

**Semester III**

**A. THEORY :**

CODE	THEORY	Contacts periods Per week			Total	Credits
		L	T	P		
CE 301	Mathematics	3	1	0	4	4
CE 302	Fluid Mechanics-I	3	1	0	4	4
CE 303	Surveying-I	3	1	0	4	4
CE 304	Engineering Materials	3	1	0	4	4
CE 305	Engineering Geology	3	1	0	4	4
CE 306	Building construction, Architecture and Town Planning	3	1	0	4	4
<b>TOTAL OF THEORY</b>					<b>24</b>	<b>24</b>

**B. PRACTICAL :**

CODE	PRACTICAL	Contacts periods Per week			Total	Credits
		L	T	P		
CE 393	Surveying Practice -I	0	0	3	3	2
CE 394	Strength of Materials Lab	0	0	3	3	2
<b>TOTAL OF PRACTICAL</b>					<b>6</b>	<b>4</b>
<b>TOTAL OF SEMESTER;</b>					<b>30</b>	<b>28</b>

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**Semester IV**

**A. THEORY :**

CODE	THEORY	Contacts periods Per week			Total	Credit
		L	T	P		
CE 401	Mathematics	3	1	0	4	4
CE 402	Fluid Mechanics-II	3	1	0	4	4
CE 403	Soil Mechanics-I	3	1	0	4	4
CE 404	Structural Analysis-I	3	1	0	4	4
CE 405	Structural Design-I	3	1	0	4	4
<b>TOTAL OF THEORY</b>					<b>20</b>	<b>20</b>

**B. PRACTICAL :**

CODE	PRACTICAL	Contacts periods Per week			Total	Credit
		L	T	P		
CE 492	Building Design and Drawing	0	0	3	3	2
CE 493	Fluid Mechanics Lab-I	0	0	3	3	2
CE 494	Soil Mechanics Lab-I	0	0	3	3	2
CE 495	Geology Lab	0	0	3	3	2
<b>TOTAL OF PRACTICAL</b>					<b>12</b>	<b>8</b>

**C. SESSIONAL :**

HU 481	Technical Report Writing & / Language Practice Lab.	3
2		

**Total of Semester = 35**

**30**

Semester V

**A. THEORY :**

CODE	THEORY	Contacts periods Per week			Total	Credit
		L	T	P		
HU 501	Engineering Economics	3	1	0	4	4
CE 502	Hydrology and Water Power Engineering	3	1	0	4	4
CE 503	Environmental Engineering-I	3	1	0	4	4
CE 504	Surveying-II	3	1	0	4	4
CE 505	Structural Analysis-II	3	1	0	4	4
CE 506	Structural Design-II	3	1	0	4	4
<b>TOTAL OF THEORY</b>					<b>24</b>	<b>24</b>

**B. PRACTICAL :**

CODE	PRACTICAL	Contacts periods Per week			Total	Credit
		L	T	P		
CE 592	Fluid Mechanics Lab-II	0	0	3	3	2
CE 593	Civil Engineering Lab-I	0	0	3	3	2
CE 594	Surveying Practice-II	0	0	3	3	2
<b>TOTAL OF PRACTICAL</b>					<b>9</b>	<b>6</b>

**C. SESSIONAL**

CODE	SESSIONAL	L	T	P	Total	Credit
CE 595	Structural Design and Drawing- I	0	0	3	3	2

**TOAL OF SEMESTER = 36**

32

**Semester VI**

**A. THEORY :**

CODE	THEORY	Contacts periods Per week			Total	Credit
		L	T	P		
CE 601	Soil Mechanics - II	3	1	0	4	4
CE 602	Transportation Engineering -I	3	1	0	4	4
CE 603	Environmental Engineering -II	3	1	0	4	4
CE 604	Structural Design -III	3	1	0	4	4
CE 605	Structural Analysis-III	3	1	0	4	4
CE 606	Water Resources Engg.-I	3	1	0	4	4
<b>TOTAL OF THEORY</b>					<b>24</b>	<b>24</b>

**B. PRACTICAL:**

CODE	PRACTICAL	Contacts periods Per week			Total	Credit
		L	T	P		
CE 696	Civil Engineering Lab-II	0	0	3	3	2
CE 697	Environmental Engineering Lab	0	0	3	3	2
<b>TOTAL OF PRACTICAL</b>					<b>6</b>	<b>4</b>

**C. SESSIONAL**

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CODE	SESSIONAL	L	T	P	TOTAL	CREDIT
CE-698	Structural Design and Drawing-II	0	0	3	3	2

**TOTAL OF SEMESTER = 33 30**

**Semester VII**

**A. THEORY :**

CODE	THEORY	Contacts periods Per week			Total	Credit
		L	T	P		
CE 701	Water Resources Engg.-II	3	1	0	4	4
CE 702	Transportation Engg.-II	3	1	0	4	4
CE 703	Foundation Engg.	3	1	0	4	4
CE 704	Structural Design-IV	3	1	0	4	4
CE 705	Hydraulics Structures	3	1	0	4	4
<b>TOTAL OF THEORY</b>					<b>20</b>	<b>20</b>

**B. PRACTICAL :**

CODE	PRACTICAL	Contacts periods Per week			Total	Credit
		L	T	P		
CE 794	Highway Engineering Lab.	0	0	3	3	2
CE 795	Computer Lab	0	0	3	3	2
CE 796	Soil Mechanics Lab II	0	0	3	3	2
<b>TOTAL OF PRACTICAL</b>					<b>9</b>	<b>6</b>

**C. SESSIONALS**

CODE	SESSIONALS	Contacts periods Per week			Total	Credit
		L	T	P		
CE 797	Project Preparations	0	0	3	3	2
CE 798	Seminar	0	0	3	3	
CE 799	Practical Training	0	0	0	0	3
<b>TOTAL OF PRACTICAL</b>					<b>6</b>	<b>5</b>
<b>TOTAL OF SEMESTER:</b>					<b>35</b>	<b>31</b>

**Semester VIII**

**A.THEORY :**

CODE	THEORY	Contacts periods Per week			Total	Credit
		L	T	P		
CE 801/1-	Elective I	3	1	0	4	4
CE 802/1-	Elective II	3	1	0	4	4
CE 803	Construction Management & Technology	3	1	0	4	4
CE 804	Estimation , Specification & Dept. Procedure	3	1	0	4	4
<b>TOTAL OF THEORY</b>					<b>16</b>	<b>16</b>

<b>C. SESSIONALS</b>						
CE 892	Project Work	0	0	12	12	8
CE 893	Seminar	0	0	3	3	2
CE 894	Comprehensive Viva-Voce	0	0	0	0	3
CE 895	Institutional Participation	0	0	0	0	3
<b>TOTAL OF SESSIONALS</b>					<b>15</b>	<b>16</b>
<b>TOTAL OF SEMESTER</b>					<b>31</b>	<b>32</b>

## ELECTIVE – I

1.Traffic Engg. & Planning	CE 801/1
2.Prestressed Concrete	CE 801/2
3.Environmental Pollution and Control	CE-801/3
4.Advanced Foundation Engineering	CE-801/4
5.Finite Element Analysis	CE-801/5
6. Computer Aided Design & Application in Civil Engg.	CE-801/6
7. Soil Dynamics and Machine Foundation	CE-801/7

## ELECTIVE – II

1.Advanced Structure	CE802/1
2.Structural Dynamics	CE802/2
3.Soil Stabilisation & Ground Improvement Technique	CE-802/3
4.Bridge Engg.	CE-802/4
5.Water Resources Management	CE 802/5
6. Remote Sensing Application in Civil Engg.	CE-802/6
7. Optimisation Technique in Civil Engg.	CE-802/7

### Civil Engineering

#### III SEMESTER

**Mathematics**  
**Code : CE-301**  
**Contact : 3L + 1T**  
**Credits : 4**

Each question consists of three parts. The first part comprises of short objective type questions, carries four marks. The remaining two parts carry eight marks each. Candidates will answer FIVE full questions choosing one from each Unit.

Vector Calculus: gradient, divergence and curl, their physical meaning and identities. Line, surface and volume integrals. Simple problems. Green's theorem, statements of divergence and Stokes' theorems. Simple applications.

Fourier Series: periodic functions, Euler's formulae. Fourier series of odd and even functions and functions with arbitrary period. Half range expansions. Fourier sine and cosine transforms. Fourier integrals. Application of Fourier series to forced vibration problems.

Partial differential equations: basic concepts, solutions of equations involving derivatives with respect to one variable only. Solutions by indicated transformations and separation of variables. Derivation of one dimensional wave equation (vibrating string) and its solution by using the method of separation of variables. Simple problems. D'Alembert's solution of wave equation. Derivation of one dimensional heat equation using Gauss divergence theorem and its solution by separation of variables. Solutions of 2-D Laplace equations.

Introduction to probability: finite sample space, conditional probability and independence. Bayes' theorem, one dimensional random variables. Two and higher dimensional random variables: mean, variance, correlation coefficient and regression. Chebyshev inequality.

Distribution: binomial, Poisson, uniform, normal, gamma, chisquare and exponential. Simple problems.

#### Text Books :

1. Murray R. Spiegel : Vector Analysis. Vector Analysis. edn.1959, Schaum Publishing Co.
2. Erwin Kreyszig : Advanced Engineering Mathematics-Fifth edn.1985, Wiley Eastern.

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3. P.L.Meyer : Introduction to probability and Statistical Applications, second edn. 979, Amerind Publishing Co.

**Reference Books :**

1. Bengamine A.R. and Cornell C.A : Probability and Statistics second edn. 1970, McGraw Hill.
2. Ang. A.H.,S. and Tang V.H. : probability concepts in Engineering, Planning and design, Vols. I and II, John Wiley.
3. Hogg and Craig; Introduction of Mathematical Statistics, fourth edn. 195 Mac Millan International. 4. B.S.Grewal : Higher Engineering Mathematics edn. 1989, Khanna publishers.

**Fluid Mechanics -I**

**Code : CE-302**

**Contact : 3L + 1T**

**Credits : 4**

Introduction : Scope and importance of subject. Fundamental concepts relating to fluid definition, molecular structure, continuum principle. Mechanics of fluids as an engineering science – Eulerian and Lagrangian approach.

Fluid properties : Density, specific volume, specific weight and relative density, viscosity, Newton's law of viscosity. Classification of fluids based on viscosity, Surface tension and capillarity, Pressure, compressibility and vapour pressure.

Fluid Statics : Pascal's law, pressure variation in a static fluid, piezometer, manometers-simple, differential, inclined and micromanometers, pressure gauges. Forces on plane and curved surfaces. Centre of pressure, buoyance and stability of floating bodies.

Fluid Flow Concepts : Streamlines, pathlines and streaklines. Stream tubes, steady, unsteady, uniform and non-uniform flows. One, two and three dimensional flows. Laminar and Turbulent flows. Rotational and irrotational flow. Continuity equation in differential form, Euler's equation in one dimensional and Bernoulli's equation.

Discharge measuring devices : Application of Bernoulli's equation-pitot tube, venturimeter and orificemeter, orifices and mouthpieces, Rectangular, triangular, Cippoletti notch, sharp crested and broad crested weirs, submerged weirs..

Flow in pipes : Turbulent flow through pipes, fluid friction in pipes, head loss due to friction. Darcy-Weisbach equation, Friction factors for commercial pipes, use of Mody's diagram, minor losses in pipes. Pipes in series and parallel. Syphon and negative pressure in pipes.

Unsteady flows : flow under variable heads, time of emptying and filling rectangular and circular tanks through orifices and pipes. Water hammer in pipes. Pressure rise due to sudden and gradual closure. Effect of compressibility of liquid and elasticity of pipe material, surge tanks – functions and types.

Boundary layers : Thickness of boundary layer. Laminar and turbulent boundary layer on a smooth plate. Drag and lift on submerged bodies. Boundary layer separation.

**Reference Books :**

1. Fluid Mechanics by Modi & Seth Standard Book House, New Delhi
2. Fluid Mechanics by A.K.Jain, Khanna Publishers, Nath Market, Nai Sarak, New Delhi.
3. Fluid Mechanics & Machinery by H. M. Raghunath – CBS Publishers. New Delhi

**Surveying-I**

**Code :CE- 303**

**Contact : 3L + 1T**

**Credits : 4**

Introduction : Definition, classification of surveying objectives, History of surveying, Modern trends in surveying, Principles of surveying.

Chain surveying : Measuring instruments, chain and its types, tapes, steel band, optical square, cross staff. Methods of measure – horizontal distances, Ranging chain surveying – reconnaissance and location, locating ground features by offsets – field book. Chaining for obtaining the outline of structures. Methods for overcoming obstacles, conventional symbols, plotting chain survey and computation of areas. Errors in chain surveying and their elimination – problems on above.

Compass surveying : Principles of compass, types of compasses, use and adjustments-Bearings, local attraction and its adjustments. Chain and compass surveying of an area. Booking and plotting. Adjustments of traverse, errors in compass surveying and precautions. Problems on above.

Plane table surveying : Equipment, Levelling, Orientation Different methods of plane tabling, working with plane table, Two and three point problems. Errors and precautions.

Levelling : Introduction, Basic definitions, Levelling instruments and their features, Temporary adjustments of levels, Levelling staffs. Methods of levelling – Differential, Profile fly levelling, cross sectioning and reciprocal. Methods of booking, Sensitiveness of bubble tube. Curvature and refraction effects. Reducing errors and eliminating mistakes in levelling. Permanent adjustments of dumpy level. Modern levels – Tilting level, Automatic or self levelling precise levels. Plotting longitudinal and cross sections. Measurement of areas and volumes, Problems on above.

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Contouring : Topographic map, Contours characteristics of contour, Contour interval, Methods of locating contours, Interpolation of contours. Uses of contours-area and volume measurement from contour map. (5 hrs)

Minor Instruments : Clinometers, Ceylon Ghat tracer, Use of planimeter (mechanical and digital)

Computer programs in surveying : Computer program for calculation of area, volume, application of Bowditch rule rate for calculation of co-ordinates.

**Text books :**

1. Surveying – Vol I & II B.C. Punmia
2. Surveying levelling – Vol I & II – T.P. Kanetkar & Kulkarni
3. Fundamentals of surveying – S.K. Roy (Prentice Hall India)

**Reference books :**

1. Plane and Geodetic surveying Vol I & II – David Clark
2. Advanced surveying – Norman Thomas

**Engineering Materials**

**Code :CE- 304**

**Contact : 3L + 1T**

**Credits : 4**

Properties – Physical and Mechanical, Definitions Stones – Classification of rock – characteristics of building stones – uses – common building stones – Artificial stones

Structural clay products – Bricks – classification – characteristics – Different forms – Testing of bricks as per BIS – Heavy duty burnt clay bricks – Burnt clay paving bricks, soiling bricks, hollow bricks. Clay tiles – mangalore Roofing tiles characteristics and uses – Refractory bricks – Types, Terracota uses, classification and characteristics Building mortars – classification – characteristics – Types and uses – Special mortars – uses.

Wood and wood products – Classification of trees and timber – structure of timber – characteristics of good timber Defects – Seasoning – Decay – Prevention – Suitability of timber for specific uses – Wood products. Veneers plywood, Fibre boards, chip boards, black boards, batten boards and laminated boards – characteristics and uses. (15 hrs).

Concrete : ingredients – Cement – Chemical composition – Composition of cement clinker – Hydration – testing as per BIS – Common types of cement – Properties and uses – Admixtures – Functions – A brief study of acceleration retarders and air entraining agents – aggregates – classification – characteristics – Testing of physical properties as per BIS – Quality of mixing water – Pozzolanas – Applications – Brief study of Fly ash, surkhi, rice husk ash and ground blast furnace slag.

Preparation of concrete – Water cement ratio – Definition of curing, workability and strength – Characteristics and uses of RCC, PSC, FRC, Ferrocement – Mix proportions – Classification of concrete

Lime – various types and uses Floor tiles – Types – Properties and uses. Ceramic materials – Classification – Glass Different types and uses.

Polymeric materials – Introduction – Rubber – Natural and synthetic – Vulcanisation of rubber – uses – plastics – properties and applications.

Paints, Enamels and Varnishes – Properties and uses Tar, Bitumen and Asphalt – Properties and uses Miscellaneous materials-Heat insulating, Sound insulating, Geosynthetics, Adhesives, - properties and uses.

**Text books :**

1. Building materials – S.K.Duggal
2. Engg. Materials – S.C. Rangwala
3. Concrete Technology – M.S. Shetty

**Engineering Geology**

**Code :CE- 305**

**Contact : 3L + 1T**

**Credits : 4**

Physical Geology : Geology and its importance in Civil Engineering : Earth as a planet – its internal structure and composition.

Earthquakes and seismic hazards : Causes and effects, seismic waves and seismographs, Mercelli's intensity scale and Richter's scale of magnitude. Distribution of Earthquakes in the world and India with examples. Earthquake resistant structures.

Weathering of rocks – Agents and kinds of weathering. Soil formation, soil profile, classification of soils, soil Erosion and soil conservation. Measures, coastal erosion and protective measures.

Geological work of rivers – origin and stages in the system. Erosion, transporation, Deposition, Floods and flood man agement measures with Indian Examples.



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Mineralogy ; Physical properties of minerals

Classification, description, chemical, composition, mode of occurrence and uses of the following group of minerals (I) Quartz group (ii) Felspar group (iii) Mica group (iv) Carbonate group (v) Amphibole group (vi) Pyroxene group

Petrology ; Broad classification of rocks

- a) igneous rocks – classification, mode of occurrence, forms of igneous rocks, texture and engineering importance.
- b) Sedimentary rocks – process of sedimentation, primary structures, classification and engineering importance.
- c) Metamorphic rocks – agents and types of metamorphism, classification and engineering importance. Engineering properties of rocks – Compressive strength, tensile strength, tensile strength, porosity, permeability, specific gravity, Abrasive resistance. Rocks as construction materials – qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing.

Structural geology : Stratification. Dip and strike, compass clinometer. Definition, description, classification of folds, faults, joints and unconformities, and their recognition in the field. Importance of geological structures in Civil Engg.

Resource Engg : Types of resources, Earth resources – renewable and non renewable resources – forest, water, minerals, oil, coal, soil. Remote sensing – introduction to remote sensing, aerial photographs and satellite imagery. Advantages and limitations of remote sensing. Interpretation of satellite data. Applications of remote sensing in geology, ground water investigation and Civil Engg.

Hydrogeology : Hydrological cycle, waterbearing properties of soils and rocks, ground water occurrence and distribution. Aquifers, types of aquifers, coastal aquifers and their management, springs and geysers, Geological work of ground water, ground water investigation, selection of well sites, types of wells, quality of ground water, ground water management.

Geophysical exploration – Methods of Geophysical Exploration Electrical resistivity method – principles of electrical resistivity survey. Field procedure – sounding and profiling, electrode configuration, interpretation of resistivity data Geophysical surveys in ground water and other Civil Engg. Projects.

Applied Geology : Surface and subsurface geological and geophysical investigations in major Civil Engg. Projects. Geological studies of Dams and reservoir sites, Geological studies for selection of tunnels and underground excavations.

Landslides : Types of landslides, causes, effects and prevention of landslides. Environmental Geology – problems of pollution and their investigation. Hazards to surface and groundwaters. Impact of mining, quarrying, Dams & reservoirs etc., on environment.

**Reference Books :**

1. A text book of Geology by Mukherjee P.K. Eleventh revised edition. The World Press Private Limited, Calcutta – 1990.
2. Engineering and General Geology by Parbin Singh, Fourth edition. Katson publishing house Delhi 1987.
3. Engineering Geology by Blyth, F.G.H & de Freitas M.H.ELBS, 7<sup>th</sup> Ed. 1984.
4. Remote Sensing Principles and Interpretation – Floyd F.Sabins, H.Freeman and Co.
5. Engineering Geology for Civil Engineers – D. Venkat Reddy, Oxford, IBH, 1995.
6. Cornllius S.Hurlbut, Jr. : Dana's Manual of Mineralogy, 17<sup>th</sup> edition. John Wiley & Sons, New York. 1985
7. Tyrell : Principles of petrology, 1972, Asia, Bombay.
8. Marland P.Billings : Structural Geology, fourth edition, 1975, Wiley eastern Prentice-Hall, U.S.A. 1972.
9. Todd D.K. : Ground Water hydrology. John Wiley & Sons, Second edition, 1980.
10. Robert F.Legget : Geology and engineering, third edition, McGraw Hill book company Singapore, 1988.

**Building Construction, Architecture and Town Planning**

**Code :CE- 306**

**Contact : 3L + 1T**

**Credits : 4**

Foundations : Objectives of preliminary investigations; definition and importance of safe bearing capacity of soils; types of foundations; spread footings and piles; design of a spread footing for a wall.

Masonry : Stone Masonry : Coursed and uncoursed random rubble masonry; fine tooled and rough tooled ashlar masonry.

Brick Masonry : Rules for brick work bonding; stretcher bond, header bond; English and Flemish bonds for one, one and a half and two brick thick walls.

Precast Blocks : Various types of concrete blocks and their uses.

Walls, Doors and Windows: Load bearing and partition walls reinforced brick walls; different types of doors and windows of timber and metal.

Stairs : Types of R.C. Stair cases with sketches; cross-section of R.C.C. stair cases; design principles and design of a dog-legged stair case.

Roofs : Types of pitched roofs and their sketches; Lean – to, coupled and collared roofs; king-post truss, queen-post truss and simple steel trusses; roof covering materials-tiles, AC sheets, and G.I. sheets.

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Plastering and Painting; Plastering with cement and lime mortar; white-washing, colour washing and distemping; Painting new wood and metal work.

Flooring : Cement concrete, terrazzo, Mosaic, marble and tiled flooring.

**Town Planning and Architecture**

Ancient History : Ancient history of human settlement and factors which shaped urbanization; Indus valley civilization (origin, religion, and general features); list of Manasara's Village/town classifications; Dantaka village plan and features.

Slums and Housing : Causes and effects of formation of slums; Slum clearance methods; prevention of formation of slums; building-bye laws/specifications for construction of houses; neighbourhood units; green belt.

Town Planning : Objectives and principles of town planning; Origin and growth of towns; Development of new towns; Features of the Chandigarh City.

Master Plan for cities: Objectives and elements of a procedure, execution, an dreport.

Zoning : Definition, objectives, and principles of zoning; various aspects of zoning (land use zoning, density zoning, and height zoning).

Architectural Aesthetics: Ancient and modern views on architecture; basic concepts of architecture (truthfulness, goodness and beauty); aims of good architecture; three important theories of architecture; A brief description of principles of architecture.

Details on Principles of Architectural Composition:Unity and harmony; balance, proportion, scale, and rhythm in architecture with examples from Indian Architecture.

**Text Books :**

Building Construction by B.C.Punmia

Building Construction and Foundation Engineering by Jha and Sinha

Principles of Town Planning by S. C. Rangwala

**References :**

Town and Country Planning by rame gowda

The Urban Pattern City Planning by Gallion and Eisner

Town Planning in Ancient India by B.B.Dutt

Space, Time and Architecture by Sigfried giedion

Comparative Architecture by Sir Banister Fletcher

Indian architecture by Perry Brown

Forms and Functions of Twentieth Century Architecture : Volume II by talbot Hamlin.

**Surveying Practice-I**

**Code :CE- 393; Credits -2**

Chain surveying :

Preparing index plans, Location sketches. Ranging

Construction of Geometric figures, Heights of objects using chain and ranging rods.

Getting outline of the structures by enclosing them in triangles/quadrilaterals.

Distance between inaccessible points.

Obstacles in chain survey.

Compass surveying :

Measurement of bearings, Construction of Geometrical figures

Distance between two inaccessible points by chain and compass.

Chain and compass traverse

Plane Table survey:

Temporary adjustments of plane table and Radiation method

Intersection, Traversing and Resection methods of plane tabling.

point problem by at least 3 different methods.

2 point problem.

Levelling :

Temporary adjustment of Dumpy level and Differential levelling.

Profile levelling and plotting the profile

Longitudinal and cross sectioning.

Gradient of line and setting out grades.

Reciprocal levelling.

Sensitiveness of Bubble tube

Permanent adjustment of Dumpy levels – third adjustment (Two peg method).

Contouring and Instruments :

Direct contouring

Indirect contouring – Block levelling

Indirect contouring – Radial contouring

Demonstration of minor instruments.

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**Strength of Materials Laboratory**

**Code :CE- 394;Credits -2**

Tension test on Structural Materials : Mild Steel and Cast Iron  
Compression Test on Structural Materials –Mild Steel, Cast Iron and timber  
Bending Test on Mild Steel and Timber  
Torsion Test on Mild Steel Circular Bar  
Hardness Tests on Ferrous and Non-Ferrous Metals, Brinell and Rockwell Tests  
Shear Test on Structural Materials – Mild Steel and Wood  
Test on Leaf Spring  
Test on closely Coiled Helical. Spring  
Impact Test : Izod and Charpy  
Fatigue Test on Mild Steel  
Demonstration of Commercial Test (Tension Test) on Specimens of Round Bars and Twisted Bars.

**IV SEMESTER**

**MATHEMATICS**

**Code-CE-401**

**Contact- 3L + 1T**

**Credits- 4**

Interpolation and application, finite differences, Newton Gregory and Lagrange's interpolation formulae, Inverse interpolation. Error expression in interpolation formulae, Numerical differentiation. Numerical. Integration : trapezoidal rule and Simpson's one third rule. Error expressions for the Integration rules. Curve fitting by method of least squares'. Numerical solution of algebraic and transcendental equation using methods of ordinary iteration, regula-Falsi and Newton-Raphson, condition for convergence and rate of convergence and rate of convergence. Multiple roots polynomial equations, Solution of systems of non-linear equations by Newton-Raphson method. Simple problems. Solutions of systems of linear equations: Gauss Jacobi, Gauss-Seidel and Relaxation methods. Solutions of tridiagonal systems. Eigen values and eigen vectors of matrices and elementary properties. Computation of largest eigen value by Power Method. Numerical solution of initial value problems in ordinary differential equations by Taylor series method, Euler's methods of second and fourth orders, predictor corrector methods, Adams Bashforth, Adams-Moulton and Milne's method. The moment generation function and its properties, functions of random variables, sampling theory, sampling distributions, weak law of large numbers, central limit theorem. Applications.

**Text Books:** :- S.S.Sastry: Introductory Method of Numerical Analysis, **end** 1990, Prentice Hall. "";  
P.L.Meyer : Introduction to probability and Statistical applications. Second edn. 1979,  
amerind Publishing Co.

**Reference Books:**

Hogg and Craig: Introduction of Mathematical Statistics, fourth edn. 1975, Macmillan i International. "

Ang. A.H.S. and Tang V.H.: Probability concepts in Engg. Planning and Design vols I  
And II , John Wiley.

Francis Scheid : Numerical Analysis edn. 1968 Schaum Publishing Co.

Gerald C.F and Patrick D. Wheatley : applied Numerical analysis , third end. 1984 Addison Wesley.

M.K.Jain , S.R.K. Iyengar and R.K. Jain : Numerical Methods for scientific and Engineering Computation , edn. 1985, Wiley  
Estern

**Fluid Mechanics II**

**Code :CE- 402**

**Contact: 3L + 1T ~ Credits: 4**

Fundamentals of open channel flow: Scope and importance, characteristics of open channel flow, distinction between pipe flow and open channel flow, Types of flow

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Steady, Unsteady; Uniform, Non uniform, gradually varied flow, rapidly varied flow. Types of open channels, Geometric elements.

Steady uniform flow: Characteristics, Chezy's and Manning's formulae, Hydraulically efficient Rectangular and trapezoidal sections. Design features of rigid boundary channels.

Specific Energy - Definition, Diagram. Critical, subcritical and supercritical flows. Channel transitions - construction and raised bed. Establishment of critical flow. Venturiflume and Parshall flume. Specific force - Definition and diagram.

Steady Non-Uniform open channel flow- Rapidly Varied Flow :- Definition, characteristics, examples, uses. Hydraulic jump in horizontal rectangular channel. Gradually Varied Flow:- Definition, characteristics, examples. Classification of channel slopes. Assumptions and derivation of gradually varied flow equation,. Classification of gradually varied flow profiles. Details of M-type profiles and examples. Direct step method of computation of M-I type profile.

Dimensional Analysis and Model studies, Dimensions and dimensional homogeneity, Importance and use of dimensional analysis.

Buckingham Pi Theorem-statement and application. Model studies - Importance and use,

Geometric, kinematic and dynamic similarity. Froude and Reynold model laws and applications. Distorted models.

Impulse - Momentum principle Statement, Use and examples of application. Impact of jet on vanes - Flat and Inclined ( stationary and moving) Inlet and outlet velocity triangles.

Hydraulic Turbines Importance of hydropower. Classification of turbines, description, typical dimensions and working principles of Pelton, Francis and Kaplan turbine (detailed design need not be dealt with) Unit and specific quantities . Performance characteristics and selection of turbines. Description and functions of drafttube.

Pumps Classification of pumps . Description and general principle of working of centrifugal and reciprocating pumps (detailed design need not be dealt with ). Unit and specific quantities , Performance characteristics . Description of multistage , jet and airlift pumps . Cavitation in pumps and turbines.

Reference Books :

Fluid Mechanics by Modi & Seth , Standard Book House , New Delhi

Fluid Mechanics by A.K.Jain , Kanna Publishers, Nath Market, Nai Sarak ,, New Delhi

Fluid Mechanics & Machinery by H.M. Raghunath- CBS Publishers New Delhi

**SOIL MECHANICS – I**  
**CODE-CE 403**  
**CONTACT-3L+1T**  
**CREDITS-4**

Origin & formation of Soil :- Types, Typical Indian Soil, Fundamental of Soil Structure, Clay Mineralogy.

Soil as a Three Phase System :- Weight- Volume Relationship, Measurement of Physical Properties of Soil: Insitu Density, Moisture Content, Specific Gravity, Relative Density.

Particle Size Distribution :- By Sieving, Sedimentation Analysis.

Index Properties of Soil :- Atterberg's Limits- Determination of Index Properties of Soil by Casagrande's Apparatus, Cone Penetrometer, Soil Indices.

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Soil Classification :- As per Unified Classification System, As per IS Code Recommendation, AASHTO Classification, Field Identification of Soil, Consistency of Soil.

Soil Moisture :- Permeability, Capillarity in Soil, Darcy's Law, Determination of Coefficient of Permeability of Soil in Laboratory & in Field, Permeability for Stratified Deposits.

Two Dimensional Flow Through Soil :- Laplace's Equations, Flow nets, Flow Through Earthen Dam, Estimation of Seepage, Uplift due to Seepage, Design of Fillers.

Effective Stress Principles:- Definition of Effective Stress, Estimation of Effective Pressure Due to Different Flow Conditions, Critical Hydraulic Gradient, Quick Sand Condition.

Stress Distribution In Soil :- Boussinesq's & Westergaard's Assumption & Formula for Determination of Stress due to Point Loads, Stress Beneath Line, Strip & Uniformly Loaded Circular & Rectangular Areas- Pressure Bulbs, Newmark's charts- Use For Determination of Stress due to Arbitrarily Loaded Areas, Contact Stress Distribution for various types of Loading & on Different Types of Soils.

References :-

- 1.Principles of Soil Mechanics & Foundation Engineering by – V.N.S. Murthy (UBS Publishers).
- 2.Soil Mechanics & Foundation Engineering by – B.C.Punmia (Laxmi Publications).
- 3.Introduction of Soil Mechanics by- B.M.Das (Galgotia Publications).
- 4.Soil Mechanics by – T.W.Lambe & R.V.Whitman.
- 5.SP-36 (Part – I & Part - II).
- 6.Basic & Applied Soil Mechanics by- Gopal(Ranjan & A.S.R.Rao (Willes EasternLtd.)

**Structral Analysis- I**

**Code :CE- 404 ;**

**Contact : 3L + 1T ;**

**Credits : 4**

Structural Systems : Conditions of equilibrium, degrees of freedom, simple systems, Compound systems, Redundant systems, Linear and non-linear structural systems.

Deflection of beams : Moment area method and conjugate beam method.

Strain energy : Strain energy and complementary strain energy, Strain energy due to axial load, bending and shear, theorem of minimum potential energy, law of conservation energy, principle of virtual work, the first theorem of Castigliano, Betti's law, Clark Maxwell's theorem of reciprocal deflection; deflections of beams and frames using Strain energy method and Unit Load Method.

Rolling loads and influence lines : Statically determinate beams and bridge trusses, series of loads and uniformly distributed loads, criteria for maximum and absolute maximum moments and shears.

Redundant Structures : The second theorem of Castigliano, Consistent deformation method for Fixed beams and frames – fixed end moments for beams due to udl, noncentral load, external moment, uniformly varying load, support settlement Analysis of frames (maximum two degree of indeterminacy).

**References :**

- Elementary structural analysis by Norris and Wilber.  
Elementary structural mechanics by Tung Au.  
Indeterminate structural analysis by Kinney  
Statically indeterminate structures by C.K.Wang  
Elements Of Structural Mechanics by N.C.Sinha& S.K.Sen Gupta-S.Chand Pub.  
Elementary theory of structures by Jindal  
Structural Analysis by Ramamurtham.  
Suspension bridges by Alfred Pusley.  
Basic structural Analysis by C.S. Reddy  
Analysis of Structures – Vol.I & Vol. II by Vazirani & Ratwani.  
Structural Analysis Vol.I by S.S.Bhavikatti

**Structural Design- I**

**Code :CE- 405 ;**

**Contact : 3L +1T ; Credits : 4**

A] Reinforced Concrete :

Basic concepts of reinforced concrete and conventional theories. Balanced,under reinforced and doubly reinforced section – Rectangular , T and L section – Analysis.

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Bond , Shear and Diagonal Tension, concepts of Development length – Example .  
Analysis and design – Introduction to working stress Method and Limit State method . I.S code provision .  
Permissible stresses. Simply supported one way slab and beams continuous one way slab and beams-Examples.  
Axially loaded columns- different types- Examples.  
Staircases – different types-Examples.

B] Steel : Materials and Specification . Structure connections-Rivet and Weld. Different types strength and failure of joints.Design of Connections- different types , bracket. eccentric connections, moment resistant connections. Design of tension and compression members – I.S code provisions. Permissible stresses , Design rules . Examples . Design of beam and plated beams. I.S code provisions. Design of columns under axial load.

**Text Books :**

I.S. 456-2000  
SP : 16-1980 Design aids for reinforced concrete – Bureau of Indian Standards  
Reinforced concrete Design by Mallick & Gupta  
Reinforced concrete Limit state design by Ashok K. Jain  
Reinforced concrete by H.S.Shah.  
Reinforced concrete structure by I.C. Sagal and A.K. Goel  
Fundamentals of reinforced concrete by N.C.Sinha and S.K. Roy-S.Chand &CO..  
  
Limit state theory and design of reinforced concrete by S.R.Karve and V.L. Shah.  
IS 800 – 1984  
Pasala Dayaratnam – Design of steel structures A.H.Wheeler & Co Ltd. 1990  
S.Alam Raj- Structural Design in Steel.  
A.S.Arya and J.L.Ajmani – Design of steel structures – Nem chand & Bros.,  
Ramachandra – Design of steel structures, Vol. I & II  
B.S.Krishnamachar and D.Ajitha Sinha – Design of steel structures Tata McGraw – Hill publishing Co. Delhi.  
S.M.A.Kazmi and R.S.Jindal – Design of steel structures – Prentice Hall of India – 1988.  
Ramamurtham – Design of steel structures.  
S.P.: 6(1) – 1964 Structural Steel Sections.  
L.S.Negi – Design of steel structures, Tata McGraw-Hill.

**Building Design and Drawing**

**Code :CE- 492 ; Credits : 2**

Foundations : Spread foundation for walls, and columns of brick masonry; footing for an RCC Column; raft and pile foundations;  
Doors and Windows; Glazed and panelled doors standard sizes. Glazd and panelled windows standard sizes, special windows and ventilators

Stairs: Proportioning and design of a dog-legged, open well RCC stari case for an office residence building; details of reinforcements for RCC stair cases: plan and elevation of straight run, quarter turn, dog-legged and open well RCC stair cases.

Roofs and Trusses : Types of sloping roofs, leanto roofs; pitched roofs (showing gabled ends and hipped ends); RCC roof with details of reinforcements; Kingpost and Queenpost trusses.

Functional Design of Buildings : To draw the line diagram, plan, elevation and section and line of the following  
Residential Buildings (flat, pitched and combined roofs)  
Office Buildings (flat roof)  
School  
Dispensary/Hospital  
Library  
Hostel block  
The designs must show positions of various components and their sizes.

**References :**

Principles of Building Drawing by Shah & Kale  
Text Book of Building Construction by Sharma and Kaul  
Building Construction by B.C.Punmia

**Fluid Mechanics Laboratory- I**

**Code:493**

**Credits-2**

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

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- 5.Measurement of water surface profile for flow over Broad crested weir
- 6.Preparation of discharge rating curve for a sluice .
- 7.Measurement of water surface profile for a hydraulic jump
- 8.Measurement of point rain fall by Rain gauges.
- 9.Measurement of evaporation loss by I.S I Standard Pan.
- 10.Visual observation of wind vane , Anemometer etc.

**Soil Mechanics Lab.- I**

**Code-CE 494**

**Credits-2**

- 1.Field identification of different type of soil as per Indian standards [ collection of field samples and identification without laboratory testing ] , determination of natural moisture content.
2. Determination of specific gravity of i) Cohesionless ii) Cohesive soil
- 3.Determination of Insitu density by core cutter Method
- 4.Determination Insitu density by sand replacement method
- 5.Grain size distribution of cohesionless soil by sieving.
- 6.Grain size distribution of finegrained soil by hydrometer analysis.
7. Determination of Attenberg's limit (liquid limit, plastic limit & shrinkage limit)
8. Determination of co-efficient of permeability by constant head permeameter (coarse grained soil)
9. Determination of co-efficient of permeability by variable head permeameter ( fine grained soil).

**Reference:**

- 1.Soil Testing by T.W. Lamb (John Willey)
- 2.SP-36 (Part-I & Part-II)
- 3.Measurement of Engineering properties of soil by E. Saibaba Reddy & K. Rama sastri.(New age International publication.

**Geology Lab**

**code:-CE- 495;Credits -2**

Study of crystals with the help of crystal models

Megascopic study of minerals including ore minerals.

Megascopic study of rocks-Igneous, sedimentary and metamorphic . Microscopic study of minerals, rocks and ore minerals.

Exercises in geological maps: drawing sections, and interpretation of geological structures. Dip and strike problems.

Thickness problems. Bore-hole problems.

V -SEMESTER

Engineering Economics (Common)

**Code :HU- 501**

**Contact: 3L + 1T Credits: 4**

Economic Systems and theories:

Definition of economics - Scope and nature of economic science - Economic decision and technical decision - Economic efficiency and technical efficiency - Micro and macro economics - Business objectives - Forms of business organisation.

Capitalistic, Communist and mixed economics - Developing and developed economies - Characteristics of Indian economy -

Economic developments in India. Economic Concepts:

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. Meaning and importance of consumption - Wants - characteristics and classification of wants. Utility - Meaning of marginal utility - Law of diminishing utility - Concept of consumer surplus.

Demand and supply analysis - Meaning of demand, Determinants of demand. Exception to the law of demand. Elasticity of demand - Meaning, Price elasticity of demand, Cross elasticity of demand. Income elasticity of demand, advertisement elasticity of demand. Demand forecasting - Basic concepts and tools used in analysis of demand forecasting for new products, existing products and consumer products. Measurement of elasticity. Law of supply.

Cost and Production Analysis:

Cost concept - Classification of cost - Cost output relationship - Cost allocations. Economics and diseconomies of scale Cost control - Cost reduction. Cost benefit analysis - Cost effectiveness analysis.

Production - Meaning - Factors of production - Land, labour, capital and organisation-

Features and their relative importance - Division of labour - Economics of large and small scale production. Economic Laws - Diminishing returns - Increasing returns. Pricing decisions under different marketing structures - Perfect competition - Monopoly - Imperfect competition. Price discrimination.

Financial Management;

Meaning, nature and scope of financial accounting, cost accounting and management accounting. Financial accounting. Meaning and uses of financial statements - Balance sheet and Profit and Loss account. Accounting concepts. Financial statement analysis - Ratio analysis - Fund flow analysis - Cash flow analysis.

Capital budgetin techniques - Capital structure decision - Cost of capital - Sources of financial Institutions. Working capital management. Investment evaluation - NPV - IRR method.

National Income, Banking and Trade:

Concept of national income - Methods of computing national income - Difficulties of measurement.

Definition of money - Functions and types of money - Value of money. Classification of banks - Functions of commercial banks - Central bank - Credit instruments.

Internal and International Trade - Balance of Trade and Balance of Payments - Exchange rates and stability.

Text Books / References:

Modem Economic Theory: K.K. Dewett and Adarsh Chand.

Economics: Samuelson Paul, McGraw Hill Book Company, 1998.

Managerial Economics; D.N.Dwivedy, Vikas Publishing House, 1995. ~ Financial Management: I.M.Pandey, Vikas Publishing House, 1999. f!~

### Hydrology and water Power Engineering

**Code:CE 502 ;Contacts: 3L+1T;  
Credits-4**

**Introduction :** Definition and scope of Hydrology , Hydrologic cycle , The Global water Budget, Practical Applications.

**Precipitation :** Definition , Forms of precipitation , Measurement of Precipitation , Errors in measurement of Rainfall , location of Raingauge , Raingauge network , Adequacy of raingauge station , preparation of data- Estimation of missing data , Test for consistency of records ( double mess curve analysis ),Presentation of rainfall data, Mean precipitation over on area-( Thissen polygon method , Isohyetal method), Frequency of point rainfall , plotting position ,PMP ( Probable maximum Precipitation), Rainfall data in India, examples.

**Abstractions from precipitation :** Evaporation – the process , factors affecting and measurement , concept of pan co-efficient , method for reduction of evaporation losses, **Transpiration-** factors affecting, measurement .Evapotranspiration - Definition,AET,,PET,Measurement-Iysimeter,FiledPlots,Perimansequation,Examples. **Initial loss-** Interception , depression storage . **Infiltration** – infiltration capacity , infiltration rate , factors affecting measurement.

**Infiltration Indices:** -  $\phi$ - index , w index , Example



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**Stream flow Measurement :** Introduction, Determination of stream discharge , Measurement of stage , measurement of velocity , Stage discharge relationship – permanent control , shifting control, examples.

**Run-off :** Introduction, factors affecting, computation, concepts of Direct Run-off, Base flow, water year,

Runoff characteristics of streams – Perennial, intermittent , ephemeral, yield ( Annual Runoff volume) – i) correlation of stream flow and rainfall ii) Empirical equations Binne’s percentages, Barlow’s tables, Strange’s tables, Khosla’s formula , Flow –mass curve and their uses, examples.

Hydrographs : Introduction, factors affecting flood Hydrograph , Components of a Hydrograph, Base flow separation, Concept of Direct Run-off Hydrograph (DRH) ,Effective rainfall, Unit Hydrograph- definition, assumptions, Derivation, Limitations and use, Unit Hydrograph of different durations-Method of superposition, The S- Curve ,Synthetic Unit Hydrograph. Snyder’s Method, concept of instantaneous unit Hydrograph (IUH), examples.

Floods : Definition and causes , Estimation of the magnitude of a flood peak- rational method, empirical method , flood frequencies studies. Important definitions- Design flood , Standard project flood (SPF) , Probable maximum floods(PMF) .

Flood Routing – Preliminary concept, examples.

Flood control Measures: Introduction, Measures-structural methods , non structural methods, flood control in India

Element of water power Engineering : Introduction, comparison of Hydro-electric and thermal power plants, classification of Hydel plants- i)Runoff river plant ii)storage plant iii)Pumped storage plant iv) Tidal plants. Some important terms and definitions- storage and Pendage , load factor, demand factor, capacity factor, utilization factor, firm power secondary power Examples .

Reference::

1. Engg. Hydrology – K.Subramanya- Tata Mc Grow hill Publishing Col.
2. A Text Book of Hydrology – P. Jaya Rami Reddy- Luxmi Publication ,N.Delhi
3. Hydrology & Water Resources Engg.- S.K. Garg –Khanna Publishers.
4. Applied Hydrology – K. N. Mutreja - Tata Mc Grow hill Publishing Co.
5. Irrigation ,Water Resources & Water Power Engg. - Dr. P.N. Modi, Standard Book House, New Delhi.

### **Environmental Engineering -I**

**Code:CE.503**

**Contact: 3L + IT Credits: 4**

Water demands: Types of demands domestic, commercial, industrial, fire, public use and losses, per capita demand, variations in demand, factors affecting demand. Design period. Forecasting population-different methods and their suitability.

Sources of water: surface sources rivers, streams, lakes and impounded reservoirs, determination of quantity of water in the above sources. Under ground sources Springs, wells and infiltration galleries, measurement of yield of open wells., tube wells, artesian wells and infiltration galleries. Comparison of surface source and subsurface sources in respect of quality and quantity.

Quality of water: Pollution and contamination of water. Sources, classification and prevention of pollution. Water borne diseases. Impurities in water. Collection of water samples. Water analysis Physical chemical and biological tests, standards for potable water.

Collection and conveyance of water: Intakes-river, lake, reservoir and canal. Hydraulic design of pressure pipes. Hydrostatic tests on pipes.

Treatment of water: Aeration, Plain sedimentation, sedimentation with coagulation- coagulant feeding devices, optimum dosage of coagulant. Filters and their different types, disinfection, water softening. The functional design of treatment unit. Removal of iron, manganes, colour, odour and taste, Fluoridation, desalination.

Distribution: Systems of distribution, layout of distribution system, Pressure in distribution system, Storage and distribution reservoirs. Capacity of reservoirs. Type of reservoirs. Detection and presentation of leakages. Design of distribution system Nomograms, Hardyross method, valves and pipe fittings, Hydrants. Necessity of pumps in water supply, types of pumps, .determination of capacity of pumps required (no derivation)

References :

Envirmental Engineering S.K. Garg -Khanna Pub

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Water Supply & Waste Water Disposal –G . M . Fair ,J . C . Geyer ,D . A . Okun . –Jhon Wiley & Sons .

Water Supply Engineering Volume I by Kshirasagar.

Manual of Water Supply & treatment - A Government of India Publication.

Water Supply and Sanitary Engineering By G.S.Birdi

Water supply engineering by Babbit and Doland

Water supply sanitary engineering by G.S. Birdi

Surveying-II

**Code :CE- 504**

**Contact: 3L + IT Credits: 4**

Theodolite surveying: Components of a theodolite. Adjustments, Horizontal and vertical angle measurements, Trigponometric levelling.

Tacheometer : Definition, Principles of stadia, tangential systems, Details of stadia system. Analytic tacheometer, Horizontal and inclined sight with staff vertical and normal for both fixed and movable hair tacheometer, Errors in tacheometer methods.

Theory of errors: Errors Definition, Laws of errors, Principles of least square, Laws of weights, Determination of probable error and its distribution, Normal equations, Method of correlates, Triangulation adjustments station and figure adjustments, Levelling adjustment, Method of equal shifts.

Curve surveying: Simple curves Definition, Notations Designations, Elements of simple curve, Setting out by linear methods and Rankine's tangential method. Two Theodolite and Tacheometric method, Compound reverse curves. Transition curves, Bernoulli's Lemniscate, Vertical cUrve types and calculations.

Hydrographic surveying: Shore line surveying sounding Locating sounding and reduction, Three point problems, Nautical sextant and station pointer.

Electro Magnetic Distance Measurement: Introduction, Electromagnetic waves, Modulation, Types of EDM instruments, Principle of their working.

Photographic surveying: Terrestrial-Principles-Phototheodolite-Horizontal and vertical distances of points from photographic measurements, Determination of the focal length of camera lens, Aerial photogrammetry, aerial camera, scale of vertical photographs, Flight planning, Drag and lift, Computation of flight plan, Ground control, Stereo scope and parallax principles.

Text Books:

Surveying -Vol 2,3 & 4 by B.C.Punmia.

Plane and Geodetic surveying -Vol 2 by David Clark

Surveying and leveling- Vol 2 by T .P. Kanetkar and Kulkarni

Fundamentals of surveying-by S.K.Roy, New Delhi.

Reference books:

Higher surveying by Norman Thomas

Surveying by Higgins.

**Structural Analysis-II**

**Code: CE- 505; Contact: 3L + 1T;**

**Credits: 4**

Arches: Introduction. Three hinged arch-analysis and influence line.

Two hinged arch and fixed arch --application of unit load method,

Castigliano's method and elastic center method, Influence line for arches.

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Portal frame: Solution by- unit load method, Castigliano's method.

Moment distribution method - solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway.

Slope Deflection Method – Method and application in continuous beams and Frames.

Cables & Suspension bridges with three hinged stiffening girders.

Curved beams- analysis  
Hooks, Rings and Bow girders.

Un-symmetrical bending.

Column analogy –method, application  
Stiffness and carry over factors for non-prismatic members.

Kani's method: application to indeterminate beams.

**References:**

Theory of structures: by S.P.Timoshenko  
Theory of structures: by S.Ramamurtham.  
Mechanics of structures: by Thadani  
Indeterminate structural analysis: by Kinney  
Statically indeterminate structures: by C.K.Wang  
Basic structural analysis: by C.S. Reddy  
Matrix method of structural analysis: by M.B.Kanchi  
Structural analysis – A matrix approach by G.S.Pandit and Gupta  
Theory of structures: by Vazirani and Rathwani Vol. II and Vol. III.  
Intermediate structural Analysis: by Wang.  
Structural Analysis Vol.II: by S.S. Bhavikatti.

**STRUCTURAL DESIGN –II**

**CE506 Contact : 3L + 1T ;  
Credits : 4**

A] Reinforced Concrete: Design Approach. Limit State Method of Design  
Design for Strength and Serviceability I.S. code provisions. Different limit states.  
Analysis and Design : Foundation – Types of foundation – plain concrete footing for column and walls . Spread footing for walls . Isolated column footing . Raft or mat foundations – Problems.  
Retaining wall- cantilever and counterfort type- Problems  
Two way slab – Grashoff Rankin's method, Pigeauds and Marcus Method . I.S method for slab design , correction for torsion and corner restraint. Problems. .  
Column and members subjected to combined axial Load and bending.  
Flat slab by direct design method and equivalent frame method I.S code provisions- Problems.

B] Steel : Design of roof truss – connection details . Built up columns under combined loading. Design of lacing and batten plates.  
ColumnBase&Base Plate- Connection details.  
Design of plate girders – stiffeners , splicing, curtailments-Riveted& Welded.  
Design gantry girder considering lateral buckling – I.S code provisions.

**Reference:**

I.S. 456-2000  
SP : 16-1980 Design aids for reinforced concrete – Bureau of Indian Standards  
Reinforced concrete Design by Mallick & Gupta  
. Design of concrete structures – Ramachandra.  
Reinforced concrete Limit state design by Ashok K. Jain  
Reinforced concrete by H.S.Shah.  
Reinforced concrete structure by I.C. Sagal and A.K. Goel  
Fundamentals of reinforced concrete by N.C.Sinha and S.K. Roy  
Limit State Design of Reinforced concrete –P.C. Varghese –PHE Publisher.  
Limit state theory and design of reinforced concrete by S.R.Karve and V.L. Shah.  
IS 800 – 1984

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Pasala Dayaratnam – Design of steel structures A.H.Wheeler & Co Ltd. 1990  
A.S.Arya and J.L.Ajmani – Design of steel structures – Nem chand & Bros.,  
Ramachandra – Design of steel structures, Vol. I & II  
B.S.Krishnamachar and D.Ajitha Sinha – Design of steel structures Tata McGraw – Hill publishing Co. Delhi.  
S.M.A.Kazmi and R.S.Jindal – Design of steel structures – Prentice Hall of India – 1988.  
Ramamurtham – Design of steel structures.  
Design Of Steel Structures - S.K.Duggal Tata Mc-Graw Hill , New Delhi.  
S.P.: 6(1) – 1964 Structural Steel Sections.

**Fluid Mechanics Laboratory II**

**Code :CE- 592**

**Credits: 2**

Experiments on Venturi and Parshall Flumes Impact of Jet on vanes  
Test on Centrifugal pump  
Test on Reciprocating pump  
Test on Pelton wheel Turbine Test on Francis Turbine Calibration of Syphons (a) Hood Syphon  
(b) Volute Syphon

Calibration of Plug Sluice  
Experiments on Hydraulic Ram  
Experimentals on Hydraulic jump  
Demonstration of working of Kaplan Turbine.

Note: Students will have to study the Layout experimental units in the laboratory.

**Civil Engg. Lab-I**

**Code :CE- 593 ; Credits : 2**

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

**References :**

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

**Surveying Practice II**

**Code :CE- 594**

**Credits: 2**

Theodolite surveying: Measurement of horizontal angles, repetition and Reiteration methods, Single plane and double plane method of trigonometric levelling, Theodolite traverse adjustments.  
Tacheometric surveying: Tacheometric constants, Measurement of horizontal and vertical distance. Tacheometric traverse and contouring.  
Curve surveying: setting out simple curve by chain and tape, offsets from longchord and tangent, from chord produced, Simple curve by rankine's method, Setting out compound and reverse curves, Transition curves, Bernoulli's Lemniscate.  
Demonstration: Box-Sextant, Nautical sextant and EDM instruments.

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**Structural Design and Drawing -I**

**Code CE: 595 credits-2**

General considerations , design principle of R.C.C. sections, limit state method of design. Loads and stresses to be considered in the design as per I.S. code provision.

Design & detailing of a i) Simply supported R.C.C. Beam.  
ii)Continuous T- Beam.

Design & detailing of a i) Simply supported one way slab  
i) One way continuous slab.

Design of different units –slab , beam column, roofing and staircase from floor plan of a multistoried frame building – two way action of floor slab.

**Reference:**

- 1.Fundamental of Reinforced concrete- N.C. Sinha & S.K.Roy.
2. Design of concrete structures – Ramachandra.
- 3.Limit State Method of Design – Varghese,PHI Ltd.
- 4.I.S- 456-2000
- 5.I.S.875
- 6.SP-16

**VI- SEMESTER**

**SOIL MECHANICS – II**

**CODE-CE 601**

**CONTACT-3L+1T**

**CREDITS-4**

**Compaction of Soil :-** Principles of Compaction, IS Light & Heavy Compaction Test, Field Compaction Equipments, Various methods of field Compaction Control, CBR Test (Soaked, Un-soaked & Field ) as per IS recommendation.

**Compressibility & Consolidation of Soil :-** Terzaghi's Theory of One Dimensional Consolidation, Compressibility characteristics of Soils, Compression Index, Coefficient of Compressibility & Volume change, Coefficient of Consolidation, Degree & rate of Consolidation, Consolidometer & Laboratory One Dimensional Consolidation Test as per latest IS Code, Determination of Consolidation Parameters under Consolidated, Normally Consolidated & Over Consolidated Soil, Secondary Consolidation.

**Shear Strength of Soil :-** Basic Concept of Shear Resistance & Shear Strength of Soil, Mohr- Columb's Theory, Determination of Shear Parameter of Soil- Stress Controlled & Strain Controlled Test, Laboratory Determination of Soil Shear Parameter- Direct Shear, Tri-axial Test, Unconfined Compression, Vane Shear Test as per Relevant IS Codes, Stress- Strain Relationship of Clays & Sands, Concept of Critical Void Ratio, Stress Path and its Application.

**Earth Pressure Theories :-** Plastic equilibrium of soil , Earth pressure at rest , Active & passive Earth pressure , Rankin's&Coulombs earth pressure theories , wedge method of analysis , estimation of earth pressure by graphical construction ( colmann & Rebhann's method).

**Retaining Wall & sheet pite structures:** Proportions of retaining walls, stability checks , cantilever and anchored sheet piles , free earth and fixed earth method of analysis of anchored bulk heads , coffer dam structures types and suitability.

**Stability of slopes :** Analysis of finite and infinite slopes , swedish

And friction circle method, Taglor's stability number , Bishop's method of stability analysis stability consideration of Earthen dams.

**References:**

1. Principles of Soil Mechanics & Foundation Engg.  
By VNS Murthy (UBS Publication)
2. Soil Mechanics and Foundation Engg.  
By B.C. Punnia (Luxmi Publication)
3. Introduction to Soil Mechanics  
By B.M. Das (Galgolia publication)
4. Soil Mechanics – by T.W. Lambe & R.V. Whitman(WEL)
5. SP-36 (Part-I & Part-II)
6. Basic & Applied Soil Mechanics  
By Gopal Ranjan & A.S.R. Rao (Wiley Easter Ltd.)

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**Transportation Engineering- I**

**Code :CE- 602**

**Contact: 3L + IL Credits: 4**

Introduction to Highway Engineering:

Scope of highway engineering; Jayakar Committee Report; saturation system; highway financing ('pay as you go method and credit financing method) and highway economics (quantifiable and non quantifiable benefits to highway users, cost of vehicle operation, annual cost method, and benefit-cost ratio method).

Highway Alignment:

Requirements; factors controlling alignment; engineering surveys for highway alignment and location.

Highway Geometric Design:

Cross-sectional elements (friction, unevenness, light reflecting characteristics, camber, kerbs, shoulders, footpaths, width of carriageway, formation, and right of way); PIEV theory, geometric design elements like design speed, passing and non-passing sight distances; requirements and design principles of horizontal alignment including radius of curvature, super elevation, extra-widening, design of transition curves, curve resistance and grade compensation and vertical alignment.

Pavement design: Evaluation of soil subgrade, sub-base, base and wearing courses; design factors for pavement thickness (including design wheel load and ESWL, strength

of pavement materials and plate load tests, and effect of climatic variations) Group Index and CBR methods of flexible pavement design; Westergaards analysis of wheel load stresses in rigid pavements; frictional stresses and warping stresses; IRC recommendations for design of rigid pavements; design of expansion and contraction joints. Benkelmen Beam Test .

Pavement construction Technique:

Types of pavement; construction of earth roads, gravel roads, WBM, bitumen and cement concrete roads; joints in cement concrete pavements.

Road Materials and Testing : Soil, Stone Aggregate, Bitumen, Marshal Stability Test .

Special problems on highways:

Failure in flexible and rigid pavements; Maintenance of earth roads, WBM and bitumen roads; remedial measures for waves and corrugations and mud-pumping; strengthening of pavements; geometric standards for Hill roads; requirements of highway drainage systems; and types of surface and subsoil drainage methods.

References : High Way Engineering By Khanna & Justo

Transportation Engineering -Vazirani & S.P Chandala Khanna Publishers

I.S Specifications on Concrete , Aggregate & Bitumen

Environmental Engineering -II

Code :CE- 603

Contact: 3L + IT Credits: 4

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Sewage and drainage: Definition of some common terms used in sanitary engineering. Systems of sanitation, systems of sewerages. Types of sewage. Sources of sanitary sewage. Estimating the quantity of sanitary sewage and storm sewage. Design of sewers. Nomograms, partial flow diagrams. Testing of sewer lines Sewer appurtenances. Pumping of sewage. House drainage.

Characteristics of sewage: Physical, Chemical and Biological. Test on sewage; Solids, dissolved oxygen, biochemical oxygen demand, stability and relative stability, chlorides, sulphide, nitrogen. pH value, grease, oil and fat. Biological tests, carbon, nitrogen and sulphur cycles.

Solid waste disposal: Quality and quantity of refuse, Collection and conveyance of solid wastes. Disposal of solid waste by composting, and other methods, Salvaging, grinding and discharging into sewers. "

Disposal by other methods: Oxidation pond, oxidation ditch, aerated lagoon, septic tank, Imhoff tank, Disposal by dilution, irrigation and farming, stream sanitation.

Treatment of sewage: Primary treatment - screen, grit chamber, detritus tank, skimming tank, plain sedimentation sedimentation with coagulation. Secondary treatment - Filtration, normal rate trickling filters, high rate trickling filters activated sludge process, aeration units, types of activated sludge process, sludge digestion. Functional design of primary and secondary treatment units.

#### References

Environmental Engineering S.K. Garg -Khanna Pub .

Water Supply , Waste Disposal & Environmental Pollution Engineering – A . K . Chatterjee – Khanna Pub .

Water Supply & Waste Water Disposal –G . M . Fair ,J . C . Geyer ,D . A . Okun . –Jhon Wiley & Sons .

Sanitary Engineering Volume II by Kshirasagar.

Manual of treatment - A Government of India Publication.

Water Supply and Sanitary Engineering By G.S.Birdi

#### **STRUCTURAL DESIGN – III**

**Code :CE- 604 ; Contact : 3L + 1T ; Credits : 4**

- A. Reinforced concrete  
Design of building frames, Design of beams and columns, Effect of lateral loading, (Wind & earthquake). Earthquake resistant provisions, bracing and shear wall, I.S. Code provisions – Design Examples.  
Design of liquid storage structure resting on ground, circular and rectangular tank- approximate method and I.S method , permissible stresses as per code provisions,  
Design of elevated water tanks, stagings – effect of lateral load.
- B. STEEL  
Design of Mill bents, Design of industrial building with multiple truss system, bracing.-lateral and longitudinal – I.S Code provisions.  
Simple Design of multi-storied building-effect of lateral load as I.S. code provision.  
Design of water tower-staging, effect of wind and earthquake I.S. Code provision , Design examples.

#### **Reference Books :**

I.S. 456-2000

SP : 16-1980 Design aids for reinforced concrete – Bureau of Indian Standards

Reinforced concrete Design by Mallick & Gupta Reinforced concrete Limit state design by Ashok K. Jain

Reinforced concrete by H.S. Shah.

Reinforced concrete structure by I.C. Sagal and A.K. Goel

Fundamentals of reinforced concrete by N.C. Sinha and S.K. Roy

Limit State Design of Reinforced concrete –P.C. Varghese –PHE Publisher.

Limit state theory and design of reinforced concrete by S.R. Karve and V.L. Shah.

IS 800 – 1984

Pasala Dayaratnam – Design of steel structures A.H. Wheeler & Co Ltd. 1990

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A.S.Arya and J.L.Ajmani – Design of steel structures – Nem chand & Bros.,  
Ramachandra – Design of steel structures, Vol. I & II  
B.S.Krishnamachar and D.Ajitha Sinha – Design of steel structures Tata McGraw – Hill publishing Co. Delhi.  
S.M.A.Kazmi and R.S.Jindal – Design of steel structures – Prentice Hall of India – 1988.  
Ramamurtham – Design of steel structures.  
Design Of Steel Structures by I.C.Syal & S.Singh – Standard Publishers.  
Steel Designers Manual -E.L.B.S Edition.  
S.P.: 6(1) – 1964 Structural Steel Section.

**Structural Analysis -III**

**Code :CE- 605 ; Contact : 3L + 1T ; Credits : 4**

Influence line for Redundant Trusses  
Approximate analysis of building frames-Cantilever and portal method  
Long span cantilever structures-analysis, problems.  
Matrix methods in structural analysis-Flexibility and Stiffness method, Elements of matrix algebra.  
Application to determinate and indeterminate problems- Application of matrix methods to plane truss, beams, continuous frames,  
Assembly of global or system stiffness matrix.

Finite Difference and Relaxation technique-Application to simple problems  
Membrane Theory and analysis-problems.  
Introduction to structural dynamics- free vibration ,forced vibration. Post elastic condition, SDOF  
Finite Element Technique in structural analysis  
- Fundamental concept, Finite Element modeling, Finite element formulation to One Dimensional Problems.

**Reference**

- 1) Analytical Methods in structural Engineering-S.A.Raz, New Age International Pub.
- 2) Structural analysis-Negi & Jangid.-Tata McGrawhill Co.
- 3)Theory of structures by S.P.Timoshenko
- 4)Theory of structures by S.Ramamurthum.
- 5)Matrix method of structural analysis by M.B.Kanchi
- 6)Structural analysis – A matrix approach by G.S.Pandit and Gupta
- 7)Theory of structures by Vazirani and Rathwani Vol. II and Vol. III.
- 8)Intermediate structural Analysis by Wang.

**Water Resources Engineering – I**

**Code- CE-606;**

**Contacts:3L+1T;Credits-4**

Introduction : Definition, necessity, history advantags and disadvantags of Irrigation, Benefits and Ill-effects of Irrigation, Types of Irrigation systems, methods of Irrigation, quality of Irrigation water, examples.

Water Requirements of crops : Crop period or Base period , Duty and Delta of a crop, relation between duty and delta,Duty at various places , flow duty and quantity duty, factors affecting duty, measures for improving duty of water, crop seasons and Indian Agriculture, Kor watering , optimum utilization of Irrigation water,Irrigation efficiencies,  
Estimation of PET- ,Penman’s method,Blaney-Criddle method,Thornthwaitemethod,Soil moisture Irrigation relationship- field capacity ,permanent wilting point, available and readily available moisture, Depth and frequency of Irrigation,Soil erosion and conservation measures,Examples.

Canal Irrigation : Introduction, classification of Irrigation canals, certain important definitions – G.C.A,C.C.A, intensity of irrigation, area to be irrigated , Time factor , capacity factor, full supply co-efficient , Nominal duty,Channel losses, Examples.

Cross – section of Irrigation canal- Important terms, Balancing depth , examples.

Design of unlined alluvial channels by silt Theories: Introduction, Kennedy’s theory, procedure for design of channel by Kennedy’s method, Drawback in Kennedy’s

Theory , use of Garret’s diagram, Lacey’s theory, concept of True regime Initial regime and final regime, design procedure for Lacey’s theory, comparison between Kennedy’s and Lacey’s theories,Methods of prevention of silt deposition in canals and reservoirs, examples.

Lining of Irrigation Cannals : Objectives, advantages and disadvantages of canal lining , economics of canal lining, requirements of canal lining, Types of lining, Design of lined

Canals- examples.

Canal Falls : Definition and location of canal falls , Brief description of ogee fall , Notch-fall , Sarda type fall and montague type fall .

Water logging of Agricultural lands and land drainage-

Definition, effects, causes, measures for prevention of water logging ,Reclamation of saline & alkaline lands ,Examples.

Land drainage – Open drains, Tile drains – Layout of a closed drainage system , Discharge and spacing of closed drains, drainage co-efficient , examples.

Reservoirs : Introduction, selection of a suitable site for a reservoir ,types of reservoirs , capacity- elevation curves, storage zones of reservoir , Fixation of reservoir capacity with the help of mass curve of inflows and out flows , safe yield , Reservoir sedimentation –Density convert , Trap efficiency , sedimentation index , capacity inflow ratio, sedimentation control , Reservoir Losses , clearance, examples.

Planning for multipurpose water Resources Development:



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Necessity of planning , steps involved in planning , function and objective of a multipurpose project , Cost allocation to various uses in multipurpose project planning i) Remaining benefits method  
ii) ultimate justifiable expenditure method , Important multipurpose projects of India , examples..

Reference Books :

- 1] Irrigation Engineering and Hydraulic Structures –By Santosh Kr.Garg.,Khanna Publishers.
- 2] Irrigation, water Resources and water Power Engineering – By Dr. P.N.Modi- Standard Book House  
Post Box : 1074- Delhi-6.
- 3]Hydrology and water Resources Engineering By- S.K. Garg.  
Khanna Publishers , 2-B Nath Market , Naisarak,Delhi-110006
- 4]Irrigation and water Power Engg- by B.C.Punmia ,S.Pande.  
Std Publication , New Delhi.
- 5] Irrigation Engg. G.L.Asawa , Wiley Eastern , New Delhi.

**Civil Engg. Laboratory – II**

**Code :CE- 696 : Credits : 2**

Tests on Concrete & Steel

Fresh Concrete Workability : Slump, Vee-Bee, Compaction factor tests

Hardened Concrete Compressive strength on Cubes, split Tensile Strength, Static modulus of elasticity, Flexure tests , Non destructive testing .Mix Design of Concrete.

Tests on Steel bars of different grade –Tension Test- percentage elongation, bend & rebend test –Code provisions.

Road Aggregates : Impact, Crushing strength, Abrasive strength (Los Angeles)

**References :**

BIS Codes on Concrete, Steel.

Laboratory manual on Concrete Testing (Part II) V.V.Sastry and M.L.Gambhir

Highway Materials Testing – S.K. Khanna and C.E.G Justo

**ENVIRONMENTAL ENGINEERING LAB**

**CODE- CE-697**

**CRDIT-2**

**Experiments :**

pH colour , turbidity  
Solids – suspended , dissolved , settleable and volatile ,  
Dissolved oxygen, BOD , COD  
Determination of fluorides and Iron  
Hardness , Chlorides  
Nitrite – Nitrogen and Ammonical – Nitrogen  
Available chlorine in bleaching powder, Residual chlorine in water &  
Chlorine demand .  
Bacteriological quality of water – presumptive test, confirmation test  
and Determination of MPN  
Jar Test.

**STRUCTURAL DESIGN & DRAWING II**

**Code : CE-698,**

**Credits -2**

.General consideration and basic concepts

. Different loads ( i.e. wind load , Dead load , live load and others)

.Analysis of wind loads based on IS:800

.Design the 4 following components of a steel framed industrial shed (Roof truss):

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1. Members of the roof truss.
2. Joints of the roof truss members
3. Pur lines
4. Gable bracings
5. Column with bracings
6. Column base plate
7. Column foundation

Reference:

- Books:
1. Design of steel structure – L S Negi (Tata Mcgrawhill Publication)
  2. Design of steel structures- Arya and Ajmami (Nem Chand & Brs; Roorkee, U.P.)
  3. Design of Steel Structures- Duggal (Tata Mcgraw hill)
  4. I.S. Code 800
  5. I.S. SP-6
  6. Handbook on Design and Detailing of Structures- Dayaratnam P. (Wheeler)
  7. Design of steel Structure- P. Dayaratnam
  8. Structural Design in steel- S.A. Roy (NewAge Int. Pvt. Ltd.)

**VII – SEMESTER**

**Water Resource Engg- II**

Code – CE701 Contacts = 3L + 1L

Credits- 4

Ground Water : Introduction , Modes of occurrence of ground water , Darcy's Law for determining ground water velocity , Empirical formulae for ground water velocity determination. Concept of aquifer , confined aquifer, unconfined aquifer , leaky or semi-confined aquifer, perched aquifer , aquiclude , aquifered , aquifuge, steady flow to wells- Dupit-Thiem's theory of well hydraulics- for both unconfined and confined aquifers- assumptions, derivation of the mathematical expressions. Unsteady radial flow towards wells- Thies non-equilibrium formula for confined aquifers, Evaluation of aquifer parameters from Thies equation-Thies method, Cooper and Jacob method, Artificial recharge of ground water – spreading method , recharge – well method, induced infiltration method, Sea water intrusion in coastal

Aquifers, Advantages of ground water reservoir. Ground water exploration in brief, safe yield , Examples.

Wells: Definition, Types-open well or Dug well, Tube well, open well-shallow open well, deep open well, cavity formation in open wells, construction of open wells, Yield of an open well – Equilibrium pumping test, Recuperating test , examples , Tube wells- Strainer type, cavity type, slotted type. Construction and Boring of Tube wells, Examples.

River Engineering : Introduction, types of rivers and their characteristics , classification of rivers , Meanders- causes, Meander parameters, Development of a cut-off, cut-off ratio.

Control and Training of Rivers: Concept, objectives.

Classification of River Training : Marginal embankment or levees, Guide Bank, Groynes or spurs, Artificial cut-off, Pitched Island, Pitching of banks and provision of launched apron, Miscellaneous method such as sills, bamdalling etc. Examples.

Bridges and culverts: Introduction , Data Collection , High flood discharge computation, Alignment, waterway, Number of spans, economic span, scour depth, Afflux, clearing depth of foundation causeway, submersible bridges , Examples.

Planning and analysis of water Resource system:

Introduction to water Resources planning, Identification and evaluation of water management plans-Basic Concept, evaluation of time streams of Benefits and costs, plan formulation , planning models and solution procedures- Dynamic programming, Recursive equations, Bellman principle of optimally Reservoir operation , single reservoir problem- i) with release as decision variable ii) with storage as decision variable , related computer programming ( not for examination).

Reference:

West Bengal University of Technology  
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- 1] Irrigation Engineering and Hydraulic Structures –By Santosh Kr.Garg.Khanna Publishers.
  - 2] Irrigation, water Resources and water Power Engineering – By Dr. P.N.Modi- Standard Book House
  - 3]Engineering hydrology – K. Subramanya,Tata Mc Graw-hill Publishers company Limited , New Delhi.
  - 4] A Text Book of Hydrology – By P. Jaya Rani Raddy, Laxmi Publications. Delhi, New Delhi, Madras, Jalandhar.
  - 5]Ground water – By H.M. Raghunath.Wilay Eastern Limited , New Delhi , Bagalore, Bombay, Calcutta, Madras, Hyderabad.
  - 6] Essential Bridge Engineer- By D. Johnson Victor,Exford & IBH Publishing Co. New Delhi, Bombay, Calcutta.
  - 7] Water Resource Systems, Planning and analysis By D.P. Luches
- Jery R. Stedinger, D.A. Haith, Prntice Hall,Ine, Englewood cliffs, New Jersey 07632.

**Transportation Engineering -II**

Code : CE - 702  
Contact : 3L+IT  
Credits : 4

**Railway Engineering :**

Introduction to Railway Engg.: Railway terminology, survey for track alignment, railway track component parts, gauges, wheel and axle arrangements.

Tractive Resistance : Resistance to traction, various resistances and their evaluation, hauling capacity and tractive effort.

Permanent way : Permanent way component parts, rails, railway sleepers, types, railway creep, anti creep devices check and guard rails, ballast requirements, types specification, formation, cross section and drainage.

Geometric Design : Alignment, horizontal curves, super elevation, equilibrium cant and cant deficiency, Gradients and grade compensation.

Railway Station Yard : Site, requirements, classification of railway stations.

Signalling and Inter locking : Objectives, principles of signaling, classification and types of signals in stations and yards & methods of interlocking.

**Docks & Harbours :**

- i) Harbours : Types, accessibility and size
- ii) Tides, wind and waves : Definitions, spring and neap tides, wave movement, littoral drift, deflection of waves, length of waves and wave action on marine structures.
- iii) Breakwaters : Classifications, materials used, methods of construction and protection
- iv) Docks : Shapes of docks and basin, location, arrangement of berth, dockwalls, dock en trances, repair dock types.
- v) Quays : Forces, types and design consideration.
- vi) Miscellaneous topics on docks and harbours, Transit sheds, warehouses, navigational aids.

**Tunnels :**

Introduction to tunneling : Considerations in tunneling, shape and size of tunnels, tunnel alignment, shaft, pilot tunnels.

Tunneling through soils and soft rock : methods of tunneling through soils and soft rock, tunnel lining, shield method of tunneling.

Tunnelling in hard rock : Methods of attack, grouting and lining.

Tunnel ventilation, Dust Removal etc.

**Airports :**

Introduction to airport planning and development : General philosophy of airport planning and development, ICAO classification of airports, site selection factors characteristics and jet aircraft.

Airport design standards ; Orientation of runways and corrections, width of runways, sight distances, gradients and clearance, taxiways and Aprons.

Airport planning : Centralized and decentralized planning concepts, terminal requirements, terminal facilities and Typical layout of airports.

**References**

A Text Book of Railway Engineering – S.P. Arora & S.C. Saxena  
Docks, Harbours and Tunnels by Srinivasan  
Transportation Engineering by Vazirani & Chandola  
Airport planning and Design. S.K.Khanna & M.G.Arora

**Foundation Engineering**

Code – CE- 703

Contacts-3L + 1T

**Credits-4**

Site Investigation & Soil Explanation : Planning of sub-surface explanation , methods , sampling, samples, Insitu tests:

SPT, SCPT, OCPT, field vane shear , Plate load test, Bore log, preparation of sub-soil Investigation report .

Foundations: Classification, selection- shallow and deep foundations.

Shallow foundations : Bearing capacity, Terzaghi's bearing capacity theory, effect of depth of embedment, eccentricity of load,

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Foundation shape on bearing capacity , Bearing capacity on layered media, Bearing capacity as per IS 6403.

Settlement : Immediate and consolidation settlement , correction for rigidity and dimensional effects, settlement in various types of soil , IS-1904 recommendations.

Allowable bearing capacity : Definition , Determination of allowable bearing capacity from insitu test- SPT , SCPT and Plate load test.

Deep foundations : Pile : Types, load transfer mechanism , method of installation of piles- classification base on material , Installation Techniques – Selection and uses, Determination of load carrying capacities of piles by static and Dynamic formulae, Pile group .  
Group efficiency, Negative skin friction , pile load test ,

Drilled shafts : Types , Design consideration , Load carrying capacity : Types, Selection – well sinking,  
Cassions : Problems & remedies.

Introduction to Ground Improvement Technique : Stabilisation using admixtures , stone columns , sand drains, grouting, geotextiles vibroflotation.

Foundation on problematic soil : Foundation on expansive soil: Foundation on expansive soil, swelling potential , swelling and it's prevention , foundation on swelling soils.

Reference:

1. Foundation Analysis & Design By J.E. Bowels ( Mc Graw Hill)
2. Principles of Foundation Engg. By B.M. Das (PWS Publishing)
3. Soil Mechanics & foundation Engg. By WNS Murthy.
4. SP- 36 (Part I & Part II)
5. Foundation Engineering By S.P. Brahma ( TMH)
6. Relevant IS Codes.

**Structural Design –IV**

Code –CE 704

Contact-3L +LT

Credits-4

Basic principles of Pre-stressed concrete. High strength concrete and high strength steel used in pre-stressing –properties and characteristics . Stress- strain and load balancing concept . Pre-tension & Roof-tensioning ,tensioning methods and end-anchorage. Losses of prestress. Stresses in concrete due to pre-stresses and load – Analysis in flexure.

.R.C.C.Bridges- Different Types – IRC loading – General consideration IRC specification simple design of a solid slab bridge.

Steel Bridges – Introduction – Different types, class of loading . Design of stringer and floor beams.

Plastic Design of steel structures- Introduction. Plastic hinges & Collapse mechanism . Design of beams , portals, gables frames and associated connections . I.S code provisions.

**Reference:**

Prestressed Concrete – S. Ramamath - Jhanpat Rai Publishers.  
Fundamentals of Prestressed concrete – N.C. Sinha & S.K.Roy.  
Design of Bridge Structures – Jagadish & Jayaram – Prentice Hall  
Principle & Practice of Bridge Engineering – S.P. Bindra- Dhanpat Rai.

Design Steel Structures- Arya Azmani – Nemchand Bros.  
Design of Steel Structures- Duggal- Tata Mc Graw Hill  
The Steel Skeleton Vol-II Baker, Horne & Heymean- ELBS  
Plastic Design of Steel Frames – Beedle – Jhon Wiley & Sons.  
Advanced Design inStructural Steel – Lothers – Prentice – Hall.

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**Hydraulic Structures**

Code CE 705  
Contacts- 3L + 1T  
Credits: 4

**Diversion Head works:**

Necessity, Difference between weir and Barrage, Type of Weirs, Selection of site , layout and description of each part, Effects of construction of a weir on the river regims, causes of failure of weirs on permeable foundation and their remedies.

Regulation and silt control at head work.

Theories of seepage and Design of weirs and Barrages:

**Failure of Hydraulic Structures Founded on Pervious foundations:** i) By piping ii) By Direct uplift, Bligh's creep theory of seepage flow , Lane's weighted creep theory, Khoslas theory & concept of flownets, concept of exit gradient and critical exit gradient, Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage, necessary corrections, examples.

Hydraulic structures for canals :

Canal falls – necessity, locations, various types and description of each type, Head regulator and cross regulator- location, description .

Cross-Drainage Works:

Necessity, types, selection of a suitable type, Description of each type Design consideration – in brief.

Dam ( General):

Definition, classification of Dams, factors governing selection of type of dam , selection of suitable site for a dam, Salient features of important dams of India.

Earthen Dams :

Introduction, Types of Earthen Dams, Methods of Construction, Causes of failure, Design Criteria, selecting a suitable preliminary section for an earthen Dam, Determination of line of seepage or phreatic line in Earthen Dam , stability of u/s and d/s slopes, seepage control in Earthen Dam, Design of filters, slope protection , examples.

Gravity Dam :

Definition, Typical cross- section, Forces acting on Gravity Dam, Combination of forces for design, Mode of failure and criteria for structural stability of Gravity Dams, Principal and shear stresses. Elementary profile of a Gravity Dam, Concept of High and low Gravity Dam, Profile of a Dam from Practical consideration,

Design consideration of Gravity Dam- in brief. Foundation treatment of Gravity dam Examples.

Spillways, Energy Dissipators and Sillway Gates :

Introduction, Location, Essential requirements, spillway capacity. Components of spillway, Controlled and un-controlled spillways, various types of spillways- description of each type in brief, Energy Dissipation below overflow spillways- Hydraulic jump formation, stilling basins, spillway crest Gates- various types and description  
Of each type in brief. Examples.

Reference:

1. Irrigation Engineering and hydraulic structures By Santosh Kumar Garg. Khanna Publishers.
2. Irrigation , water Resources and Water Power Engg. – By Dr.P.N. Modi, Standard Book House. Post Box : 1074- Delhi-6
3. Water Resources Engineering Principle and practice By Satya Narayana Murthy Challa. New Age ,Internation (P) Ltd. Publishers. New delhi, Bangalore, Chennai , Hyderabad, Kolkata, Lucknow , Mumbai.
4. Design of Small Dams. United States Department of the Interior Bureau of Reclamation.
5. Concrete Danms- By- R.S. Varsney , Oxford & I & H Publishing Co. New Delhi, Bombay , Calcutta.

**Highway Engineering Lab.**

Code CE 794

**Credits –2**

Tests on highway materials – Aggregates- Impact value , los-Angeles Abrasion value water absorption , Elongation & Flakiness Index.

Bitumen & bituminous materials – specific gravity , penetration value , Ductility, softening point, loss on heating, Flash & Fire point test.

Stripping value test

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Design of mix gradation for mix seal surfacing  
Design of B.M. & S.D.B.C. Mix  
Marshal Stability Test.  
Benkelman Beam Test.

Reference:

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

**Computer Lab.**

Code : 795

**Credits: 2**

Curve fitting , Straight line fitting by method of least squares

Matrix Applications.

- a) Solution of simultaneous equations.
- b) Integration, Trapezoidal rule, Simpsons Rule, Gauss-Quadrature.
- c) Application Programs.
  - i) Bearing Capacity Coefficient
  - ii) Stability of slopes

Application programs in hydraulics and fluid mechanics

- a. Coefficient of permeability for flow through layered soil,
  - i) Parallel to layers.
  - ii) Perpendicular to layers
  - iii) Pipe Net work solution

Application programs in Structural Engineering:

- a. **SF** and **BM** at different sections of a simply supported beam with different loading conditions.
  - b. Design of rectangular sections of RCC beam.
    - i) Limit State method.
    - ii) Working Stress method.

Demonstration packages like Auto CAD, STAAD etc.

Reference:

1. Weben Systems Inc- C Language user's Hand book '-Galgotia
2. Gary bronson – Stephen Menconi- 'Fundamentals of C Programming.

**Soil Mechanics Lab.-II**

Code-CE796

Credit –2

1. Determination of compaction characteristics of soil by light compaction.
2. Determination of compressibility characteristics of soil by Pedometer test ( co-efficient of consolidation & compression Index)
3. Determination of unconfined compressive strength of soil ( Samples to be collected from field)
4. Determination of Shear parameter of soil by Direct shear test

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- ( Samples to be collected from field).
5. Determination of un raised shear strength of soil by venue shear test.
  6. Determination of shear parameter of soil by Triaxial test  
( Samples to be collected from field )
  7. Determination of CBR of a soil specimen ( unsoaked) as per IS code recommendation.
  8. Determination of CBR of Soil specimen (Soaked) as per IS code recommendation.
  9. Standard Penetration Test.
  10. Field vane shear test.
  11. Penetration of P late load test .
- Expt No.9 & 10 to be conducted by large groups in the field .

Reference:

1. Soil testing by T.W. Lamb ( Joh willey)
2. SP-36 (Part-I & Part –II )
3. Measurement of engineering properties of soil by E.Jaibaba Reddy & K. Ramasastrri.

**VIII SEMESTER**

**Traffic Engineering & Planning**  
**Code – CE 801/1**

Contact – 3L + 1T

**Credits- 4**

**Introduction :** Traffic Engineering.

Traffic Characteristics: Road user, vehicular, Road.

Traffic studies : Volume, speed, origin-destination (O – D)

Flow, Capacity, Parking, Accident.

Traffic planning : Relationship, between speed Travel-time, volume , Density and capacity, Traffic Projection.

Traffic Operations: Regulations, Control Devices.

Traffic Control Devices : Signs, Signals, Markings, Islands, Road Lights.

**Reference:**

Highway Engineering by Khanna and Justo

- - Highways by O'Flaherty

Traffic and transport planning by L.R. Kadiyali

I.S. specifications on concrete, aggregates and bituminous mater

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**Pre stressed Concrete**  
**Code – CE –801/2,**  
Contact – 3L + 1T  
Credits – 4

Introduction – Basic principles, Types of prestressing-Behaviour in flexure.  
Materials used and their properties-concrets, High strength steel-Specifications I.S. Code provisions-Lossessin prestressing.  
Analysis of Beams for flexure funder working ultimate loads-examples.  
Methods advocated by Lin. Manel.  
Design of sections for flexure under working and ultimate loads-Cable profile – examples.  
Shear and Bond. Design for same, Anchorage Bones , Deflections. Statically determinate cases like poles columns. Indeterminate  
Beams-Load Balancing method, Analytical Method Design – cable profile – Anchorage Zones.  
composite Structures, partial prestressing and non prestressed reinforcement , circular prestressing.

**Reference:**

Prestressed concrete – N. Krishnaraju  
Prestressed concrete structures – P. Dayaratnam  
Fundamentals of Prestressed concrete – N.C. Sinha and S.K. Roy  
Prestressed concrete – S. Ramamrutham  
Design of prestressed concrete structures – T.Y. Lin and Ned H.Burns.  
Modern prestressed concrete – Libby  
IS -1343

**Environmental Pollution and Control**  
**Code – CE 801/3**  
Contact- 3L + 1T  
**Credits- 4**

Introduction : Environment , Ecosystem, Ecological Balance, Impact, Pollution ,control. Pir Pollution : Pollutants, Effects,  
Sources, Dispersion, Lapse Rate, Inversion, Impact of wind, atmospheric pressure moisture and precipitation on dispersion  
Of air pollutants, Design of stack height. Air Pollution Control: self Cleansing properties of the environment. Dilution method,  
Installing engineering devices, control of partuculate pollutants, control of gaseon pollutank, controlling air pollution from  
automobiles.  
Water pollution : Pollution characteristic of certain typical  
Industries, Suggested Treatment.  
Environmental Impacts: Thermal Power Plant, Mining, Radioactivity. Global Environmental issues : Osone depletion, Acid rains  
Global Warming- Green House Effect.  
Moise Pollution: Definition, effect Characteristics measurement. Levels, sources, control.  
Administrative control on Environment  
Water Act 1974 , Water less Act. 1977, Air Act 1981. The Environmental Act, 1986 , Motor Vehical Act. 1988.

**Reference**

Enviornental engineering- S.K.Garg – Khanna Publisher  
Water Supply , Waste Disposal &Enviornental Pollution Engineering – A . K . Chatterjee – Khanna Pub

**Advanced Foundation Engineering**  
**Code – 801/4**  
**Contact- 3 L + 1T**



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**Credits- 4**

1. Brief review of soil exploration : Preparation of borelog. Geophysical exploration : Seismic refraction survey electrical resistivity method , No and depth of bore holes, soil investigation report.  
2. Shallow Foundations : Bearing Capacity from SPT CPT , field load tests bearing capacity of foundation with uplift or tension forces. Safety factors in foundation design.  
Foundation Settlement : Immediate settlement, size effect on settlement and bearing capacity, consolidation settlement, proportioning of footing based on equal settlement.  
3. Deep Foundations : Pile : Tension piles, Laterally loaded piles, lateral modulus of subgrade reaction pile groups, settlement of pile groups, pile caps, batten piles, Negative skin friction.  
Drilled piers : Analysis and design of drilled piers, settlement of drilled piers.  
Caissons : Types, Caisson design Sinking and control.  
4. Retaining walls and sheet pile structures.: Gravity cantilever and counter fort retaining walls: Stability checks and design, cantilever sheet piling. Anchored sheet piling. free and fixed earth support , Route's amount reduction to free earth support , sheet pile anchorages.  
5. Design of foundation for vibration control : elements of vibration theory, vibrating base , soil springs and damping constants, dynamic soil parameters, embedment effect on dynamic base response . general consideration in designing dynamic bases.  
6. Earthquake effects on soil foundation system:  
Influence of soil condition on shaking intensity and structural damages , ground settlement , liquefaction potential and on landslides.

Reference:

1. Foundation Analysis & Design By J.E. Bowels ( Mc Graw Hill)
2. Principles of Foundation Engg. By B.M. Das (PWS Publishing)
  
3. Construction and Geotechnical Methods in Foundation Engineering By – R. M. Koener (Mc Graw Hill Publications )
  
4. Hand Book Of Machine Foundation. By –P, Sirinivashu &C.V. Vaidyanathax (TMGH )
5. Earthquake Resistant Design, BY D.J.Dorcoick (John Wiley & Sons )
6. Relevant Is Codes -IS –1904, IS 8009, IS –1893, IS 2911 etc

**Finite Element Analysis**

**Code –CE801/5**  
**Contacts 3L + 1T**

Credits- 4

Basic concepts :

Matrices related to structural analysis:

Solution of simultaneously linear equation , Gaussian Elementation Method , LOL decomposition.

Different storage Half band width and skyline.

Structural Analysis – Flexibility and stiffness method.

Elements of Elasticity- Two dimensional problems, Plate bending etc.

Energy Principles: Principle of virtual works principle of Minimum potential energy.

Principle of minimum complementary functional energy.

Weighted residual methods- Governing differential equations of beams & plates and their finite difference force . Concept of discretification .

Finite Element Method:

Displacement approach- Element, Trust element etc.

Isoparametric Elements- Shape function, natural co-ordinates.

Numerical integration Technecques.

4 - Nodal Iso parametrics element.

8 –Nodat Iso parametrics element.

Plane elasticity problems- Plate stress problems, Plane strain problems

Different Triangular Elements CET, LST etc.

Plate Bending problems- General formulation Triangular Plate

Bending Rectangular plate bending elements etc.

Reference:

1. Energy and Finite Element methods in Structural Mechanics – Z.H. Shames and C.L. Dym (New Age International Publishers Ltd. Wiley eastern Ltd. , India.)
2. Matrix Finite Element computer and Structural analysis- M. Mukhopadhayay,(Oxford & IBM)
3. Finite element analysis – C.S. Krishnamurthy( TMH – Tata Mc Graw Hill.
4. Finite element method – by R.D. Cook.
5. The finite element method- Vol.I & II – O.C.Zienkarcz & R.L. Taylor Mc Graw Hill – New York

**Computer Aided Design and Applications In  
Civil Engineering**

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**Code :CE-801/6**  
**Contact : 3L + 1T**  
**Credits : 4**

Various aspects of programming – Compiled and interpreted programs – interactive programs – Modular programs – Modular programming – Program planning and sequencing – Object oriented programming – Parallel computing techniques Programming in C/C++ Modules and Functions – Declarations and displays ; The decision control structure; Arrays ; Structures Programs for matrix operations.

Application programs to solve problems in Civil Engg. Areas for

Solution of simultaneous equations.  
Methods for numerical integration  
Best fit – straightline using method of least squares  
Curve setting by Rankines method  
Average permeability for flow through layered soils  
Calculation of bearing capacity factors of soil  
Computation of moment of resistance of RC sections using working stress method  
Generalised programme to find maximum span moment and points of contraflexure for simply supported beam.

Computer aided design : Stages in structural design – Structural planning – Analysis of structure – Design of structural elements and programming aspects – Detailing of reinforcement and preparation of schedules.  
Flow chart, and programs for Limit state theory for RC members – Flexure, shear and torsion – Serviceability, Bond

Selection of Number – diameter combination of bars  
Number of rows of bars for given number diameter combination of bars and breadth of beam.  
Selection of diameter – spacing – combination of bars.  
Design constants for balanced section.  
Interpolation of stresses from strains.  
Check for service ability  
Check for development length  
User selection of diameter – spacing of stirrups.

Flow charts and programmes for Design of beams, slabs and columns

Design of a beam section  
Design of shear reinforcement  
Design of one way slab  
Design of two way slab  
Design of axially loaded short column  
Design of column subjected to axial compression and uniaxial bending.

**References :**

Weben Systems Inc. ‘C language user’s Hand book’ – Galgotia  
Computer Aided design in reinforced concrete – V.L.Shah – Structures Publishers  
Gary bronson & Stephen Menconi – ‘Fundamentals of C programming – A first book of C’ – Jaico.

**Soil Dynamics & Machine Foundations**

**Code CE 801/7**

Contact 3L +1T  
Credits: 4

Introduction : Basic design criteria, permissible amplitudes, soil parameters in the design of machine foundations.

Theory of Vibrations : Free and forced vibration of single degree of freedom system with and without damping, two degrees of freedom with and without damping, Natural frequency and resonance and its effects.

Dynamic soil properties ; Insitu measurement, field tests, I.S. code method, elastic half space theory to evaluate soil properties.

Foundation Under Reciprocating Engines : Principles and design considerations, I.S. code specifications. Unbalanced internal forces, Vertical Two cylinder engine, Multicylinder Dynamic analysis of vertical compression.

Deep foundation : Design criteria, Mathematical model, Lumped parameter model, stiffness and damping of piles and pile groups.

Machine Foundations for Generators : Design consideration and applications.

Isolation Techniques : Active and passive isolation, absorbers, principles and design considerations, methods of decreasing vibrations of existing foundations.

**References :**

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Barkan D.D, 'Dynamics of bases and foundations.' McGraw Hill, 1962  
Prakash S., 'Soil Dynamics', McGraw Hill, 1991.  
Major A., 'Vibration analysis and design of foundations for machines and turbines.' 1967.  
I.S. Codes : 5249 – 1978, 2974-1970.  
Richart F.E., Hall J.R. and Woods R.D., 'Vibrations of soils and foundation', Prentice Hall, 1970.  
Das, B.M., 'Fundamentals of Soil Dynamics', New York, Elsevier.  
'Analysis and design of foundations for vibrations', Edited by Moore, P.J., Oxford and IBM Publishing Company.

**Advanced Structure**  
**Code- 802/1**  
**Contact-3L+1T**  
**Credits-4**

Analysis of moment Distribution for non prismatic method:  
Tapered beam , doubly tapered beams, tapered beams with hinge at center . Use of relevant tables for various cases.  
Translational moment distribution- Cantilever , different cases, problems symmetry , Antisymmetry for vierendeel Girders etc.,  
problems .Effect of axial forces and shear force in moment distribution – beams with flexible connections, Different cases,  
problems.

Influence lines for statically indeterminate cases, Moment Distribution techniques- Buckling, Elastic & Inelastic problems,  
energy methods, methods of successive approximation , compression flange, Beams on Elastic foundation- Beams of unlimited  
length , semi infinite beams, finite beams.  
Non liner ( Non hooken) – Redundent structures , problems.  
Matrix method- Stiffness and flexibility approach Indeterminate cases problems.  
Model analysis : Direct and Indirect method of model analysis.

Reference:  
Advanced Theory of Structures – by N.C.Sinha ,P.K.Gayen  
Dhanpat Rai Publications ( P ) Ltd.  
Advanced Structural Analysis by Genaro  
Analysis of Engineering Structures by Pippard & Baker.  
Advanced Strength of Materials by Timoshenko.  
Advanced strength of Materials by Murphy  
Analysis of Grid Frames by Henry and Jaeger  
Static Structures by Matheoson Vol. I & II.  
Matrix method of Structural Analysis by C.K.Wang  
Theory of Structures by Timoshenko & Young  
Statically Indeterminate Structures by Paul Anderson  
Matrix Method of Structural Analysis – by Pandit & Gupta  
Advanced Mechanics of materials by Boresi and O.M.Sidebottom  
Theory of Structures by A.S.Anand.

**Structural Dynamics**  
**Code – CE 802/2**  
**Contacts-3L+1T**  
**Credits-4**

Introduction : Dynamic disturbances – Earthquakes, blasts, oscillating machines, wind gust etc., response of structures,  
Definitions and fundamental aspects of periodic motion, Newton's law of motion  
Albert's principle,different types of damping.  
Vibration of structures with single degree of freedom :  
Degrees of freedoms and modes of vibration : Undamaged and damped free vibration,Undamaged and damped forced vibrations  
due to harmonic excitation.  
Response to unbalanced machinery: Response to harmonic excitation ,force transmulated to the foundation and base isolation.  
Response to architrary periodic excitation- Fourier analysis.  
Response to non periodic arbitrary, step and pulse excitations-  
Convolution integral and time stepping methods.  
Response spectra-Definition , characteristics, construction and peak structural response.  
Generalised single degree of freedom system and Rayleigh's method.  
Vibration of strctures with multi degrees of freedom:  
Two degrees of freedom system- a single mass structure : Coupled Extension rocking mode, coupled flemoral torsional mode  
mix and coubled flexural rocking mode, two mass structures.  
N- degrees of freedom system.  
Nodal – analysis and structural response .  
Vibration of beams: Transverse-bending deformation , shear deformation and rotatary inertia,axial and torsional.  
Energy method.  
Rayleigh's method, Variational approach – Largrange equation.

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Reference:

1. Elementary Structural Dynamics – by V.K. Manicks Selvam.
2. Advance Structural Dynamics by V.K. Manick Selvam.
- 3 Dynamics of Structure – Clough and J. Penzien
- 4 do- Thomson.
- 5.- do- MarioPaz.
- 6.- do- A.K.Chopra.
7. -do- Timoshehenko and Young

**Soil Stabilisation and Ground Improvement**  
**Code CE-802/3**  
**Contact – 3L + 1T**

Credits-4

**1. Soil Stabilisation** : Introduction , Stabilisation of soil with granular bearing skeleton and otherwise soil without granular skeleton, common nomenclature of stabilization soil systems and stabilization methods, specific methods of soil stabilization: Stabilisation with cement, lime flyash and bitumen.

**2. Insitu densification** : Introduction, Compaction : methods and controls **densification of granular soil**: Vibration at ground surface , Impact at ground surface vibration at depth, Impact at depth.  
Densification of Cohesive Soils : Preloading and devotoring Band drains and stone columns, dectrical and thermal methods.

**3. Geotextiles** : Over view, Geotextiles as separators , reinforcement. Geotextiles in filtration and drainage, geotextiles in erosion control.

**4. Grouting** : Over view , suspension and solution grout, grouting equipment and methods , grout design and layout grout monitoring schemes.

5. Soil stability : Rock anchors, soil tistacks, soil nailing. Reinforced earth , undapinning.

**Reference:**

- M.R.Hausmann (1990), Engineermg Principles of Ground Modificaitons, McGraw Hill Publishing Co.  
Shroff. A.V & Shah D.L.(1986), Grouting Technology in tunnelling and dam construction, Oxford and IBH Publishing Co.Pvt.Ltd., New Delhi.  
Koerner. R.M. (1986) Designing with Geosynthetics'. Prentice Hall.  
Jones C.J.F.P (1985), Earth Reinforcement and structures', Butter Worths, London  
Rankilor P.R. (1981), Members in ground Engineering,' John Wiley and Sons.  
Koerner R.M. (1984), Construction and Geotechnical methods in foundation engineering.' McGraw Hill, New York.  
Ingold T.S. & Miller K.S. (1988), Geotextile Hand Book,' Thomas Telford Ltd.

**Bridge Engineering**

Code – CE 802/4

**Contact- 3L + 1T**

**Credits- 4**

Loading standards- I.R.C Loads, Analysis of IRC loads, Impact Factors . Different other loads to be considered.

I.R.C. code provisions. Importance of Hydraulic factors in Bridge design .

Reinforced concrete solid slab bridge- General design features.

Effective width method. Simply supported slab bridge and cantilever .

**Slab bridge** – Analysis and Design.

**Box culverts**- Introduction, Design method. Beam and slab bridges-Introduction, Pigeandr method, D3esign of interior panel of slab, longitudinal girdam Gyon- Marsonent method, Mendry- Jalgar method. Courbon's theory – Design examples.

Balanced cantilever bridges- General features . Arrangement of supports . Design features. Shear variation. Articulation . Design examples.

Plate girder bridges- Introduction. Elements of plate girder and their design . Lateral bracing – Design Example.

Steel trused bridges- General features. Types of trusses. Design features. Design examples.

Composite bridges – General aspects , shear connectors , Design principle.

Cable stayed bridge – General features . Components of cable stayed bridge . Design features.

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**Reference:**

Principles & Practice Of Bridge Engineering - S.P.Bindra –Dhanpat Rai Pub.  
Design Of Bridge Structures -T.R. Jagadesh , M.A.Jayaram.  
Essentials of bridge engineering by D.J.Victor  
Bridge engineering by Krishnaraju  
Bridge engineering by Ponnuswamy  
Design of concrete bridges by Aswani, Vizirani, Ratwani  
**Design of steel structures by Arya & Ajmani**  
Concrete structures Vol. IV by Vazirani & Ratwani  
Structures design and drawing by Krishnamurthy.  
IRC Codes

**Water Resources Management**  
**Code – CE-802/5**  
**Contact-3L +1T**

Credits-4

Planning and analysis of Water Resource Systems- Introduction , System Analysis . Engineers and Policymakers, characteristics of systems analysis applications.

**Methods of Analysis:**

Introduction, Evaluation of Time streams of Benefits and Costs.Plan formulation, Planning models and solution procedures , lagranges Multipliers, Dynamic programming , Recursive equations , Principle of optimality, Bellmans', principle of optimality. Curse of dimensionality of discrete dynamic programming . Examples.

**Reservoir operation :**

Sequential process, single Reservoir problem- with release as decision variable with storage as decision variable ( deterministic approach).Examples, Related Computer Programming.

Multi-reservoir problems ((Deterministic approach), Computer programming

**Water Resources Planning under Uncertainty:**

Introduction, probability concepts and Methods- Random variables and Distributions, univariate probability Distributions, properties of Random variables – Moment and Expectation ( Univariate Distributions),Moment Generating Functions, Measures of Central tendency, Measures of Disperation, Measures of symmetry (Shakeness) , measures of peakadness (kurtosis) examples.

**Stochastic River Basin Planning Model :**

Introduction , Reservoir operation, Stochastic Dynastic programming operating Model, probability Distribution of storage volumes and Releases, examples.

**Water quality management:**

Prediction and Simulation, water quality Management Modeling.

**Reference:**

Applied Hydrology by V.T.Chow  
Hydrology by Raudkivi  
Stochastic hydrology by Jayarami Reddy

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Water Resources Engg. M.C. Chaturvedi  
Water Resources Systems Planning & Analysis –By Ddenice P Loucks ,Jery R Stedinger &Douglas A Heinth – Prentice Hall  
,Inc New Jersey

**Remote Sensing Applications In Civil Engineering**

**Code :CE-802/6**  
**Contact : 3L + 1T**  
**Credits : 4**

Introduction, Ideal Remote Sensing system, EM spectrum, atmospheric windows, Ranges of sensing system, Spectral signatures, Type of sensors, Radar

Basic principles of photogrammetry, Areal photography, Interpretation, various applications like water resources, Terrain Evaluation, Forestry, Agriculture, Landuse, Viisual interpretation, groundwater verification Radiometer.

Multispectral, Multitemporal, Multistage concept, Satellite images, FCC, Digital image processing, Image restoration, image enhancement, False color imagery

Pattern recognition and Digital signal processing, Basic introduction, Band interieave method, Clustering analysis, Statistical techniques

Applications of Remote Sensing to Civil Engg. Problems like cloud cover, Surface water hydrology, river drainage and flood flow. Watershed mapping, Groundwater inventory, Soil mapping, Soil moisture mapping, Land use & Land cover mapping, Drought assessment, Coastal processes, Urban studies, Disaster warning system.

Introduction to GIS, Advantages, Data storage and retrieval & monitoring in GIS desmonstration of typical GIS tool/software

References ;

Remote Sensing & Image interpretation – Lilles & Kieffer  
Remote Sensing in Civil Engg – Mather  
Remote Sensing Principles – Sabines  
Introduction of RS-KK Rampal

**Optimization Technique in Civil Engineering**

Code-CE-802/7  
Contact – 3L + 1T  
Credits-4

Theory :

Introduction : Engineering applications, Statement of the problem, classification of optimization problems and optimization techniques.

Classical optimization Techniques:

Single variable , multivariable with no constraint with equality constraints and with inequality constraints.

Linear Programming I : Simplex method – solution of a system of linear simultaneous equations , pivotal reduction of a general systems of equations, simplex algorithm.

Linear Programming II : Revised simplex method.

Non linear programming I : One-dimensional minimization method- a) Elimination method.  
b) Interpolation method.

Non-linear Programming- II : Unconstrained optimization techniques. Direct Search methods, Random search methods, univariate method, Pattern search method.

Descent methods- steepest descent method , conjugate grandout method , variable metric method.

Non-linear Programming III : Constrained optimization Techniques , Direct method and Indirect methods.

Applications:

Introduction :Optimum Design Methods and Classifications.

Mathematical Modelling : Design variables, objective functions, constraints etc.

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Sequential linear programming : Cutting plane method & non limit method.

Optimum Design of reinforced concrete structures – Isolated column fortings, retaining walls, Intze water tank silos, shells etc.

Optimum Design of steel structures – Trusses, Transmission Towers etc.

Reference :

1. Optimization theory and applications - SS Rao (Wiley Eastern Limited).
2. Structural optimization using sequential linear programming – SS Bharikatti ( Vikas publishing house Pvt. Ltd. New Delhi)
3. Optimum structural Design – R H Galle ghear and OC Zienkuricz ( Wiley)

**Construction Management and Technology**

**Code –CE 803**

**Contact- 3L+ 1T**

**Credits –4**

Planning : General consideration , Definition aspect, prospect, roominess, grouping, circulation privacy, acclusion.

Regulation and Bye laws : Bye Laws is respect of side space, Back and front space , Cavared areas, height of building etc., Lavatory blocks , ventilation .

Requirements : for stair lifts in public assembly building, offices,

Fire Protection :- Fire fighting arrangements in public assembly buildings, planning , offices, auditorium.

Construction plants & Equipments:- Plants & equipments for earth moving , road constructions, excavators, domers, scrapers, Spreaders, rollers, their duses, choices. Plants &Equipments for concrete construction :- Batching plants, concrete winers, Vibrators etc., quality control.

Planning & Scheduling of constructions Projects :-

Planning by CPW & PEART,Preparation of network, Determination of slacks or floats. Critical activities. Critical path, project duration . expected mean time , probability of completion of project, Estimation of critical path, problems.

Management : Professional practice, Defination, Rights and responsibilities of owner, engineer, Contractors, types of contract, Invitation of tender, tender notice, acceptance of tender Arbitration.

Reference:

P.P.Dharwadkar, 'Management in construction industry'. Oxford and IBH Publishing company New Delhi (1979)

J.O.Brien, 'Construction Management', Critical path Methods in Contraction', Wiley Interscience. (1966)

Puerifoy, R.L. 'Construction Planning, Equipments and methods', McGraw Hill. (1973)

B.C.Punmia and K.K.Kandelwal, 'Project planning and control with PERT and CPM' (1977)

PWD codes A and D code.

PERT and CPM by L.S. Srinath

Construction equipments and its management by S.C.Sharma

**Estimation, Specification, And Departmental Procedure**

**Code : CE – 804**

**Contact : 3L + 1T**

**Credits : 4**

Definition – Types – Methods of estimating – Units of measurements –taking out quantities – Detailed estimate for the following : Single room building, double room building with and different thickness of walls, residential and public buildings (single storeys and double stories) – Slab culvert – pipe culvert – Elevated rectangular water tank Computer application for quantity surveying.

Detailed specifications for building items such as earthwork, foundation, flooring, RCC roof, brick masonry plastering, pointing, white and colour washing, distempering

Analysis of rates for the following items of works – Foundations – Brickmasonry for walls, RCC roof, flooring and flooring finishes – Plastering, painting, white and colour washing.

Departmental procedure – Administration, technical and financial sanction – Operation of PWD and other public sector Organisations – Tender and its notification, EMD and SD – Different methods of execution of works, Modes of payments to contractors – Arbitration – Appointment – award – fees

References :

1,2,3 Estimating and costing by Chakraborty / Datta or Birdi

Madras detailed standard specifications

Standard data book

Elements of estimating and costing by S.C.Rangwala . 'D' code of PWD