West Bengal University of Technology  
BF – 142, Salt Lake City, Kolkata – 700 064
Civil Engineering Revised Course Structure upto 8th Semester, 2007
Remaining syllabus will be published soon
(To be applicable for the students who admitted in the session July 2005-2006)

STRUCTURE

Semester III

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TOTAL OF SEMESTER 30 28
West Bengal University of Technology
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Semester IV

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**TOTAL OF SEMESTER**  
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Semester VI

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ELECTIVE – I

Advanced Transportation Engineering  CE 801/1
Environmental Pollution and Control  CE-801/2
Advanced Structural Analysis  CE-801/3
Advanced Foundation Engineering  CE 801/4
Remote Sensing and GIS  CE-801/5

ELECTIVE – II

Soil Stabilisation & Ground Improvement Technique  CE-802/1
Bridge Engineering  CE-802/2
Water Resources Management & Planning  CE 802/3
Prestressed Concrete  CE-802/4
Structural Dynamics & Earthquake Engineering  CE-802/5
SYLLABUS

Semester III

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


(8)

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.

(12)

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.

(8)

Distribution: Binomial, Poisson, Uniform, Normal, Gamma, Chi-square and Exponential. Simple problems.

(8)

Text Books:


Reference Books:


Fluid Mechanics
Code: CE-302
Contact: 3L + 1T
Credits: 4

Fluid Statics: Forces on plane and curved surfaces. Center of pressure, buoyancy and stability of floating bodies.

(3)
Discharge measuring devices: Application of Bernoulli’s equation- 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.

Fundamentals of open channel flow: Scope and importance, characteristics of openchannel flow, distinction between pipe flow and open channel flow, Types of flow: Steady, Unsteady; Uniform, Non uniform, Gradually varied flow, Rapidly varied flow.

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


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

Buckingham Pi Theorem: Statement and application.

Geometric, Kinematic and Dynamic similarity.

Introduction to Hydraulic Turbines (Pelton & Francis turbine) and Pumps (centrifugal & reciprocating)

Reference Books:
1. Fluid Mechanics by Modi & Seth Standard Book House, 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: Chain and its types, optical square, cross staff. Reconnaissance and site 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.
Compass surveying: 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.

(8)

Plane table surveying: Equipment, leveling, orientation, different methods of survey, two and three point problems, errors and precautions.

(4)


(8)


(4)

Minor Instruments: Clinometers, Planimeter (mechanical and digital)

(3)

Books recommended

1. Surveying – Vol I & II B.C. Punmia
3. Fundamentals of surveying – S.K. Roy (Prentice Hall India)
4. Surveying By A. Dey [PHI]
5. Plane and Geodetic surveying Vol I & II – David Clark
6. Advanced surveying – Norman Thomas
7. Advanced surveying – Som & Ghosh

Structural Mechanics
Code: CE-304
Contact: 3L + 1T
Credits: 4

Fundamental of Stresses: Simple stresses and strain, modulus of elasticity, modulus of rigidity, bulk modulus, their relationship, strain energy due to direct stresses, impact loads, shearing stresses, factor of safety, permissible stress, proof stress.

(5)

Beam Statics: Support reactions, concepts of redundancy, definitions, axial force, shear force and bending moment diagrams for concentrated, uniformly distributed, linearly varying load, concentrated moments in simply supported beams, cantilever and overhanging beams.

(7)

Symmetric Beam Bending: Basic kinematic assumption, moment of inertia, elastic flexure formulae and its application, moment carrying capacity, Shear stress Distribution in beams section.

(6)

Deflection of beams by Double Integration: Elastic curve, moment Curvature relationship, governing differential equation, boundary conditions, direct integration solution for simple beams.

(4)
Torsion: Pure torsion, torsion of circular solid shaft and hollow elastic bars, torsional equation, torsional rigidity, closed coil helical spring. (4)

Two Dimensional Stress Problems: Principal stresses, maximum shear stresses, Mohr’s circle of stresses, construction of Mohr’s circle (5)

Introduction to thin cylindrical shells: Hoop stress and meridional stress and volumetric changes. (2)

Columns: Fundamentals, criteria for stability in equilibrium, column buckling theory, Euler’s load for columns with different end conditions, limitations of Euler’s theory – problems, eccentric load and secant formulae, Rankine & IS code formulae (5)

Books recommended

- Engineering Mechanics of Solids By E. P. Popov [PHI]
- Strength of Materials By S S Bhavikatti [Vikas Publishing House Pvt. Ltd]
- Strength of Materials By R. Subramanian [OXFORD University Press]
- Elements of Strength of Material By S. P. Timoshenko & D. H. Young [EWP Pvt. Ltd]
- Strength of Material By A. Pytel & F. L. Singer [AWL Inc]
- Strength of Material By Ramamrutham
- Engineering Mechanics I by J. L. Mariam [John Willey]
- Engineering Mechanics I by I. H. Shames [PHI]

Engineering Geology
Code: CE-305
Contact: 4L
Credits: 4

Geology and its importance in Civil Engineering. (2)

Mineralogy: Definition, internal and external structure of minerals, study of crystals, Classification and physical properties of minerals. (3)

Classification of rocks. (4)

a) Igneous rocks: Origin, mode of occurrence, forms & texture, classification and engineering importance.
b) Sedimentary rocks: Process of sedimentation, classification and engineering importance.
c) Metamorphic rocks: Agents and types of metamorphism, classification and engineering importance.

Weathering of rocks: Agents and kinds of weathering, soil formation & classification based on origin. (2)

Geological work of rivers: Origin and stages in the system, erosion, transportation and deposition. (1)

Structural geology: Introduction to structural elements of rocks, dip & strike, definition, description, classification of folds, faults and joints, importance of geological structures in Civil Engineering. (4)

Earthquakes and seismic hazards: Causes and effects, seismic waves and seismographs, Mercelli’s intensity scale and Richter’s scale of magnitude. (3)
Engineering properties of rocks: Porosity, permeability, compressive strength, tensile strength and abrasive resistance. (3)

Rocks as construction materials: Qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing. (3)

Geophysical exploration: Methods of Geophysical Exploration, electrical resistivity method field procedure – sounding and profiling, electrode configuration, interpretation of resistivity data. Geophysical surveys in ground water and other Civil Engg. Projects. (4)

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. (4)

Landslides: Types of landslides, causes, effects and prevention of landslides. (3)

Reference Books:

Building Material and Construction
Code: CE- 306
Contact: 4L Credits: 4
Materials of Construction

Bricks – classification – characteristics – Testing of bricks as per BIS . (2)

Aggregates: Types, Classification and Characteristics (3)

Lime: Types, composition, Manufacturing, Properties – Hydration (2)

Mortars: Classification and characteristics – Types and uses (2)

Cement: OPC – Composition . (3)

Concrete: Types – Ingredients – uses . (2)

Wood and wood products: Structure, characteristics of good timber, defects, seasoning, decay & its 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. (4)
West Bengal University of Technology  
BF – 142, Salt Lake City, Kolkata – 700 064  
Civil Engineering Revised Course Structure upto 8th Semester, 2007  
Remaining syllabus will be published soon  
(To be applicable for the students who admitted in the session July 2005-2006)


Building Construction

Foundations: Types of foundations [definitions and uses]: Spread foundations, Piles and Well foundation (3)

Brick Masonry: Rules for bonding; stretcher bond, header bond; English and Flemish bonds for one, one and a half brick thick walls. (2)

Walls, Doors and Windows: Load bearing and partition walls reinforced brick walls; common types of doors and windows of timber and metal. (2)

Stairs: Types; R.C. Stair cases with sketches; Elevation and Cross section, Design principles and design of a dog-legged stair case. (3)

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 (2)

Plastering and Painting: Plastering with cement and lime mortar; White-washing, colour washing and distempering; Painting: New and existing wood and metal work. (2)

Flooring: Cement concrete, terrazzo, Mosaic, marble and tiled flooring (2).

Precast Element : Types and uses . (1)

Recommended Books

1. Building materials – S.K. Duggal
2. Building materials – P. C. Varghese [Prentice Hall of India]
4. Concrete Technology – M.S. Shetty
6. Building Construction by B.C.Punmia
7. Building Construction and Foundation Engineering by Jha and Sinha

References:
National Building Code

Geology Lab
Code: CE- 395
Credits -2
Study of crystals with the help of crystal models
Identification of Rocks and Minerals [Hand Specimens]
Microscopic study of Rocks and minerals
Study of Geological maps, interpretation of geological structures Thickness problems, Bore-hole Problems
West Bengal University of Technology
BF – 142, Salt Lake City, Kolkata – 700 064
Civil Engineering Revised Course Structure upto 8th Semester, 2007
Remaining syllabus will be published soon
(To be applicable for the students who admitted in the session July 2005-2006)

Structural Mechanics Lab

Code: CE- 394
Credits -2

Tension test on Structural Materials: Mild Steel and Tor steel (HYSD bars)
Compression Test on Structural Materials: Timber, bricks and concrete cubes
Bending Test on Mild Steel
Torsion Test on Mild Steel Circular Bar
Hardness Tests on Ferrous and Non-Ferrous Metals: Brinnel and Rockwell Tests
Test on closely coiled helical spring
Impact Test: Izod and Charpy

IV SEMESTER

MATHEMATICS-II
Code-CE-401
Contact- 3L + 1T
Credits- 4

Interpolation and application, finite differences, Newton Gregory and Lagrange's interpolation formulae,
Inverse interpolation. Fundamentals of error expressions in interpolation formulae, Numerical
method of least squares'
(10L)

Numerical solution of algebraic and transcendental equation using methods of ordinary iteration, Regula-
Falsi and Newton-Raphson, condition for convergence and rate of convergence. Multiple roots polynomial
(10L)

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.
(6L)

Numerical solution of initial value problems in ordinary differential equations by Taylor series method,
Euler's methods of second and fourth orders.
(5L)

The moment generation function and its properties, Fundamental concepts of frequency distribution, mean,
mode, standard deviation and their properties and application.
(5L)

S. A. Mollah “Numerical Analysis and Computational Procedures” Books and Allied Publishers
N. G. Das “Statistical Methods in Commerce, accountancy and economics – Vol 1”
Goon, Gupta and Dasgupta “ Basic Statistics”

Reference Books:
Quantity Surveying, Specification and Valuation
Code-CE-402
Contact- 3L + 1T
Credits- 4

Quantity Surveying: Types of estimates, approximate estimates, items of work, unit of measurement, unit rate of payment, quantity estimate of a single storied building, bar bending schedule, details of measurement and calculation of quantities with cost, bill of quantities, abstract of quantities, estimate of quantities of road, underground reservoir, surface drain, septic tank. (16 L)

Analysis of rates: Earthwork, brick flat soling, DPC, PCC and RCC, brick work, plastering, flooring and finishing, (6L)

Specification of materials: Brick, cement, fine and coarse aggregates (2L)

Specification of works: Cement concrete, reinforced cement concrete, first class brickwork, cement plastering, pointing, white washing, colour washing, distempering, lime punning, painting and varnishing (6L)

Valuation: Values and cost, gross income, outgoing, net income, scrap value, salvage value, market value, Book Value, sinking fund, capitalised value, Y. P., depreciation, obsolescence, deferred income, freehold and leasehold property, mortgage, rent fixation, valuation table. (6L)

References:
“Estimating, costing, Specification and Valuation in Civil Engineering” by M. Chakroborty
Civil Estimating, Costing and Valuation by Agarwal / Upadha
Surveying-II
Code: CE- 403
Contact: 3L + 1T
Credits: 4

Theodolite surveying: Components of a Theodolite, Adjustments, Horizontal and vertical angle measurements, Trigonometric leveling, problems on height and distances, traverse table, co-ordinates

(6L)

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

(6L)

Triangulation: Adjustments of station and figure, Leveling adjustment, Method of equal shifts.

(4L)

Curve surveying:
(1) Simple curves Definition, Notations Designations, Elements of simple curve, Setting out by linear methods and Rankine's tangential method. Two Theodolite and tachometric method,

(6L)

(2) Introduction to Compound and reverse curves, vertical curve: types (2L)

(3) Transition curves: lemniscates, cubic spiral, cubic parabola, setting out

(4L)

Hydrographic surveying: Vertical control Datum: tide measurement, Horizontal Control: Shore line surveying, Sounding: Location of sounding and reduction, Three point problems, Nautical sextant and station pointer.

(4L)

Remote Sensing: Introduction to remote sensing and its application in civil engineering,

(1L)

Photographic Survey: Introduction to terrestrial and aerial photogrametry, determination of true north

(3L)

Reference 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
Surveying –Bannister, Raymond and Baker, Pearson Education
Higher surveying by Norman Thomas
Surveying by Higgins.
Structural Analysis- I  
**Code:** CE- 404  
**Contact:** 3L + 1T  
**Credits:** 4

Determinate plane trusses: Analysis by method of joints, method of section and graphical method.  
(2L)

Analysis of determinate portal frames  
(1L)

Deflection analysis of beams: Area-moment theorem and Conjugate beam theory.  
(3L)

Strain energy: Due to axial load, bending and shear, Torsion; Castiglino's theorems, theorem of minimum potential energy, principle of virtual work, Betti’s law, Maxwell’s theorem of reciprocal deflection, Unit-Load method.  
(6L)

Use of energy principles for deflection analysis of determinate beams, trusses and simple portal frames.  
(6L)

Influence line diagrams: Statically determinate beams and trusses under series of concentrated and uniformly distributed rolling loads, criteria for maximum and absolute maximum moments and shears.  
(8L)

Redundant structures: Concepts of statical and kinematic indeterminancy of beams, trusses and portal frames; Application of second theorem of Castigliano and method of consistent deformation for analysis of propped cantilever, fixed beams and continuous beams (maximum two degree of indeterminacy) for simple loading cases.  
(10L)

Reference books:
- Basic structural Analysis by C.S. Reddy
- Statically indeterminate structures by C.K.Wang
- Elementary structural analysis by Norris and Wilber
- Structures – Schodek, Pearson Education
- Elementary structural mechanics by Tung Au.
- Indeterminate structural analysis by Kinney
- Elastic analysis of structures by Kennedy and Madugula [Harper and Row]
- Structural Analysis Vol.I by S.S.Bhavikatti
- Elementary theory of structures by Jindal
- Structural Analysis by Ramamurtham.

Structural Design- I  
**Code:** CE- 405  
**Contact:** 3L +1T; **Credits:** 4

(2L)

Working stress method of design: Basic concepts and IS code provisions for design against bending moment and shear forces - Balanced, under reinforced and over-reinforced beam/ slab sections; design of
singly and doubly reinforced sections.

(5L)

Limit state method of design: Basic concepts and IS code provisions (IS:456) for design against bending moment and shear forces; concepts of bond stress and development length; Use of ‘design aids for reinforced concrete’ (SP:16).

(5L)


(5L)

Design and detailing of one-way and two-way slab panels as per IS code provisions.

(6L)

Design and detailing of continuous beams and slabs as per IS code provisions.

(3L)

Staircases: Types; Design and detailing of reinforced concrete doglegged staircase.

(3L)

Design and detailing of reinforced concrete short columns of rectangular and circular cross-sections under axial load.

(3L)

Shallow foundations: Types; Design and detailing of reinforced concrete isolated square and rectangular footing for columns as per IS code provisions.

(4L)

Text Books:

SP: 16-1980 - “Design aids to IS: 456”
Reinforced concrete Design by Mallick & Gupta
Reinforced concrete Limit state design by Ashok K. Jain
Limit State Design of Reinforced Concrete by P.C. Varghese
Reinforced Concrete Design by Pillai and Menon [TMH]
Reinforced concrete by S.N.Sinha [TMH]
Reinforced concrete by H. S. Shah.
Reinforced concrete structure by I.C. Syal and A.K. Goel
Design of concrete structures by B.C. Punmia
Concrete Technology – Neville, Pearson Education

Surveying Practice-I
Code: CE- 491
Credits -2;
Contact- 3P

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.

Leveling:
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 leveling.
Sensitiveness of Bubble tube
Permanent adjustment of Dumpy levels – third adjustment (Two peg method).
Contouring
Direct contouring
Indirect contouring – Block leveling
Indirect contouring – Radial contouring
Demonstration of minor instruments.

**Fluid Mechanics Laboratory**
*Code: 492; Credits-2; Contact- 3P*

- Determination of Orifice co-efficient
- Calibration of Orifice meter
- Calibration of V- Notch
- Measurement of velocity of water in an open channel using a pitot tube
- Measurement of water surface profile for flow over Broad crested weir
- Preparation of discharge rating curve for a sluice
- Measurement of water surface profile for a hydraulic jump
- Determination of efficiency of a Centrifugal pump
- Determination of efficiency of a Reciprocating pump
- Determination of efficiency of a Pelton wheel Turbine
- Determination of efficiency of a Francis Turbine
- Determination of efficiency of a Hydraulic Ram

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

**Building Design and Drawing**
*Code: CE- 493; Credits: 2; Contact- 3P*

- 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. Glazed and panelled windows standard sizes, special windows and ventilators
Stairs: Proportioning and design of a dog-legged, open well RCC stair 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, lean-to 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

The designs must show positions of various components and their sizes.

Introduction to drawing by using software package.

References:

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

Numerical Analysis and Computer Programming – I
Code: CE-494;
Credits: 2;
Contact-1L + 2P

Computer language - C: Statements, Numerical input/output; transfer of control, principles of flow charting; sub-routines, file handling and system, programming techniques.


Development of C programme to solve matrix and other numerical problems as mentioned above.

V SEMESTER
SOIL MECHANICS – I
CODE-CE 501
CONTACT-3L+1T
CREDITS-4

Origin & formation of Soil :- Types, Typical Indian Soil, Fundamental of Soil Structure, Clay Mineralogy. (2L)

Soil as a Three Phase System :- Weight- Volume Relationship, Measurement of Physical Properties of Soil: Insitu Density, Moisture Content, Specific Gravity, Relative Density. (5L)

Particle Size Distribution :- By Sieving, Sedimentation Analysis. (3L)
Index Properties of Soil :- Attarberg’s Limits- Determination of Index Properties of Soil by Casagrande’s Apparatus, Cone Penetrometer, Soil Indices. (4L)

Soil Classification :- As per Unified Classification System, As per IS Code Recommendation, AASHTO Classification, Field Identification of Soil, Consistency of Soil. (3L)

Soil Moisture :- Darcy’s Law, Capillarity in Soil, Permeability, Determination of Coefficient of Permeability of Soil in Laboratory, Permeability for Stratified Deposits. (4L)

Effective Stress Principles:- Definition of Effective Stress, Estimation of Effective Pressure Due to Different Conditions, (4L)

Two Dimensional Flow Through Soil :- Laplace’s Equations, Flow nets, Flow Through Earthen Dam, Estimation of Seepage, Uplift due to Seepage, Design of Fillers, Critical Hydraulic Gradient, Quick Sand Condition. (5L)

Stress Distribution In Soil :- Bousinesq’s & Westergaad’s Assumption & Formula for Determination of Stress due to Point Loads, Stress Beneath Line, Strip & Uniformly Loaded Circular - 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. (6L)

References :-

5. SP-36 (Part – I & Part - II).

CONCRETE TECHNOLOGY
CODE-CE 502
CONTACT-3L+1T
CREDITS-4

Concrete as a Structural Material, Good Concrete Manufacture of Portland Cement, Chemical Composition of Cement, Hydration of Cement, Heat of Hydration and Strength, Tests on Cement and Cement Paste – fineness, consistency, setting time, soundness, strength. (6L)

Types of Portland Cement – ordinary, Rapid hardening, low-heat, sulphate resisting, Portland slag, Portland pozzolana, super sulphated cement, white cement (6L)


Quality of Water – Mixing Water, Curing Water, Harmful Contents. (6L)
Properties of Fresh Concrete – Workability, Factors Affecting Workability, Slump Test, Compacting Factor Test, Kelly Ball Test, Flow Table Test, Segregation, Bleeding, Setting Time, Mixing and Vibration of Concrete, Mixers and Vibrators, curing, Methods, Maturity.

Strength of Concrete – Water/Cement ratio, Gel/Space ratio, Strength in Tension, Compression, Effect of Age on Strength, Relation between Compressive and Tensile Strength, Fatigue Strength, Stress Strain Relation and Modules of Elasticity, Poisson’s Ratio, Shrinkage and Creep, Compression Test on Cubes, Cylinders, Non-Destructive Tests.

Admixtures – different types, effects, uses, Retarders and Super plasticizers.

Mix Design by I.S. Code method.

Light-weight, Polymer and Fibre-reinforced concrete.

References:
2. Concrete Technology by M.S. Shetty (S.Chand)
4. Concrete Technology by A.R. Santakumar

Environmental Engineering -I

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

Sources of water: surface water: 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.


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. (8L)

References:
Environmental Engineering - S.K. Garg -Khanna Pub
Water Supply Engineering Volume I by Kshirasagar.
Water Supply and Sanitary Engineering By G.S.Birdi
Water supply engineering by Babbit and Doland
Water supply sanitary engineering by G.S. Birdi

Structural Analysis-II
Code: CE- 504
Contact: 3L + 1T;
Credits: 4

Two hinged arch and fixed arch -application of unit load method,
Castigliano’s method and elastic center method, Influence line for arches. (8L)

Portal frame: Solution by- unit load method, Castigliano’s method. (3L)

Moment distribution method - solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway. (4L)

Slope Deflection Method – Method and application in continuous beams and Frames. Cables & Suspension bridges with three hinged stiffening girders. (4L)

Curved beams- analysis
Hooks, Rings and Bow girders. (4L)

Un-symmetrical bending. (4L)

Column analogy –method, application (2L)

Stiffness and carry over factors for non-prismatic members. (4L)

Kani’s method: application to indeterminate beams and frames. (3L)

References:
Theory of structures: by S.P.Timoshenko
Theory of structures: by S.Ramamurthum.
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 Design- II  
**Code**: CE- 505  
**Contact**: 3L +1T; **Credits**: 4

Design of Steel Structures

**Materials and Specification** :- Rolled steel section, types of structural steel, specifications (1L)

**Structure connections**:-  
(1) Riveted, Welded and Bolted including High strength friction grip bolted Joints. – types of riveted & bolted joints, assumptions, failure of joints, efficiency of joints, design of bolted, riveted & welded joints for axial load.  
(2) Eccentric connection : - Riveted & bolted joints subjected to torsion & shear, tension & shear, design of riveted, bolted & welded connection. (8L)

**Compressive members** : –  
(1) Design of compression members, effective lengths about major & minor principal axes, I.S code provisions. Permissible stresses, Design rules, Examples. Design of one component, two components and built up compression members under axial load.  
(2) Built up columns under eccentric loading  
Design of lacing and batten plates.  
Different types of Column Bases- Slab Base, Gusseted Base, Connection details. (5L)

**Beams** : - Permissible stresses in bending, compression and tension. Design of rolled steel sections, Plated beams. Simple Beam end connections, Beam -Column connections. I.S code provisions (5L)

**Plate girders** - Design of Webs & Flanges, Concepts of curtailment of flanges – Riveted & Welded

**Web stiffeners**, **Web Flange splices** - Riveted, Welded & Bolted. (6L)

**Gantry Girder** : Design gantry girder considering lateral buckling – I.S code provisions. (5L)

**Reference:**  
IS 800 – 2007 (Latest Revised code)  
S.P.: 6(1) – 1964 Structural Steel Sections  
Ramanurtham – Design of steel structures.  
Civil Engineering Lab- I
Code CE – 591
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 modules, moisture content, bulk density, voids and deleterious materials.

Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density and voids.

Tests 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 (Part I) – V.V Sastry and M. L. Gambhir.

Surveying Practice II
Code: CE – 592
Credits: 2


Tachometric 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 curve, Transition curves, Bernoulli’s Leminscate.

Demonstration: Box – Sextant, Nautical sextant and EDM instruments. Use of Total station.

Soil Mechanics Lab. – I
Code – CE 593
Credits – 2

1. Field identification of different type of soil different type of soil as per Indian standards [collection of field samples and identifications 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 of 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 Atterberg’s limits (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 parameter (fine grained soil).

References:

1. Soil Testing by T.W. Lamb (John willey)

2. SP-36 (Part I & Part – II)


**Structural Design and Drawing – I**

**Code CE: 594**

**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

   ii) 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.

References:


3. Limit State Method of Design – Varghese. PHL Ltd.

4. I.S. 456-2000

5. I.S. 875

6. SP- 16
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. 5h

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, Consolidemeter & Laboratory One Dimensional Consolidation Test as per latest IS Code, Determination of Consolidation Parameters under Consolidated, Normally Consolidated & Over Consolidated Soil, Secondary Consolidation. 8h

Shear Strength of Soil :- Basic Concept of Shear Resistance & Shear Strength of Soil, Mohr- Coulomb’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. 8h

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 Method). 5h

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. 5h

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. 5h

References:
1. Principles of Geotechnical By B.M. Das (Thomson)
2. Principles of soil Mechanics & Foundation Engineering by VNS Moorthy(UBS Publication)
5. SP-36 (Part-I & Part-II)

Transportation Engineering- I
Code :CE- 602
Contact: 3L + 1T
Credits: 4

Introduction to Highway Engineering:
West Bengal University of Technology  
BF – 142, Salt Lake City, Kolkata – 700 064  
Civil Engineering Revised Course Structure upto 8th Semester, 2007  
(To be applicable for the students who admitted in the session July 2005-2006)

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)  
4h.

Highway Alignment: 
Requirements; factors controlling alignment; engineering surveys for highway alignment and location.  
2h

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.  
12h

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, IRC method 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 .  
8h

Pavement construction Technique: 
Types of pavement; construction of earth roads, gravel roads, WBM, bitumen and cement concrete roads; joints in cement concrete pavements.  
6h

Road Materials and Testing : Soil, Stone Aggregate, Bitumen, Marshal Stability Test .  
4h

References : High Way Engineering By Khanna & Justo  
Transportation Engineering -Vazirani & S.P Chandala Khanna Publishers  
I.S Specifications on Concrete , Aggregate & Bitumen  
Principles of Transportation Engineering: P. Chakraborty & A. Das(PHI)  
Transportation Engineering- C.J Khisty & B.K Lall.

Environmental Engineering -II  
Code :CE- 603  
Contact: 3L + 1T Credits: 4

4h

6h
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, limhoff 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


Water Supply and Sanitary Engineering By G.S.Birdi

Structural Analysis -III

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

Influence line for Redundant structures:(Beams & Trusses)

Approximate analysis of building frames-Cantilever and portal method

Matrix methods in structural analysis;Flexibility and Stiffness method; Elements of matrix algebra;
Application of matrix methods to plane truss; continuous beam & frames.

Finite Difference and Relaxation technique-Application to simple problems

Introduction to structural dynamics- free vibration ,forced vibration. SDOF,

Finite Element Technique in structural analysis
- Fundamental concept, Finite Element modeling, Finite element formulation to One Dimensional Problems.

Reference

2) Structural analysis-Negi & Jangid.-Tata McGrawhill Co.
West Bengal University of Technology  
BF – 142, Salt Lake City, Kolkata – 700 064 
Civil Engineering Revised Course Structure upto 8th Semester, 2007

Remaining syllabus will be published soon
(To be applicable for the students who admitted in the session July 2005-2006)

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-605;
Contacts: 3L+1T;
Credits: 4

<table>
<thead>
<tr>
<th>Course Content</th>
<th>Number of Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment area and its physical characteristics; Hydrologic cycle; Hydroclimatology.</td>
<td>2</td>
</tr>
<tr>
<td>Precipitation types and forms, Measurement of rainfall – Rain gauges, Estimation of missing rainfall data, checking of consistency, Optimum number of Rain gauges. Calculation of average rainfall over area – different methods. Frequency analysis of rainfall intensity duration curve. Rainfall mass curve, hyetograph.</td>
<td>4</td>
</tr>
<tr>
<td>Evaporation, evapotranspiration and infiltration – the processes, measurement and estimation.</td>
<td>2</td>
</tr>
<tr>
<td>Factors affecting run off, estimation of run off, rainfall run off relationship. Flow duration graph. Time for concentration. Peak flow.</td>
<td>4</td>
</tr>
<tr>
<td>Stream flow measurement; direct and indirect methods, stage discharge curve; backwater effects.</td>
<td>4</td>
</tr>
<tr>
<td>Hydrographs; characteristics. Base flow separation. Unit Hydrographs. Derivation of unit hydrographs. S-curve. Snyder’s and Clark’s synthetic unit hydrographs.</td>
<td>4</td>
</tr>
<tr>
<td>Types of Irrigation systems, methods of irrigation.</td>
<td>2</td>
</tr>
<tr>
<td>Water requirements of crops: Crop period or Base period, Duty &amp; Delta of a crop, relation between Duty &amp; Delta, Duty at various places, flow Duty &amp; quantity Duty, factors affecting Duty, measures for improving Duty of water, crop seasons.</td>
<td>4</td>
</tr>
<tr>
<td>Canal Irrigation: Introduction, classification of irrigation canals, Efficient section, certain important definitions, Time factor, Capacity factor, full supply co-efficient, Nominal duty, Channel losses, Examples.</td>
<td>4</td>
</tr>
<tr>
<td>Design of unlined alluvial channels by silt Theories: Introduction, Kennedy’s theory, procedure for design of channel by Kennedy’s method, Lacey’s theory, concept of True regime Initial regime and final regime, design procedure using Lacey’s theory, Methods of prevention of silt deposition in canals and reservoirs, examples. Lining of Irrigation Cannals : Objectives, advantages and disadvantages of canal lining, economics and requirements of canal lining, Types of lining, Design of lined Canals- examples</td>
<td>6</td>
</tr>
</tbody>
</table>
References:

Soil Mechanics Lab.-II
Code-CE-691
Credit –2

1. Determination of compaction characteristics of soil.
2. Determination of compressibility characteristics of soil by Oedometer test (co-efficient of consolidation & compression Index)
3. Determination of unconfined compressive strength of soil
4. Determination of Shear parameter of soil by Direct shear test
5. Determination of undrained shear strength of soil by vane shear test.
6. Determination of shear parameter of soil by Triaxial test
7. Determination of CBR of a soil specimen as per IS code recommendation.

Reference:
1. Soil testing by T.W. Lamb (Joh Willey)
2. SP-36 (Part-I & Part -II)

Civil Engg. Laboratory – II
Code :CE- 692 :
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–Tension Test- Bend & rebend test –Code provisions.

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
West Bengal University of Technology
BF – 142, Salt Lake City, Kolkata – 700 064
Civil Engineering Revised Course Structure upto 8th Semester, 2007
Remaining syllabus will be published soon
(To be applicable for the students who admitted in the session July 2005-2006)

Sessional

STRUCTURAL DESIGN & DRAWING II
Code : CE-693,
Credits -2

Problems on general consideration and basic conceptsp
Discussion on different loads ( i.e. wind load, Dead load, live load and others) as per IS800
Design & drawing of the following components of a roof truss:

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 Mc graw 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.)

Computer Programming in Civil Engineering
Code :CE- 694 ;
Contact : 1L + 2P ;
Credits : 2

Solution of problems from different areas of Civil Engineering.

Semester VII

Water Resources 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, aquieclude, aquitard, steady flow to wells- Dupuit-Thiem’s theory of well hydraulics- for both unconfined and confined aquifers-assumptions, derivation of the mathematical expressions. Unsteady radial flow towards wells- Thiems non-equilibrium formula for confined aquifers, Evaluation of acquifer parameters from Thiems equation-
Cooper and Jacob method, Artificial recharge of ground water – spreading method, well method, induced infiltration method, Sea water intrusion in coastal aquifers. 
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 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.

Water resources planning: India’s water resources, water resources development, purpose, classification, functional requirements of multipurpose projects, project formulation, evaluation, future strategies, planning & management strategies.

Reference:
2] Irrigation, water Resources and water Power Engineering – By Dr. P.N. Modi- Standard Book House

Transportation Engineering –II
Code : CE - 702
Contact : 3L+IT
Credits : 4

Railway Engineering:
Introduction to Railway Engg.: Railway terminologies, 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, specifications, 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.
Signaling and Interlooking: Objectives, principles of signaling, classification and types of signals in stations and yards & methods of interlocking.

Docks & Harbours:
1) Harbours: Types, accessibility and size
2) 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.
3) Breakwaters: Classifications, materials used, methods of construction and protection
4) Docks: Shapes of docks and basin, location, arrangement of berth, dockwalls, dock entrances, repair dock types.
5) Quays: Forces, types and design consideration.
6) Miscellaneous topics on docks and harbours, Transit sheds, warehouses, navigational aids.

Airports:
Introduction to airport planning and development: General philosophy of airport planning and development, ICAO classification of airports, site selection factors, characteristics of jet aircraft.
Airport design standards: Orientation of runways, length of runways and corrections, width of runways, sight distances, gradients and clearances, 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. Aro
Airport Transportation Planning & Design- Virendra Kumar & Satish Chandra; Galotia Publication Pvt. Ltd. New Delhi.

Foundation Engineering
Code – CE- 703
Contacts-3L + 1T
Credits-4

Site Investigation & Soil Exploration: Planning of sub-surface exploration, methods, sampling, samples, Insitu tests:
SPT, SCPT, DCPT, 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, 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,


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

Problems for foundation on expansive soil and its remedies

Reference:
1. Foundation Analysis & Design By J.E. Bowels ( Mc Graw Hill)
4. SP- 36 (Part I & Part II)
5. Foundation Engineering By S.P Brahma ( TMH)
6. Relevant IS Codes.

Structural Design –III

Code –CE 704
Contact-3L +LT
Credits-4

Design of RCC liquid storage structure resting on ground (rectangular and circular), I.S code method.

Fundamental concept on effect of lateral loads due to wind and earthquake on building frame (as per IS 875and 1893)

Basic principles of Pre-stressed concrete, Materials, Stress, strain and load balancing concept, Losses of prestress, Analysis in flexure and shear.

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.


Reference:
Relevant IS and IRC codes.
Design of Bridge Structures – Jagdish & Jayaram – Prentice Hall
Prestressed Concrete-Ramamrutham.
Design Steel Structures- Arya Azmani – Nemchand Bros.
West Bengal University of Technology  
BF – 142, Salt Lake City, Kolkata – 700 064  
Civil Engineering Revised Course Structure upto 8th Semester, 2007  
Remaining syllabus will be published soon  
(To be applicable for the students who admitted in the session July 2005-2006)  

Design of Steel Structures- Duggal- Tata Mc Graw Hill  
Design of Steel Structures by N.Subramanian, OUP.  
The Steel Skeleton Vol-II Baker, Horne & Heymean- ELBS  
Advanced Design inStructural Steel – Lothers – Prentice – Hall.  

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 regime, 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, 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, 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, Engery 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: Examples.  

Reference:  
2. Irrigation , water Resources and Water Power Engg. – By Dr.P.N. Modi,Standard Book House. Post Box  
   : 1074- Delhi-6  
ENVIRONMENTAL ENGINEERING LAB
CODE: CE-791
CREDIT-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, confirmative test
  and Determination of MPN
- Jar Test.

Highway Engineering Lab.
Code CE 792
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, softening point, loss on heating, Flash & Fire point test.
- Stripping value test
- Design of B.C. & 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 Application in Civil Engineering-I Lab
Code: CE 793
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.
Application programs in Structural Engineering:
ii) Perpendicular to layers
iii) Pipe Net work solution

Remaining syllabus will be published soon
(To be applicable for the students who admitted in the session July 2005-2006)

Reference:
1. Weben Systems Inc- C Language user’s Hand book ‘-Galgotia

Semester VIII
ELECTIVE – I

Advanced Transportation Engineering
Code – CE 801/1
Contact – 3L + 1T
Credits- 4

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Details of Course Content</th>
<th>Hours</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Geometric Design of Highways: Cross-section design of Expressways and Arterial roads, Development of Super Elevation on Horizontal Curves, Design of Vertical curves.</td>
<td>4</td>
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</tr>
<tr>
<td>2</td>
<td>Geometric Design of Intersections: Types, Forms, Intersection Operations, Design of Speed change lanes, Intersection sight distance ( AASHTO consideration), interchange types( flow diagrams only), channelization of three and four legged right-angled intersections.</td>
<td>8</td>
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<tr>
<td>3</td>
<td>Geometric Elements of round about</td>
<td>2</td>
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<tr>
<td>4</td>
<td>Traffic Engineering: Stream variables; Spacing and Concentration, Headway and Flow, Time mean and Space mean speeds, Relation between speed, flow and density, Development of Stream flow equations-Problems, Stream Measurements by the Moving Observer Method.</td>
<td>6</td>
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<tr>
<td>5</td>
<td>Capacity and Levels of Service for Uninterrupted Traffic Flow</td>
<td>2</td>
<td>36</td>
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<tr>
<td>6</td>
<td>Traffic Signals: Types, Design of Isolated Fixed Time Signals.</td>
<td>4</td>
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References:

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<tr>
<th>Sl. No</th>
<th>Name</th>
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<th>Publishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Highway Engineering</td>
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<tr>
<td>5</td>
<td>Highway Engineering</td>
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</table>
Environmental Pollution and Control
Code – CE 801/2
Contact – 3L + 1T
Credits- 4

<table>
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<th>Hours</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction: Environment. Pollution, Pollution control,</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Air Pollution: Pollutants, Effects, Sources, Dispersion, Lapse Rate, Inversion, and Impact of wind, atmospheric pressure, moisture and precipitation on dispersion of air pollutants, Design of stack height.</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>3</td>
<td>Air pollution Control: Self cleansing properties of the environment, Dilution method, Installation of engineering devices, control of the particulates, control of pollutants, control of air pollution from automobiles.</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Water pollution: Pollution characteristics of typical industries, Suggested Treatment</td>
<td>4</td>
<td>4</td>
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<tr>
<td>5</td>
<td>Environmental Impacts: Thermal power plant, Mining, Radioactivity.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Global Environmental issues: Ozone depletion, Acid rain, Global Warming-Green house effects, Noise Pollution: Definition, Effect, Characteristics, Measurement, Levels, Sources, control.</td>
<td>4</td>
<td>4</td>
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<tr>
<td>7</td>
<td>Administrative control on environment</td>
<td>4</td>
<td>4</td>
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<tr>
<td>8</td>
<td>Water Act, Air Act, Motor Vehicle Act</td>
<td>3</td>
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References:

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<tr>
<th>Sl. No</th>
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<th>Author</th>
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<tr>
<td>3</td>
<td>Environmental Engineering, Vol.II,</td>
<td>P. N. Modi</td>
<td>Oxford University</td>
</tr>
<tr>
<td>4</td>
<td>Environmental Modelling,</td>
<td>Rajagopalan</td>
<td>Press</td>
</tr>
<tr>
<td>5</td>
<td>Environmental Engineering</td>
<td>P. V. Rowe</td>
<td>TMH</td>
</tr>
<tr>
<td>6</td>
<td>Air Pollution</td>
<td>Rao</td>
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Advanced Structural Analysis
Code – CE 801/3
Contact – 3L + 1T
Credits- 4

<table>
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<th>Details of Course Content</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Matrix methods of analysis: Matrix formulation of redundant beam analysis (Clapeyron's three moment theorem and slope deflection method). Stiffness and flexibility approaches for beams, simple portal frame, trusses.</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Dynamic analysis of structural frames: Wind analysis of structures by using I.S. Code provisions, Seismic analysis as per IS 1893, Computer oriented algorithms.</td>
<td>9</td>
</tr>
</tbody>
</table>
### Theory of plates and shells
Thin plate analysis. Differential equation of bending under point and uniformly distributed load, various support systems. Rectangular and circular plates. Membrane analysis of thin shell, meridional & hoop stress, shell of revolution, cylindrical shell, applications.

### Introduction to finite element
Potential Energy, shape function, linear, triangular and rectangular element, fundamentals for one-dimensional, two dimensional structure, isoparametric formulation, simple two dimensional problems related to civil engg.

### References:

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name</th>
<th>Author</th>
<th>Publishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Matrix Methods of Structural Analysis</td>
<td>M.B. Kanchi.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Analysis of Structures</td>
<td>T.S. Thandavamoorthy</td>
<td>Oxford University Press</td>
</tr>
<tr>
<td>3</td>
<td>Structural Dynamics Theory &amp; Computation</td>
<td>Mario Paz</td>
<td>CBS</td>
</tr>
<tr>
<td>5</td>
<td>Theory of Plates &amp; Shells</td>
<td>Timoshenko &amp; Kreiger</td>
<td>Mc Graw Hill</td>
</tr>
<tr>
<td>6</td>
<td>Finite Element Method for Structural Engineers (A Basic Approach)</td>
<td>W. N. Al-Rifaie &amp; A. K. Govil</td>
<td>Wiley Eastern Limited</td>
</tr>
<tr>
<td>7</td>
<td>Introduction to Finite Element Engineering</td>
<td>T. R. Chandrapatula &amp; A. D. Belegundu</td>
<td>Pearson Education</td>
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<tr>
<td>8</td>
<td>Finite Element Analysis</td>
<td>Buchanan, Rudramoorthy</td>
<td>Mc Graw Hill</td>
</tr>
<tr>
<td>9</td>
<td>Computational Structural Machanics</td>
<td>Rajasekaran &amp; Sankarasubramanian</td>
<td>PHI</td>
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<tr>
<td>11</td>
<td>IS 1893, IS 875 and relevant IS codes</td>
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### Advanced Foundation Engineering

#### Code – CE 801/4
#### Contact – 3L + 1T
#### Credits- 4

<table>
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<tbody>
<tr>
<td>1</td>
<td><strong>Soil Exploration and Site Investigation</strong></td>
<td></td>
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<tr>
<td></td>
<td>Planning of soil exploration programme, Field testing, Preparation of bore-log and soil investigation report</td>
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<tr>
<td></td>
<td>Geo-physical exploration: Seismic refraction survey electrical resistively method</td>
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<tr>
<td>2</td>
<td><strong>Shallow Foundations</strong></td>
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<td></td>
<td>Bearing Capacity from SPT and SCPT and Plate load Test data, Proportioning of footing based on settlement criteria.</td>
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<tr>
<td></td>
<td>Beams on elastic foundation: Infinite beam, Finite beam, Modulus of sub-grade reaction and effecting parameters.</td>
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<td></td>
<td>Raft Foundation: Settlement and Bearing Capacity analysis, Analysis of flexible and rigid raft as per IS 2950.</td>
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</tr>
</tbody>
</table>

39
## Deep Foundations

- Pile: Tension piles, Laterally loaded piles: Elastic continuum approach, Ultimate load Analysis, Deflection and maximum moment as per IS 2911, Pile load test
- Drilled Shaft: Construction procedures, Design Considerations, Load Carrying Capacity and settlement analysis
- Caissons: Types, Sinking and control.

## Retaining walls and sheet pile structures

- Gravity cantilever and counter fort retaining walls: Stability checks and design
- Sheet Pile Structures: Cantilever sheet piling, Anchored sheet piling: Free and fixed earth support methods of Analysis, Braced Excavation

## Design of foundation for vibration control

- Elements of vibration theory, Soil- springs and damping constants, dynamic soil parameters, Types of Machine foundations, General consideration in designing dynamic bases.

## Foundations on Problematic soils: Problems and Remedies

### References:

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name</th>
<th>Author</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foundation Analysis &amp; Design</td>
<td>J.E. Bowels</td>
<td>Mc Graw Hill</td>
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<tr>
<td>2</td>
<td>Principles of Foundation Engineering</td>
<td>B.M. Das</td>
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<tr>
<td>3</td>
<td>Foundation Design Manual</td>
<td>N. V. Nayak</td>
<td>Dhanpat Rai Publication Pvt. Ltd</td>
</tr>
<tr>
<td>4</td>
<td>Foundations for Machines: Analysis and design</td>
<td>Shamsher Prakash, Vijay K Puri</td>
<td>Wiley Series in Geotechnical Engineering</td>
</tr>
<tr>
<td>5</td>
<td>Advance Foundation Engineering</td>
<td>N. Som &amp; S. C. Das</td>
<td>Tata McGraw Hill</td>
</tr>
<tr>
<td>6</td>
<td>Hand Book of Machine Foundation</td>
<td>P. Sirinivashalu &amp; C.V. Vaidyanathan</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>IS –1904, IS 6403, IS 8009, IS 2950, IS 2911 etc</td>
<td>--------</td>
<td>Bureau of Indian Standard</td>
</tr>
</tbody>
</table>

### Remote Sensing and GIS

- **Code** – CE 801/5
- **Contact** – 3L + 1T
- **Credits**: 4

### Details of Course Content

<table>
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<th>Hours</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Introduction:</strong> Definition and types of remote sensing, Tacheometry (Planimetry/ altimetry), Triangulation (Frame work / adjustment), Trilateration (EDM/ Total Station), Geodetics (physical/ geometrical geodesy), Error Analysis (causes / law of weights), Numerical example</td>
<td>7</td>
<td>7</td>
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<tr>
<td>2</td>
<td><strong>Photogrammetry:</strong> Camera System (phototheodolite/ aircraft), Ground photograph (oblique/orthogonal streephoto), Aerial photograph ( perspective scale/ flight planning), distortion (relief / tilt), Geomatrix ( parallax / mapping), application (topographies / interpretation), Numerical examples</td>
<td>7</td>
<td>7</td>
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<tr>
<td>3</td>
<td><strong>Satellite survey:</strong> Satellite Sensing (Sensors / platforms), energy sources (electromagnetic / atmospheric interaction), visual interpretation ( Band width), digital processing (imageries / enhancement), data integration (multi-approach / GIS), microwave imaging (active system / radars), applications</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>
### Astronomy:
- Celestial sphere (star-coordinates / transformation), field astronomy (azimuth, solar and polar method), 3D computation (local vs global), spherical trigonometry, Multilateration, Observation, Corrections in astronomy, Correlation of low, medium, remote objects, Global Positioning Systems

### Geoinformatics:
- GIS concept (Introduction/ definition), planning and management, spatial data model, database and DBMS, linking of attributes, geospatial analysis, modern trends

#### References:

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<tbody>
<tr>
<td>1</td>
<td>Surveying (Volume 2):</td>
<td>Duggal S.K.</td>
<td>Tata Mc Graw Hill</td>
</tr>
<tr>
<td>3</td>
<td>Geographic Information System:</td>
<td>Tor Bern Herdgen</td>
<td>Wiley</td>
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<td>4</td>
<td>Surveying:</td>
<td>Bannister, Raymond &amp; Baker</td>
<td>Pearson</td>
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<tr>
<td>5</td>
<td>Remote Sensing &amp; Image Interpretation:</td>
<td>Lilesand, Kiefer and Chipman</td>
<td>Wiley</td>
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<tr>
<td>6</td>
<td>Surveying (Volume 2):</td>
<td>Kanetker &amp; Kulkarni</td>
<td>(BS publication).</td>
</tr>
<tr>
<td>7</td>
<td>Remote Sensing &amp; Geographical information System:</td>
<td>Reddy M.A.</td>
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<tr>
<td>8</td>
<td>Advanced Surveying</td>
<td>Rampal K.K.</td>
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### ELECTIVE – II

**Soil Stabilisation & Ground Improvement Technique**

**Code – CE 802/1**

**Contact – 3L + 1T**

**Credits- 4**

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<tbody>
<tr>
<td>1</td>
<td><strong>Soil Stabilization:</strong> Introduction, Stabilization of soil with granular skeleton and soil without granular skeleton, common nomenclature of stabilized soil systems and stabilization methods, specific methods of soil stabilization: Stabilization with cement, lime fly-ash</td>
<td>8</td>
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<tr>
<td>2</td>
<td><strong>In-situ densification:</strong> Introduction, Compaction: methods and controls <em>Densification of granular soil</em>: Vibration at ground surface, Impact at ground surface, Vibration at depth (Vibroflotation), Impact at depth. <em>Densification of Cohesive Soils</em>: Preloading and dewatering, Design of Sand drains and Stone columns, Electrical and thermal methods.</td>
<td>12</td>
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<td>3</td>
<td><strong>Geo-textiles:</strong> Over view: Geotextiles as separators, reinforcement. Geotextiles in filtration and drainage, geotextiles in erosion control.</td>
<td>6</td>
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<tr>
<td>4</td>
<td><strong>Grouting:</strong> Over view: Suspension and Solution grout, Grouting equipment and methods, Grout design and layout, Grout monitoring schemes.</td>
<td>6</td>
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<td>5</td>
<td><strong>Soil stability:</strong> Reinforced earth fundamentals, Soil nailing, Soil and Rock Anchors, Underpinning</td>
<td>4</td>
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</tbody>
</table>
West Bengal University of Technology  
BF – 142, Salt Lake City, Kolkata – 700 064  
Civil Engineering Revised Course Structure upto 8th Semester, 2007  
Remaining syllabus will be published soon  
(To be applicable for the students who admitted in the session July 2005-2006)

References:

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<td>N. V. Nayak</td>
<td>Dhanpat Rai Publication Pvt. Ltd</td>
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<td>4</td>
<td>Construction and Geotechnical methods in</td>
<td>R.M. Koener</td>
<td>Mc Graw Hill</td>
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<td></td>
<td>foundation engineering</td>
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<td>6</td>
<td>Reinforced Earth</td>
<td>T S Ingold</td>
<td>Thoam Telford</td>
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<td>7</td>
<td>Designing with Geosynthetics</td>
<td>R M Koerner</td>
<td>Prentice Hall</td>
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Bridge Engineering  
Code – CE 802/2  
Contact – 3L + 1T  
Credits- 4

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<tbody>
<tr>
<td>1</td>
<td><strong>Introduction</strong>, - Definition and Basic Forms, Component of bridge, classification of bridge, short history of bridge development. I.R.C Loads. Analysis of IRC Loads, Impact factors, Other loads to be considered, Importance of Hydraulic factors in Bridge Design.</td>
<td>4</td>
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<tr>
<td>2</td>
<td><strong>Reinforced concrete solid slab bridge</strong>: Introduction, General design features. Effective width method. Simply supported and cantilever Slab Bridge, analysis and design</td>
<td>8</td>
<td>36</td>
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<td>3</td>
<td><strong>Box Culvert</strong>: Introduction, Design method and Design example</td>
<td>2</td>
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<tr>
<td>4</td>
<td><strong>Beam and Slab Bridges</strong> Introduction, Design of interior panel of slab. Pigeauds method, Design of longitudinal girder, Calculation of longitudinal moment, design example.</td>
<td>6</td>
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<tr>
<td>5</td>
<td><strong>Balanced Cantilever Bridges</strong>: General Features, Arrangement of supports, design features Articulation, Design example.</td>
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<td>6</td>
<td><strong>Steel Bridges</strong>: General features, types of stress, Design example.</td>
<td>3</td>
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<td>7</td>
<td><strong>Plate Girder Bridge</strong>: Elements, design, lateral bracing. Box- girder Bridges.</td>
<td>3</td>
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<td>8</td>
<td><strong>Composite Bridges</strong>: General aspects, method of construction, analysis of composite section, shear connectors, design of composite beam.</td>
<td>3</td>
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<td>9</td>
<td><strong>Cable Stayed Bridge</strong>: General features, Philosophy of design.</td>
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<tr>
<td>1</td>
<td>Principle &amp; Practice of Bridge Engineering</td>
<td>S.P. Bindra– D.J. Victor</td>
<td>Dhanpat Rai Pub</td>
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<td>2</td>
<td>Essentials of bridge engineering</td>
<td></td>
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<td>3</td>
<td>Bridge engineering</td>
<td>Ponnumswamy</td>
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<td>4</td>
<td>Design of Bridge Structures</td>
<td>T.R. Jagadesh, M.A. Jayaram</td>
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<td>5</td>
<td>Bridge engineering</td>
<td>by Krishnaraju</td>
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<td>6</td>
<td>Design of concrete bridges</td>
<td>by Aswani, Vizirani , Ratwani</td>
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<td>7</td>
<td>Design of steel structures</td>
<td>Arya &amp; Ajmani</td>
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Water Resources Management & Planning
Code – CE 802/3
Contact – 3L + 1T
Credits- 4

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<tr>
<td>1</td>
<td>Planning and analysis of Water Resource Systems: Introduction, System Analysis, Engineers and Policymakers</td>
<td>3</td>
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<tr>
<td>3</td>
<td>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)</td>
<td>6</td>
<td>36</td>
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<tr>
<td>4</td>
<td>Water Resources Planning under Uncertainty: Introduction, probability concepts and Methods – Random variable and Distributions, Univariate probability Distributions ,properties of Random variable – Moment and Expectation ( Univariate Distributions) , Moment Generating Functions, Measures of Central tendency, Measures of Dispersion, Measures of symmetry ( Skewness), measures of peakedness ( kurtosis), examples</td>
<td>10</td>
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<tr>
<td>5</td>
<td>Stochastic River Basin Planning Model: Introduction, Reservoir operation, Stochastic, Dynamic programming, Operating Model, Probability Distribution of Storage volumes and Releases, examples</td>
<td>6</td>
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<td>6</td>
<td>Water quality Management: Prediction and Simulation, Water quality Management Modeling</td>
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<tbody>
<tr>
<td>1</td>
<td>Applied Hydrology</td>
<td>V.T. Chow</td>
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<td>2</td>
<td>Hydrology</td>
<td>Raudkivi</td>
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<td>3</td>
<td>Stochastic Hydrology</td>
<td>Jayarami Reddy</td>
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<td>4</td>
<td>Water Resources Engg.</td>
<td>M.C. Chaturvedi</td>
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### Prestressed Concrete

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

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<tr>
<td>1</td>
<td><strong>Introduction of Prestressed concrete</strong>: Materials, prestressing system, analysis of prestress and bending stress, losses. Shear and torsional resistance: design of shear reinforcement, design of reinforcement for torsion shear and bending. Deflections of prestressed concrete members: Importance, factors, short term and long term deflection.</td>
<td>7</td>
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<tr>
<td>2</td>
<td><strong>Limit state design criteria</strong>: Inadequacy of elastic and ultimate load method, criteria for limit states, strength and serviceability. Design of sections for flexure: methods by Lin and Magnel</td>
<td>6</td>
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<td>3</td>
<td><strong>Anchorage Zone stresses in post tensioned members</strong>: stress distribution in end block, anchorage zone reinforcement</td>
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<tr>
<td>4</td>
<td><strong>Composite construction of prestressed and in-situ concrete</strong>: types, analysis of stresses. <strong>Statically Indeterminate structures</strong>: advantages of continuous member, effect of prestressing, methods of achieving continuity and method of analysis of secondary moments.</td>
<td>8</td>
<td>36</td>
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<tr>
<td>5</td>
<td><strong>Prestressed concrete poles and sleepers</strong>: Design of sections for compression and bending</td>
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<td>6</td>
<td><strong>Partial prestressing and non prestressed reinforcement</strong></td>
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<tbody>
<tr>
<td>1</td>
<td>Prestressed Concrete, Fourth Edition</td>
<td>N Krishna Raju</td>
<td>Mc Graw Hill</td>
</tr>
<tr>
<td>2</td>
<td>Design of Prestressed Structures</td>
<td>T.Y.Lin and N.H.Burns</td>
<td>Wiley Eastern Ltd</td>
</tr>
<tr>
<td>3</td>
<td>Fundamentals of Prestressed Concrete</td>
<td>N.C.Sinha and S.K.Roy</td>
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<td>4</td>
<td>Prestressed Concrete</td>
<td>S.Ramamurthan</td>
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### Structural Dynamics & Earthquake Engineering

**Code – CE 802/5**  
**Contact – 3L + 1T**  
**Credits-4**

<table>
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<td>1</td>
<td><strong>Theory of vibrations</strong>: Degrees of freedom, Undamped single degree freedom system, Damped single degree freedom system, Natural frequency, modes of vibration, Introduction to multiple degree freedom system</td>
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<td>2</td>
<td><strong>Response of single degree freedom system due to harmonic loading</strong>: Undamped harmonic excitation, Damped Harmonic excitation</td>
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<tr>
<td>3</td>
<td><strong>Response due to Transient loading</strong>: Duhamel’s Integral, Response due to constant force, Rectangular load, Introduction to numerical evaluation of Duhamel’s integral of undamped system.</td>
<td>6</td>
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</tbody>
</table>
Elements of seismology: Fundamentals: Elastic rebound theory, Plate tectonics, Definitions of magnitude, Intensity, Epicenter etc., Seismographs, Seismic zoning, Response of Simple Structural Systems


References:

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<th>Name</th>
<th>Author</th>
<th>Publishers</th>
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</thead>
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<tr>
<td>1</td>
<td>Structural Dynamics (Theory and Computation)</td>
<td>Mario Paz.</td>
<td>CBS Publishers and Distributor</td>
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<tr>
<td>2</td>
<td>Dynamics of Structure (Theory and Application to Earthquake Engineering)</td>
<td>A.K. Chopra</td>
<td>Pearson Education</td>
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<td>3</td>
<td>Elements of Earthquake Engineering</td>
<td>Jai Krishna, A. R. Chandra</td>
<td>South Asian Publishers</td>
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<tr>
<td>4</td>
<td>Earthquake Resistant Design</td>
<td>D. J. Dowrick</td>
<td>John Willey &amp; Sons</td>
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Construction Management, Technology & Departmental Procedure
Code – CE 803
Contact- 3L+ 1T
Credits –4

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<tbody>
<tr>
<td>1</td>
<td>Planning: General consideration, Definition of aspect, prospect, roominess, grouping, circulation privacy, acclussion</td>
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<td>2</td>
<td>Regulation and Bye laws: Bye Laws in respect of side space, Back and front space, Covered areas, height of building etc., Lavatory blocks , ventilation, Requirements for stairs, lifts in public assembly building, offices</td>
<td>4</td>
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<td>3</td>
<td>Fire Protection: Fire fighting arrangements in public assembly buildings, planning , offices, auditorium</td>
<td>2</td>
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<tr>
<td>4</td>
<td>Construction plants &amp; Equipment: Plants &amp; equipment for earth moving, road constructions, excavators, dozers, scrapers, spreaders, rollers, their uses. Plants &amp;Equipment for concrete construction: Batching plants, concrete mixers, Vibrators etc., quality control</td>
<td>8</td>
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<tr>
<td>5</td>
<td>Planning &amp; Scheduling of constructions Projects: Planning by CPM &amp; PERT,Preparation of network, Determination of slacks or floats. Critical activities. Critical path, project duration . expected mean time , probability of completion of project, Estimation of critical path, problems.</td>
<td>8</td>
<td>36</td>
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<tr>
<td>6</td>
<td>Management: Professional practice, Definition, Rights and responsibilities of owner, engineer, Contractors, types of contract</td>
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<td>7</td>
<td>Departmental Procedures: Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders, Arbitration</td>
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* Serial 1, 2, 3 are as per National Building Code and KMDA specification
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<tbody>
<tr>
<td>2</td>
<td>Management in construction industry</td>
<td>P.P. Dharwadkar</td>
<td>Oxford and IBH Publishing company New Delhi</td>
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<td>3</td>
<td>Construction Management, Critical path Methods in Construction,</td>
<td>J.O. Brien</td>
<td>Wiley Interscience</td>
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<td>4</td>
<td>PERT and CPM</td>
<td>L.S. Srinath</td>
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<td>5</td>
<td>Project planning and control with PERT and CPM’ Construction equipments and its management</td>
<td>B.C. Punmia and K.K. Kandelwal</td>
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Accountancy & Economics
Code : CE – 804
Contact : 3L + 1T
Credits : 4

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<tr>
<td>2</td>
<td><strong>Cost Accounting</strong>: Introduction, Classification of Costs; Break-even Analysis; Budgeting &amp; Budgetary Control, Objectives, Advantages &amp; Limitations of Budgeting, Cash Budget, Flexible Budget, Master Budget, etc</td>
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<td>3</td>
<td><strong>Financial Management</strong>: Cost of Capital: Capital Budgeting, Working Capital Management</td>
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Economics

Introduction: Definition of Economics- scope and nature of economic science- Economic decision and technical decision- Economic efficiency and Technical efficiency, Forms of business organization. Capitalistic, Communist and mixed economics, Developing and developed economics, Characteristics of Indian economy

Demand and revenue analysis: Meaning of demand, Determinants of demand, Exception to the law of demand. Elasticity of demand- Meaning, Price Elasticity of demand

Demand Forecasting: Basic concepts and tools used in Analysis of demand forecasting for new demands, existing products and consumer products.

Cost and Production Analysis:

References:

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<tr>
<th>Sl. No</th>
<th>Name</th>
<th>Author</th>
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<tbody>
<tr>
<td>1</td>
<td>Modern Accountancy</td>
<td>A. Mukherjee &amp; M. Hanif</td>
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<td>A. Banerjee &amp; D. Maumder</td>
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<td>Dr. S. Kr. Paul</td>
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<td>9</td>
<td>Financial Management</td>
<td>Dr. D. Majumder; Sk. Raju Ali &amp; Lutfun Nesha</td>
<td>ABS Publishing House</td>
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</table>

Computer Application in Civil Engineering - II
Code: CE 891
Contact: 0 0 3
Credits: 2

Mathematical formulation, Algorithm, Flow Chart & Programming of at least 5 (five) of the following problems:
1. Digital terrain model from leveling data
2. WGS (World Geodetic System Co-ordinate) from total station traverse
3. Estimation of flood hydrograph at a section from given rainfall data
4. Flood routing through storage reservoir with given area level parameter and inflow hydrograph
5. Water quality management programme
6. Analysis of simple framed structure by direct stiffness method
7. Analysis of two way slab by IS 456 2000
8. Design of flexible pavement by IRC 37 - 2001
9. Bearing capacity and settlement analysis of shallow foundation as per IS 6403 and IS 8009(Part I)
10. Design of super-elevation
11. Determination of stresses for rigid pavement
12. Design of water treatment plant

Demonstration of Standard application softwares.