pre-qualification procedure, earnest money, security deposit, contract document, general and important conditions of contract, measurement and measurement book. **Inspection and Quality Control:** Construction quality, inspection, quality control and quality assurance, total quality management. **Construction Cost and Budget:** Construction cost, classification of construction cost, unit rate costing of resources. Budget – Types of budget, project master budget.	9
II	**Construction Methods and Equipment**: Brief study of equipment required for earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting. Investment and operating costs and output of various equipment. **Construction disputes and settlement**: Types of dispute, modes of settlement of disputes, arbitration, arbitrator, advantages and disadvantages of arbitration, and arbitration award.	8
III	**Construction Planning and Management**: Network Techniques–bar charts, use of CPM and PERT for planning, drawing network diagrams, time estimates, slack, critical path, crashing and time-cost trade off, resource smoothing, resources levelling, construction, equipment, material and labour schedules. Preparation of job layout. **Management techniques:** CPM cost model, resource allocation and histograms. Project	9

	Management Software.	
IV	**Concept of Materials Management:** Inventory, inventory control, economic order quantity-safety stock, ABC analysis. **Safety in Construction:** Safety measures in different stages of construction, implementation of safety programme. **Project Management Information System**: PMIS concept, information system computerization, benefits of computerized information system.	**9**

Text Books:

1. L.S.Srinath – PERT and CPM ***"Principles and Applications",*** Affiliated East-West Press
2. Peurifoy and Schexnayder,***"Construction Planning, Equipment, and Methods",*** Tata McGraw Hill
3. S.Seetharaman, ***"Construction engineering and management" ,***Umesh publications.

Reference Books:

1. Shrivastava, ***"Construction Planning and Management",***Galgotia Publications
2. Gahlot and Dhir, ***"Construction Planning and Management",*** New Age International
3. K.K. Chitkara, ***"Construction project management",*** Tata McGraw Hill
4. P.P. Dharwadkar, ***"Management in Construction Industry",*** Oxford and IBH
5. V.N.Vazirani and S.P.Chandola, ***"Heavy Construction",***
6. Patil B.S., ***"Civil Engineering Contracts and Estimates",*** 3rd Edition, University Press.

CE-708: MUNICIPAL SOLID WASTE MANAGEMENT

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

Note: Code of practice for Plain and Reinforced Concrete IS 800-2007is permitted in the examination.

COURSE OBJECTIVE:

To learn the fundamental concepts of handling municipal solid waste generated around the globe.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Sources and types of municipal solid wastes:** Sources and types of solid wastes, factors affecting generation of solid wastes, characteristics, methods of sampling and characterization effects of improper disposal of solid wastes, public health effects, principle of solid waste management, social & economic aspects, public awareness, role ofNGOs.	7
II	**On-site Storage & Processing:** On-site storage methods, materials used for containers, on-site segregation of solid wastes,public health & economic aspects of storage. Processing techniques and equipment, resource recovery from solid wastes, composting, incineration, pyrolysis, options under Indian conditions.	8
III	**Collection and Transfer:** Methods of Collection, types of vehicle, manpower requirement, collection routes, transfer stations, selection of location, operation & maintenance, options under Indian conditions.	**7**
IV	**Disposal of Solid Waste:** Dumping of solid waste, MSW landfills, site selection, design and operation of MSW landfills, Leachate and gas collection/ treatment facility. Environmental monitoring during lad filling, closer and post closer plans.	**7**

Text Books:

1. George Tchobanoglouset.al., **"*Integrated Solid Waste Management*",** McGraw-Hill Publishers.

Reference Books:

1. Bilitewski .B, HardHe .G, Marek .K, Weissbach.A, and Boeddicker .H, **"*Waste Management*",** Springer.
2. Manual on Municipal Solid Waste Management, **"*CPHEEO",*** Ministry of Urban Development, Government of India, New Delhi.
3. Landreth .R.E and Rebers, P.A, **"Municipal Solid Wastes – problems and Solutions",** Lewis Publishers.
4. Bhide .A.D. and Sundaresan .B.B, **"Solid Waste Management in Developing Countries",** INSDOC.

CE-709: BRIDGE ENGINEERING

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To learn the basic fundamentals of bridge engineering with special emphasis on concrete and steel bridges.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Investigation of Bridges:** Definition, classifications, selection of bridge site, preliminary data to be collected, design discharge and its determination, linear waterway, economical span, vertical clearance above HFL, scour depth and choice of bridge type. **Standard Specifications:** Road bridges, I.R.C. loadings, code provisions for carriageway width, clearances, loads considered, etc. Standard specifications for railway bridges, railway bridge code.R.C.C. culvert.	8
II	**Reinforced Concrete Bridges:** T-beam bridge, Courbon's theory for load distribution, balanced cantilever bridges, pre-stressed concrete bridges, (General discussions).	7
III	**Steel Bridges:** Introduction to suspension bridges, cantilever bridges, cable stayed bridges,general arrangement of single-track broad-gauge railway bridge with open floor, design of stringers, cross girders, main trusses, top and bottom lateral bracing, complete design of through type truss bridge. **Sub Structure:** Types of piers and abutments, design forces, design of piers and abutments.	8
IV	**Bearing and Joints:** Various types of expansion bearing and fixed bearings, elastomeric bearings, joints and their types, design of bearings, inspection and maintenance of bridges.	7

Text Books:

1. Johnson Victor, D,***"Elements of Bridge Engineering",*** Oxford and IBH Publishing Co., Ltd.
2. Rishnaraju, N,***"Design of Bridges"***, Oxford and IBH Publishing Co., Ltd.
3. PonnuSwamy, ***"Bridge Engineering",***McGraw-Hill Publication.

References:

1. Raina, V. K. **"Analysis, Design and Construction of Bridges**", Tata McGraw-Hill Publication.
2. Vazirani, Ratvani&Aswani, "***Design of Concrete Bridges***", Khanna Publishers.
3. Jagadish T.R. & M.A. Jayaram, "***Design of Bridge Structures",***Prentice Hall India Pvt., Ltd.
4. Swami Saran, "***Analysis and Design of sub-structures***", Oxford IBH Publishing co ltd.

CE-710: FINITE ELEMENT METHOD

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

The course aims at introducing the fundamental principles of the modeling structures for statics and dynamics analyses. In the second half of the module the student's will be taught how to use the finite element method in practice and to critically assess and evaluate the results of analysis. The module aims to provide an introduction to this important stress analysis technique, and by way of case studies shows how it may be used to design components.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Introduction to Finite Element Analysis:** Introduction, basic concepts of Finite Element Method, introduction to elasticity, steps in Finite Element Analysis. **Finite Element Formulation Techniques:** Virtual work and variational principle, Raleigh-Ritz method, Galerkin method, stiffness matrix and boundary conditions.	**8**
II	**Element Properties:** Natural coordinates, triangular elements, rectangular elements, Lagrange and Serendipity elements, solid elements, isoparametric formulation, stiffness matrix of isoparametric elements, numerical integration, worked out examples.	**9**
III	**Analysis of Frame Structures:** Stiffness of truss members, analysis of truss, stiffness of beam elements, Finite Element Analysis of continuous beam, plane frame analysis, analysis of grid and space frame.	**6**
IV	**FEM for Two and Three Dimensional Solids:** Constant strain triangle, linear strain triangle, rectangular elements, numerical evaluation of element stiffness, computation of stresses, ax symmetric element, Finite Element formulation using ax symmetric element, Finite Element formulation for 3-dimensional elements, worked out examples.	**8**

Text Books:

1. T. R. Chandrupatla and A. D. Belegundu, ***"Introduction to Finite Elements in Engineering",***2nd Edition, Prentice Hall, New Jersey.
2. J. N. Reddy, ***"An Introduction to the Finite Element Method",*** 2nd Edition, McGraw Hill, Inc., New York.
3. O. C. Zienkiewicz and Y. K. Cheung, ***"The Finite Element Method in Structural and Soild Mechanics",*** McGraw Hill, London.
4. W. Weaver Jr. and J. M. Gere, ***"Matrix Analysis of Framed Structure",*** CBS Publishers & Distributors, New Delhi, India.

Reference Books:

1. D. Maity, ***"Computer Analysis of Framed Structures",*** I. K. International Pvt. Ltd. New Delhi
2. Erik G. Thompson, ***"Introduction to the Finite Element Method: Theory, Programming and Applications",*** John Wiley
3. H. C. Martin and G. F. Carey, ***"Introduction to Finite Element Analysis - Theory and Application",***NewYork, McGraw-Hill
4. K. H. Huebner, D. L. Dewhirst, D. E. Smith and T. G. Byron, ***"The Finite Element Method for Engineers",*** John Wiley & Sons Inc., New York.
5. K. J. Bathe, ***"Finite Element Procedures",*** Prentice-Hall of India, New Delhi, India
6. R. D. Cook, ***"Concepts and Applications of Finite Element Analysis",*** Wiley.

CE -711: PROJECT WORK - I

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	4	2	50	50	100	-

COURSE OBJECTIVE:

To expose students to simulate real life situations related to civil engineering and carry out a design project in one of the specializations of civil engineering with substantial multidisciplinary component.

PROCEDURE:

1. Students should be exposed to different Civil Engineering construction worls such as R. C. C. Structures, Steel Structures, Bridges, culverts, Hydraulic Structures, water tanks, Roadwork, Railways, Water supply and Sanitary works, Geotechnical Exploration, Maintenance and Rehabilitation works, Irrigation systems, Formwork, Reconnaissance and Detailed Surveying &levelling etc. At least two visit to sites are expected.

2. The students will carry out a project in one of the following civil engineering areas but with substantial multidisciplinary component involving Architecture, Mechanical engg. Electrical engg., Biotechnology, Chemical engg., Computer science:
   - Structural Engineering
   - Geotechnical Engineering
   - Water Resources Engineering and environmental engg.
   - Geomatics Engineering and surveying
   - Construction management
   - Transportation engineering

3. Student groups will be formed (4- 6 in a group) and a faculty member will be allocated to guide them. There will be three reviews in the semester. First review will not carry any marks but the project topic will be finalized in it. Of remaining 2 reviews one will be carried out in the mid-semester and the last one by the end of semester.

CE - 712: INDUSTRIAL PRACTICAL TRAINING

(Training to be undergone after VI semester)

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
0	0	0	2	50	50	100	-

COURSE OBJECTIVE:

To expose students to simulate real life situations related to civil engineering in different organizations.

TRAINING REPORT:

1. Each student shall maintain a log book of activities of the training. It should have entries related to the work done, problems faced, solution evolved etc.
2. Each student shall submit the final report signed by the training supervisor/head for the evaluation. The student is expected to prepare the report in the prescribed format based on the training undergone, experience gained and relevance.
3. Each student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made.

CE - 713: COMPUTER AIDED DESIGN PRACTICE LAB-II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	3	2	30	20	50	2 hrs

COURSE OBJECTIVE:

The objective of the course is to help students to acquire fundamental and working knowledge of popular civil engineering software's so as to enable them perform computationally intensive tasks faster than with traditional programming languages such as C,C++, and FORTRAN.

1. **Transportation Engineering**: Modeling, analysis and design of rigid and flexible pavements, Rail Infrastructure Design and Optimization using software MAX ROAD, Power Rail Track, etc.
2. **Environmental Engineering**: Modeling, analysis and design of water distribution system and sanitary sewers using WATER CAD /SEWER CAD /WATER GEM/SEWER GEM.
3. **GIS:** Working on Latest Version of GIS software (ArcGIS Pro/ENVI/Gypsy)
4. **Project Management**: Working on Project Management software such as Primavera/ MS Project.

NOTE:

1. Students are supposed to document each exercise/tutorial.

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Recommended software packages:

The following packages or their equivalent are recommended for the above listed exercises:

AutoCAD, Grapher/Sigmaplot, MAX Road, Power Rail Track. Water CAD, Sewer CAD, WaterGEM, SewerGEM, ArcGIS Pro, ENVI, Gyps, Primavera/MS.

CE 808: PROJECT WORK - II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
0	0	16	8	50	50	100	3 hrs

COURSE OBJECTIVE:

To simulate real life situations related to civil engineering and impart adequate training so that confidence to face and tackle any problem in the field is developed in the college itself.

PROCEDURE:

1. The project work started in the seventh semester will continue in this semester. The students should complete the project work in this semester and present it to the assessing committee (as constituted in the seventh semester). The performance of the students in the project work shall be assessed on a continuous basis by the project evaluation committee through progress seminars and demonstrations conducted during the semester.
2. Each project group should maintain a log book of activities of the project. It should have entries related to the work done, problems faced, solution evolved etc. There shall be at least an Interim Evaluation and a final evaluation of the project in the 8^{th}semester.
3. Each project group has to submit an interim report in the prescribed format for the interim evaluation. Each student is expected to prepare a report in the prescribed format, for final evaluations based on the project work. Members of the project group will present the relevance, design, implementation, and results of the project to the project evaluation committee. Each group will submit the copies of the completed project report signed by the guide to the department.
4. The head of thedepartment will certify the copies and return them to the students. One copy will be kept in thedepartmental library and one by the respective guide. The assessment committee and project guides will award the marks for the individual students in a project as follows:

   50% of the marks is to be awarded by the guide and
   50% by the evaluation committee.

   Internal Continuous Assessment:
   40% - Data collection, Planning/ Design and detailing/Simulation and analysis
   30% - Presentation & demonstration of results
   20% - Report
   10% - Regularity in the class

CE-801: HIGHWAY PAVEMENT DESIGN

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

Note:IRC 37 2001 and 58-2002 and design charts are permitted for University Examinations

COURSE OBJECTIVE:

To equip the students to carry out design and evaluation of flexible and rigid pavements in varied field conditions.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Introduction:** Types and component parts of pavements - Factors affecting design and performance of pavements - Functions and significance of sub grade properties – Various methods of assessment of sub-grade soil strength for pavement design - Cause and effects of variations in moisture content and temperature - Depth of frost penetration - Design of bituminous mixes by Marshall method.	**8**
II	**Design of flexible pavements:** Stresses and deflections in homogeneous masses, Burmister 2 layer and 3 layer theories, Wheel load stresses, ESWL of multiple wheels, Repeated loads and EWL factors, Empirical, semi-empirical and theoretical approaches for flexible pavement design:Group index, CBR, Triaxial, Mcleod and Burmister layered system methods	**9**
III	**Design of rigid pavements:** Types of stresses in rigid pavements: Wheel load stresses, Warping stresses, Friction stresses, Combined stresses, Factors influencing stresses, Design and detailing of slab thickness - Types of joints in cement concrete pavements: Longitudinal, contraction and expansion joints, Design of Joint Details for Longitudinal Joints, Contraction Joints and Expansion Joints - IRC Method of Design, IRC recommendations.	**9**

IV	**Pavement Evaluation:** Structural and functional requirements of flexible and rigid pavements - Pavement distress, Evaluation of pavement structural condition by Benkelman beam, Rebound deflection and Plate load tests, Introduction to design of pavement overlays, Problems of highway rehabilitation, Pavement rehabilitation programming.	**8**

Text Books:

1. Khanna S.K. and Justo, CEG, ***"Highway Engineering",***Nem Chand and bros.
2. Yoder and W Nitezak, ***"Principles of Pavement Design",*** John Wiley

Reference Books:

1. Yang, ***"Design of Functional Pavements",*** McGraw Hill
2. David Croney, ***"The Design and Performance of Road pavements",*** HMSO publications
3. Hass and Hudson, ***"Pavement Management System",*** McGraw Hill Book Co.
4. IRC 81-1981- ***"Tentative Guidelines for Strengthening of Flexible Pavements by Benklman Beam Deflections Techniques".***
5. IRC: 37 - 2001, ***'Guidelines for the Design of Flexible Pavements'***
6. IRC: 58 - 2002, ***'Guidelines for the Design of Rigid Pavements'***

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CE-802: GROUND WATER HYDROLOGY

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

To make the students aware of the importance of groundwater resources and to impart strategic background information for its effective and wise utilization.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Occurrence of ground water:** Origin, Rock properties affecting ground water vertical distribution, Geologic formations as aquifers, Types of aquifers, Aquifer parameters,Laplace equation,Potential flow lines, Flow net -Seepage under a dam, Steady unidirectional flows in aquifers, Confined and unconfined, Steady radial flow towards a well, Well in uniform flow, Steady flow with uniform discharge,Partially penetrating wells,Steady flow in leaky aquifer.	**8**
II	**Unsteady flow:** General equation, Cartesian and polar coordinate, Unsteady radial flow in to a well, Confined, unconfined and leaky aquifers, Multiple well system,Pumping tests,Non equilibrium equation for pumping tests,Thies‟ method - Jacob method – Chow's method -Characteristics well losses, Step draw down test,Well near aquifer boundaries, Determination of boundaries from pumping test, Image wells for various boundary conditions, Cavity well and open well, yield tests-pumping and recuperation test.	**9**
III	**Design of Tube wells:** Types of wells,Gravel packed wells,Well loss, Selection of screen size, Yield ofa well,Test holes,Well logs,Methods of construction,Dug wells, Shallow tube wells,Deep wells, Gravity wells,Drilling in rocks,Screen installation ,Well completion,Well development, Testing wells for yield,Collector or radial wells,Infiltration galleries,Failure of tubewells.	**9**

IV	**Ground water investigation:** Geographical investigation: Electrical resistivity method, Seismic refraction method, Gravity and magnetic method - Test drilling, Resistivity logging, Potential logging. Artificial recharge of ground: Recharge by water spreading, pits, shafts and wells. Rain water harvesting.	**8**

Text Books:

1. Raghunath H. M., ***"Ground water Hydrology",*** Wiley
2. Yoder and W Nitezak, ***"Principles of Pavement Design",*** John Wiley

Reference Books:

1. Todd D.K., ***"Ground Water Hydrology",*** John Wiley
2. Garg S.P., ***"Ground Water & Tube wells",*** Oxford & IBH
3. Raghunath H.M., ***"Hydrology",***Wiely Eastern

CE-803: WATER POWER ENGINEERING

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

The aim of the course is to introduce the students to types of hydro-power stations, their components and functions and different types of loads on power plants.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Introduction:** Sources of power, estimation of water power, necessity and importance of harnessing small hydro power, flow duration and power duration curves, load curve, load factors, capacity factors, utilisation factors, firm and secondary power. **Types of Hydro Power Plants:** Elements of Hydro power, classification of hydro-power plants, run-of-river plants, storage plants diversion canal development, pumped storage plants, tidal power plants, base load and peak load plants in a power grid.	**8**
II	**Intakes:** Intake structures, functions and their types, Surge Tanks, components of intakes-forebay, trash racks, gates and valves, force required to operate gates.	**9**
III	**Conveyance System:** Penstocks, design criterion, economical diameter anchor blocks, cradles and footings, water hammer, instantaneous closure of power canal, surge tank, surges in canals.	**9**
IV	**Turbines:** Types of turbines, specific speed and classification of turbines, synchronous speed, scroll casing, flumes and draft tubes, dimensions of scroll casing and draft tubes, setting of turbines. **Power House:** General layout and arrangements of hydro-power units, number and size of units, sub-structure, spacing of units, super-structure, underground power stations, tidal power.	**8**

Text Books:

1. ***"Water Power Engineering",***Dandekar, M.M., Sharma,K.N.
2. ***"Water Power Engineering",*** Borrows, H.K
3. ***"Water Power Engineering",***M.M.Deshmukh.

Reference Books:

1. *Barrows, H.K., **"Water Power Engineering",** McGraw Hill.*
2. ***"Hydro-Electric Engineering Practice Vol.I ,II&III",** Brown J.G.*
3. ***"Water Power Development, Vol.I& II",**Mosonyi,E.*
4. ***"Hydro Power Structures",** R S Varshney, Nem Chand& Bros*

CE-804: DESIGN OF PRE-STRESSED CONCRETE STRUCTURES

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

Note: Code of practice for Plain and Reinforced Concrete IS 800-2007is permitted in the examination.

COURSE OBJECTIVE:

Toprovide an exposure to the design of Prestressed Concrete Structures and Structural Elements.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Introduction:** Basic concepts of prestressing, terminology, applications. Materials for prestressing: High strength concrete, permissible stresses in concrete, high strength steel, permissible stresses in steel. **System of pre-stressing:** Pre-tensioning and post tensioning systems, tensioning devices,Lec-Macallsystems, Magnel Blaton post tensioning, Freyssinet systems, Gifford Udal system.	**7**
II	**Losses of Prestress:** Types of losses of prestress, loss due to elastic deformation of concrete, shrinkage, creep, relaxation of stress in steel,friction,anchorage slip. Total loss in pretensioned and post tensioned members. **Analysis of Prestress and Bending stresses:** Basic assumptions, resultant stresses at a section, concept of load balancing, cracking moment.	**7**
III	**Deflections:** Factors influencing deflections, short term deflections of un-cracked members, deflections of cracked members, prediction of long term deflections. **Shear and Torsional Resistance:** Ultimate shear resistance of pre stressed concrete members, pre stressed concrete members in torsion, design of reinforcements for torsion, shear and bending.	**6**

IV	**Design of Flexural Members:** Dimensioning of flexural members, design of pre-tensioned and post tensioned beams, design of partially pre stressed members, design of one way and two way slabs, continuous beams. Design for axial tension, compression and bending, bond and bearing.	**8**

Text Books:

1. Krishnaraju .R, ***"Prestressed Concrete",***Tata McGraw-Hill Education, New Delhi.
2. Pandit, G. S., Gupta, S. P., **"P*restressed Concrete",*** CBS Publishers & Distributors.
3. Rajagopalan .N, ***"Prestressed Concrete",***Alpha Science International, Limited.

Reference Books:

1. Lin T.Y, Design of, ***"Prestressed Concrete Structures",*** Asia Publishing House, Bombay.
2. Guyon .V, ***"Limit State Design of Prestressed Concrete",***Vol.I& II Applied Science Publishers, London.
3. *IS: 1343- 1980, **"IS Code Of Practice For Prestressed Concrete",***BIS, New Delhi.

CE 805: DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	0	3	40	60	100	3 hrs

COURSE OBJECTIVE:

The course aims to introduce to the students the basics of Earthquake Engineering, seismology, building geometrics & characteristics, structural irregularities, cyclic loading behaviour of RC, steel, pre-stressed concrete elements and various codal provisions and their application on different types of structures.

COURSE CONTENT:

UNIT	CONTENT	No of hrs.
I	**Elements of Engineering Seismology**: Theory of Vibrations, Indian Seismicity, Earthquake History, Behavior of structures in the past Earthquakes.	7
II	**Seismic Design Concepts:** Cyclic loading behavior of RC, Steel and Prestressed Concrete elements, Response Spectrum, Design spectrum, capacity based design.	7
III	**Provision of Seismic Code frames:** shear walls, Braced frames, Combinations, Torsion. Performance of Regular Buildings 3D Computer Analysis of Building Systems (Theory only), Design and Detailing of frames, Shear walls and Frame walls.	6
IV	**Seismic performance:** Irregular Buildings -Soil performance, Modern Concepts, Base Isolation, Adoptive systems, Case studies.	8

Text Books:

1. PankajAgarwal and Manish ShriKhande, ***"Earthquake Resistant Design of Structures",*** Prentice- Hall of India, New Delhi.

Reference Books:

1. Bullen K.E., ***"Introduction to the Theory of Seismology",*** Great Britain at the University Printing houses, Cambridge University Press.

CE 806: TRANSPORTATATION SYSTEM PLANNING

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	T	P/D	C	Sessional	End Semester Exam	Total	
3	0	2	4	40	60	100	3 hrs

COURSE OBJECTIVE:

The course aims at introducing the fundamental principles of the modelling for statics and dynamics analyses. In the second half of the module the student's will be taught how to use the method in practice and to critically assess and evaluate the results. The module aims to provide an introduction to this important stress analysis technique, and by way of case studies shows how it may be used to design components.

COURSE CONTENT:

UNIT	Content	No of Hrs.
I	**Transportation Planning Process:** Introduction, elements of Transportation planning, definition of goals and objectives, identification of needs, generation,evaluation and implementation of alternatives. **Land use and transportation system:** Urban system components, Concept and definitions, criteria for measuring and comparing urban structure, land use and transportation.	**8**
II	**Transport demand analysis:** Nature and analysis of Transportation demand, sequential demand analysis, Trip generation models, Trip distribution models, Model split analysis, Traffic assignment models.	**9**
III	**Public transportation:** Historical development of urban transportation, Mass Transit definitions and classifications, Route development, stop location and stopping policy, schedule development.	**6**

IV	**Transportation economics:** Scope of transportation economics, Transportation demand, demand, supply and equilibrium, sensitivity of travel demand, factors affecting elasticities, elements of engineering conomics.	**8**

Text Books:

1. Kadyali,L.R., ***"Traffic engineering and Transport planning",*** Khanna Publishers.
2. Papacostas, C.S.,***"Fundamentals of Transportation Engineering".***

Reference Books:

1. Hutchinson B.G., ***"Principles of Urban Transportation System Planning",*** McGraw Hill.
2. Bruton M.J., ***"Introduction to Transportation Planning, Hutchinson",*** London.
3. C. JotinKhisty, B. Kent Lall, ***"Transportation Engineering",*** Prentice Hall of India.

CE-809: INDUSTRIAL PROJECT

Teaching and Examination Scheme:

Teaching Scheme			Credits	Marks			Duration of End Semester Examination
L	**T**	**P/D**	**C**	**Sessional**	**End Semester Exam**	**Total**	
0	0	16	8	50	50	100	3 hrs.

Note: Industrial Project of Four months duration is to be carried out by the student in industry under the joint supervision of faculty advisers from institution as well as from the industry

Suggested List of projects:

1. Any productive project involving application of engineering fundamentals to solve problems encountered by human kind, in collaboration with industry, R&D institutes, institutes of international/national/state importance as deemed fit by the faculty members/concerned supervisor.