

**CE/ME/EC/CS/SE/IT/EB/EI/EE /MRE 301 ENGINEERING MATHEMATICS-III****Module I**

**Fourier series and Fourier integrals:** Periodic functions, Euler formulae for Fourier coefficients, functions having arbitrary period, even and odd functions, half range expansions, Fourier integral, Fourier cosine and sine transformations, linearity property, transform of derivatives, convolution theorem (no proof)

**Gamma and Beta functions**, error functions - definitions and simple properties.

**Module II**

**Special functions:** Legendre polynomial, Rodrigue's formula- generation function, recurrence formula for  $P_n(x)$ , orthogonality. Bessel function,  $J_n(x)$ - recurrence formula, general function, orthogonality.

**Module III**

**Partial differential equations:** Solutions of equations of the form  $F(p, q) = 0$ ,  $F(x, p, q) = 0$ ,  $F(y, p, q) = 0$ ,  $F(z, p, q) = 0$ ,  $F_1(x, p) = F_2(y, q)$ , Lagrange's form  $Pp + Qq = R$ .

**Vibrating string :** one dimensional wave equation, D'Alembert's solution, solution by the method of separation of variables. One dimensional heat equation, solution of the equation by the method of separation of variables, solutions of Laplace's equation over a rectangular region and a circular region by the method of separation of variables.

**Module IV**

**Probability and Statistics: Probability distributions:** random variables (discrete & continuous), probability density, mathematical expectation, mean and variance of a probability distribution, binomial distribution, Poisson approximation to the binomial distribution, uniform distribution, normal distribution

**Curve fitting:** method of least squares, correlation and regression, lines of regression.

**Module V**

**Sampling distributions :** population and samples, the sampling distribution of the mean

( $\mu$  known), the sampling distribution of the mean ( $\mu$  unknown), the sampling distribution of the variance, point estimation, interval estimation, tests of hypotheses, null hypotheses and significance tests, hypothesis concerning one mean, type I and type II errors, hypotheses concerning two means.

**The estimation of variances** Hypotheses concerning one variance - Hypotheses concerning two variances.

**Note:** Treatment of the topics under Modules IV, V should be oriented towards application of statistical techniques to problems in real life.

**References:**

- 1) Ervin Kreyszig : Advanced Engineering Mathematics, Wiley Eastern
- 2) Potter, Goldberg : Mathematical Methods, Prentice - Hall
- 3) Churchill R.V. : Fourier series and Boundary Value Problems - McGraw Hill
- 4) Miller & Freind : Probability and statistics for Engineers, Prentice Hall of India.
- 5) Bowker & Lieberman : Engineering Statistics Prentice - Hall
- 6) Kirk - Patrick : Introductory statistics and probability for engineering science and technology, Prentice -Hall
- 7) Parzen E : Modern Probability Theory and its Applications, Wiley eastern.

**CE 302 SURVEYING - I****MODULE Module I**

Introduction : Classification of surveys, primary division of Surveying-Principle of working from whole to part-conventional signs. Chain Surveying: Instruments - principles of chain surveying-Filed book-plotting-Tie and check line-Chaining and Ranging-obstacles-chaining on sloping ground -Errors in chain Survey-uses of cross staff and optical square.

**Module II**

COMPASS SURVEY : Prismatic compass-surveyor's Compass whole circle system and Quadrantal system-True and magnetic bearing-Dip and Declination-Local attraction-Traversing-Plotting a Traverse Survey -Graphical adjustment of closing error in a closed Traverse.

Plane Table Survey: Instruments and accessories- Advantages and disadvantages of plane tabling-orientation- Different methods of plane Tabling- Two point problem-Three point problem - Errors in plane tabling.

**Module III**

Levelling: Definitions of Terms used in Levelling-Bench marks-levelling instruments-Temporary and permanent adjustments-principles of levelling-Simple levelling, Differential levelling-Reduction of levels-Classification of leveling-Profile levelling and cross sectioning correction for curvature and refraction-Reciprocal levelling-Errors in levelling.

Contour Survey: Definition-characteristics of Contour- uses of contours- Methods of contouring-Interpolation Contours-uses of Contour map.

**Module IV**

Area and volumes: Areas along Boundaries- the Mid-ordinate rule-Average ordinate rule-Trapezoidal rule-Simpson's rule- Area by Meridian distance method- Area by Double meridian method.

Departure and total latitude method-Coordinate method-use of Planimeter-Computation of volume by Trapezoidal and Prismoidal formulæ -Mars haul curve.

Minor Instruments: Hand levels-Indian pattern clinometer-Ceylon ghat Tracer-Pantagraph-Eidograph-Box Sextant

**Module V**

Theodolite Surveying: Study of Theodolite - Temporary and permanent adjustments- measurement of horizontal angle- method of repetition and reiteration- measurement of vertical angle - Theodolite traversing by direct observation of Angles and by direct observation of Bearings- Adjustment of a closed Traverse ( angular error, bearings & closing error) - Bowditch rule-Transit rule-Gale's traverse Table-Omitted measurements.

Tacheometric Surveying : Instruments used-Stadia System-fixed and movable hair methods-Tacheometric constants- Anallatic lens-Tangential System-Direct reading tacheometer-Subtense Bar.

**Reference:**

- 1) Plane and Geodetic Surveying : David Clark
- 2) Surveying and levelling : Kanetkar T.P
- 3) Surveying and levelling : Hussain
- 4) Surveying - Vol I & II : Punmia B.C

## CE/SE 303 STRENGTH OF MATERIALS

### Module I

Tension, compression and Shear:

Types of external loads, self weight, internal stresses, normal and shear stresses, strain, Hooke's law, Poisson's ratio, relationship between elastic constants, stress- strain diagrams working stress, elongation of bars of constant and varying sections, statically indeterminate problems in tension and compression, assembly and thermal stresses, strain energy in tension compression and shear.

Analysis of stress and strain: Stress on inclined planes for axial and biaxial stress fields, principal stresses Mohr's circle of stress, principle strains, strain rosette.

### Module II

Bending moment and shearing force:

Different types of beams, shear force and bending moment diagrams for simply supported and cantilever beams, relationship connecting intensity of loading, shearing force and bending moment.

Stresses in Laterally loaded symmetrical beams: Theory of simple bending ,limitations, bending stresses in beams of different cross sections, moment of resistance, beams of uniform strength, beams of two materials, principal stresses in bending, strain energy due to bending, shearing stresses in bending.

### Module III

Deflection of Beams: Differential equation of the elastic curve, slope and deflection of beams by method of successive integration, McCaulauy's method, moment area method, conjugate beam method, deflection due to shear.

### Module IV

Theory of Columns: Axial loading of short strut, long columns, Euler's Formula, Rankine Formula, secant Formula, Eccentric Loading , direct& bending stresses.

Torsion: torsion of circular solid and hollow shafts, power transmission, strain energy in shear and torsion, close coiled helical springs.

### Module V

Cylinders : Thin Cylinders, thick cylinders-Lame's equation, stresses in thick cylinders due to internal pressures, compound cylinders, shrink fit, wire wound pipes and cylinders.

Theories of failure : Significance- maximum principal stress theory, maximum principal strain theory, max shear stress theory, octahedral shear stress theory, maximum total energy theory and maximum distortion theory.

**Note:** S.I. Units to be followed.

### References:

- 1) Timoshenko & Young : Elements of strength of Materials (Affiliated East West Press)
- 2) F.V. Warnock : Strength of Materials (Sir, Issac Pitman SonsLtd. London)
- 3) E.P. Popov : Mechanics of Materials (SI Version Prentice Hall, India)
- 4) William A. Nash : Strength of Materials (2/e). (Schaum's Outline Series)
- 5) Pytel & F.L. Singer : Strength of materials ( Harper and row publishers)

## CE 304 CONCRETE TECHNOLOGY

### Module I

Cement : Chemical composition – Hydration of cement

Uses and properties of various types of cements: Ordinary Portland /cement-Rapid Hardening Cement-Extra Rapid Hardening Cement-Sulphate Resisting Cement-Blast Furnace Cement-Quick Setting Cement-Super Sulphate Cement-Low Heat Cement-Portland Pozzolana Cement-Air-entraining Cement-Coloured Cement-Hydrophobic Cement-Masonry Cement-Expansive Cement- -Oil well Cement-High Strength Cement-Rediset Cement-High Alumina Cement. **Testing of cement** : Standard Consistency – setting time – Sieve test – Fineness test – Air permeability method – Soundness – Compressive strength.

### Module II

Aggregates: Classification – Sources-size, shape and texture-Grading of aggregates-Sieve analysis – Fineness Modulus – Specific surface and surface index – thermal properties. **Testing of aggregates** : Flakiness index – Elongation index – Specific gravity – Bulk density and voids – Crushing value- Ten percent fines value – Impact value – Abrasion value – Organic impurities – Cleanliness – Soundness – Absorption and measurement of moisture content – Bulking – Alkali-aggregate reaction. Water -Quality of water for mixing and curing-Use of sea water for mixing concrete.

### Module III

Admixtures in concrete : Air –entraining agents – Pozzolanic admixtures – Accelerators-Retarders – Gas forming agents – Air detraining agents- Alkali – aggregate expansion inhibitors-Damp proofing and permeability reducing agents – Workability agents –Grouting agents – Corrosion inhibiting agents – Bonding admixtures – Fungicidal, Germicidal and Insecticidal admixtures – Coloring agents – Miscellaneous admixtures-Hot and cold weather concreting-under water concreting

### Module IV

Fresh Concrete ; Workability, Factors affecting- Measurement of workability – Segregation – Bleeding – Batching of concrete – Mixing – Transportation – Placing- Compaction of concrete – Curing Finishing.

Strength of concrete : Elasticity, shrinkage and creep – Durability of concrete- Compression test- test to determine the modules of elasticity of concrete using compressometer – Flexural strength – Tensile strength – Non-destructive testing methods. Test on composition of hardened concrete – determination of cement content – determination of original w/c ratio.

### Module V

Concrete Mix Design : Concept – Variables I proportioning – Statistical quality control of concrete – ACI method — Method recommended by Indian Standards – High strength concrete mix design – Mix design based on flexural strength. **Special Concrete** : Ready mixed concrete, Light – Weight concrete – No. fines concrete – High density concrete-sulphur infiltrated concrete – Fibre reinforced concrete – Polymer concrete.

### Reference:

- |                                 |  |
|---------------------------------|--|
| 1. M.S. Shetty                  | : Concrete Technology                                |
| 2. D.F. Orchard                 | : Concrete Technology – Vol I, II & III              |
| 3. A Short and W. Kinniburgh    | : Light weight Concrete                              |
| 4. Mikhailov, Paaturoev & Kires | : Polymer Concretes and their structural uses.       |
| 5. SP – 96 ACI Publication      | : Accelerated Strength Testing                       |
| 6. U.S.D.I:                     | Concrete Manual                                      |
| 7. SP-23 (S & T)                | Handbook on concrete Mixes based on Indian Standards |
| 8. A.M. Neville                 | : Concrete Technology                                |

## CE 305 HABITAT ENGINEERING

### Module I

Climatology climate weather elements of climate minor climate –climate and building four different climate regions- Arctic, Cold, Temperate and tropical and their characteristics need to study climate. Human comfort- Heat balance of body- Bio climatic chart- application of bio climate chart microclimate –effects of topology, vegetation, building elements etc.

### Module II

Ventilation- Natural ventilation and factors affecting human comfort- Air changes, humidity, Quality of air, temperature use of buildings etc.

Requirements of good ventilation system, types of ventilation- Window design for natural ventilation in tropics.

Airflow patterns inside buildings.

### Module III

Geographical elements- the sun and the earth – The dynamics of air and water on the earth surface. Design of sun protection devices- thermal insulation, heat flow through elements –convection, conduction radiation and evaporation- effect of landscaping –protection of building form lighting, hurricanes, earth quakes. Termite and fungal protection - Application of the above into design of buildings.

### Module IV

Housing situation in India – Magnitude of the Housing problem situation in developing and developed countries- social economic and political aspects of housing- Housing in our national plans -National Housing policy- Demand, Supply and storage & housing resources- housing schemes slum improvement, clearance and redevelopment- housing co-operations public and private agencies dealing with housing. Type of financing system various financial institutions like banks, HUDCO, HDFC, etc. national housing Bank.

### Module V

Cost reduction techniques- planning, construction, maintenance and longevity aspect. Locally available building materials and their usability Construction technique – use of appropriate and alternate technology skill and labour.

The modern family and housing need- housing requirements of different members. Expectation from rural and urban housing. Requisites of lands and land development- land acquisition act, town planning act and building by laws.

### References :

1. S.C. Rangwala : Building Construction, Character Book Stall
2. Victor Olgyay : Design with climate, Prince on university press.
3. Givoni : Man, climate and Architecture
4. Mar welley and Jane Drew : Tropical Architecture koenigs beggar, Inger
5. Koenigs beggar& Inger et.al : Manual of topical Housing and Building Part I climatic design
6. Tessiegan.M.S : The House its plan and use (Oxford & IBH Publishing co)
7. Madhavan Rao & Ramamchandra. : Modern Trends in Housing in developing countries .

## CE 306 SURVEY PRACTICALS - I

### LIST OF EXERCISES

#### *Chain survey :*

1. Study of instruments.
2. Travelling and plotting of details-2 exercises.
3. Cross staff survey.

#### *Compass Survey :*

1. Study of Prismatic and Surveyor's compass.
2. Traversing with compass and plotting.
3. Open compass traverse-length of closing side by calculation and plotting.

#### *Plane Table survey :*

1. Method of Radiation.
2. Method of Intersection.
3. Solving three point problem - Bessel's method.
4. Solving three point problem - trial and error method & tracing paper method.
5. Solving two point problem.

#### *Levelling:*

1. Study of levelling instruments.
  2. Fly levelling.
  3. Longitudinal sectioning.
  4. Cross sectioning.
- Contour surveying.

Permanent adjustments.

#### *Minor Instruments:*

Study of planimeter, pantagraph and ediograph.

Study of hand levels, clinometer, Ceylon Ghat Tracer and Sextant.

## **CE 307 STRENGTH OF MATERIALS LABORATORY**

Standard tension test on M.S rod using U.T.M and a suitable extensometer

Torsion test on M.S specimen

Double shear test on M.S rod

Impact Tests- Izod and Charpy

Hardness tests –Brinell,Vickers and Rockwell hardness

Test on springs

7. Tests on wood

(a) Flexural test (b) Compression test

Compressive strength of masonry units

(a) Bricks (b) Stone (c) hollow block units

9. Fatigue test

Strut test

Verification of Clerk Maxwell's law of reciprocal deflection and determination of Young's Modulus.

## CE(A)/ME/EC/CS/SE/IT/EB/EI/EE /MRE 401 ENGINEERING MATHEMATICS IV

**Module I**

**Complex Analytic functions and conformal mapping** : curves and regions in the complex plane, complex functions, limit, derivative, analytic function, Cauchy - Riemann equations, elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions.

Conformal mapping: Linear fractional transformations, mapping by elementary functions like  $e^z$ ,  $\sin z$ ,  $\cos z$ ,  $\sin hz$ , and  $\cos hz$ , Schwarz - Christoffel transformation.

**Module II**

**Complex integration:** Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's series, Laurent's series, residue theorem, evaluation of real integrals using integration around unit circle, around the semi circle, integrating contours having poles, on the real axis.

**Module III**

**Numerical Analysis** : Errors in numerical computations, sources of errors, significant digits. *Numerical solution of algebraic and transcendental equations*: bisection method, regula falsi method, Newton - Raphson method, method of iteration, rates of convergence of these method,

*Solution of linear system of algebraic equations*: exact methods, Gauss elimination method, iteration methods, Gauss-Jacobi method.

**Polynomial interpolation** : Lagrange interpolation polynomial, divided differences, Newton's divided differences interpolation polynomial.

**Module IV**

**Finite differences:** Operators  $\Delta$ ,  $\nabla$ ,  $\Delta^2$ , and  $\nabla^2$ , Newton's forward and backward differences interpolation polynomials, central differences, Stirling's central differences interpolation polynomial.

**Numerical differentiation:** Formulae for derivatives in the case of equally spaced points.

**Numerical integration:** Trapezoidal and Simpson's rules, compounded rules, errors of interpolation and integration formulae. Gauss quadrature formulae (No derivation for 2 point and 3 point formulae)

**Module V**

**Numerical solution of ordinary differential equations:** Taylor series method, Euler's method, modified Euler's method, Runge-Kutta formulae 4<sup>th</sup> order formula,

**Solution of linear difference equations with constant co-efficients:** Numerical solution of boundary value problems, methods of finite differences, finite differences methods for solving Laplace's equation in a rectangular region, finite differences methods for solving the wave equation and heat equation.

**Reference:**

- 1) Ervin Kreyszig : Advanced Engineering Mathematics, Wiley Eastern
- 2) S.S.Sastry : Introductory Method of Numerical Analysis, PHI
- 3) Ralph G. Stanton : Numerical Methods for Science and Engg., PHI
- 4) Conte & Carl de Boor : Elementary Numerical Analysis Analogarithmic approach  
i. McGraw Hill
- 5) Jani, Iyengar & Jain : Numerical Methods for scientific and  
i. Engineering Computations. Wiley Eastern.
- 6) E.V.Krishnamurthy, S.K.Sen : Numerical Algorithms, Affiliated East West.



## CE 402A/B SURVEYING - II

### Module I

**Curves** : Types of curves - Basic definitions-Elements of a simple curve - Methods of setting out (Linear methods and Angular methods)-Compound Curves-Elements of a compound curve-Reverse Curve-Transition curves-advantages-super elevation-length of a transition curve -vertical curves-Types of vertical curves-length of the vertical curve.

### Module II

**Triangulation** : Principles of Triangulation-classification triangulation-reconnaissance-Selection of Triangulation Stations-Intervisibility of Triangulation stations-Determination of elevations of stations (No obstruction due to intervening ground and obstruction due to intervening ground)  
-Signals-Elevated towers-selection of site for base line-Base line measurement-corrections-Satellite station.

### Module III

#### Adjustments of observations :

Laws of weight-Corrections to field measurements with a closing error-Theory of least squares-Normal equation method-Most probable values of directly observed quantities and indirectly observed quantities-Method of differences - Triangulation adjustments -Station adjustments for 3 different. Cases (when the horizon is closed with angles of equal weight - unequal weight-when several angles are measured at a station individually and also in combinations)- Figure adjustment of a plane triangle adjustment of two connected triangles-adjustment of a braced quadrilateral - adjustment of a level network-adjustment of a closed traverse.

### Module IV

#### Field Astronomy :

Definitions - solution of astronomical triangle-Co-ordinate systems-Time - Solar-Sidereal and Standard-Equation of time-sun dial-Determination of time, azimuth, latitude and longitude.

### Module V

#### Hydrographic Survey:

Introduction - Shore Line Survey - River survey Soundings Methods of sounding - Method of locating Soundings – plotting soundings-Three Point problem

#### Photogrammetry:

##### Phototheodolite -

Principle of the method of Terrestrial photogrammetry - Field work - Stereo - Photogrammetry - aerial Surveying - Terminology - Scale and distortion of the vertical photograph - principle of Binocular vision & Stereoscopic fusion - Flight planning - plotting from Air Photographs - Heighting - Photo Interpretation Comparison between Air Photograph and Map -Application of Air photograph.

#### Reference:

- 1) T.B. Kanetkar & S.V. Kulkarni : Surveying & Levelling - Part II
- 2) Dr. B.C. Punmia : Surveying vol II & vol II
- 3) T.M. Lillesand & R.W Keifer : Remote Sensing and Image Interpretation.

**CE 403A/B ANALYSIS OF STRUCTURES-1****MODULE I****Elastic Theorems and Energy Principles:**

Strain Energy and Complementary Energy, review of strain energy due to axial load, bending, shear and torsion, principle of superposition, principle of virtual work, Castigliano's theorem for Deflection (first theorem), theorem of complementary energy, Betti's theorem, Maxwell's Law of Reciprocal Deflections, Castigliano's second theorem and principle of Least work, Muller-Breslau's principle, application of method of virtual work (unit load method) and strain energy method for determination of deflections of statically determinate beams, pin-jointed trusses and rigid frames.

**Module II & Module III****Moving Loads and influence Lines:**

Moving loads on statically determinate structure, criteria for maximum effects, maximum bending moment and shear force diagrams, enveloping curves, equivalent uniformly distributed load for moment and shear.

Influence lines for reaction, shear and bending moment in simply supported beams, overhanging beams, bridge girder with floor beams, influence lines for forces in trusses, criteria for maximum effects in beams and trusses, reversal of stress under live load, influence lines from virtual displacement diagrams, influence line for deflection of simple beams, application of Muller-Breslau's principles of determination of influence lines for continuous beams.

**Module IV**

**Cables and Suspension Bridges:** Analysis of forces in cables, temperature effects, suspension bridges with three hinged and two hinged stiffening girders, influence lines.

**Module V**

**Arches:** Theory of arches, Eddy's theorem, Analysis of three hinged, two hinged and fixed arches, influence lines, reaction locus, rib-shortening settlement and temperature effects.

NOTE: S.I. Units shall be followed

**References:**

- 1) Wilbur, Norris : Elementary Structural Analysis (McGraw Hill)
- 2) Vazirani & Ratvani : Analysis of Structures – Vol I,II (Khanna Publishers)
- 3) Junarkar : Mechanics of Structures – Vol II (Chaitanya)

## CE 404A/B ENGINEERING GEOLOGY

### Module I

Introduction: Definition - branches of geology - scope of geology - earth as a planet - internal structure and composition of the earth - continental drift - plate tectonics. **Physical Geology:** Rock weathering and soils - physical weathering - chemical weathering - climate and soil formation - classification of soil - soil erosion and its control. *Wind* - Wind erosion - Wind transportation - Wind deposition - Rivers - erosion - transportation - deposition - river meandering - types of rivers - drainage patterns. *Oceans* - marine erosion - transportation - deposition - shore control problems. Earthquakes - terminology - classification - causes - effects - seismic waves - seismograph - location of epicentre - distribution of earthquakes - earthquake resisting constructions. Volcanoes - types of volcanoes - volcanic products - types of volcanic eruptions - nature of eruptions - Conos and other volcanic structures - distribution of volcanoes. *Landslides* - terminology - classification - causes - control of landslides.

### Module II

**Mineralogy:** Definition of minerals - physical properties of the following minerals - quartz, Telspar, Muscovite, Biotite, Augite, hornblende, Garnet, Tourmaline, Kyanite, Tale, Kaoline, Serpentine, Calcite, Flourite & Corundum. **Petrology:** Rocks of the earth crust, crystallisation, texture and mode of occurrence of igneous rocks - importance textural and structural features of sedimentary rocks - classification of sedimentary rocks - Agents and types of metamorphism - study of the following rocks with special reference to their engineering significance - Granite, Diorite, Syenite, Gabbro, Rhyolite, Trachy, Andesite, Basalt, Sandstone, Limestone, Shale, Conglomerate, Breccia, Laterite, Gneiss, Schist, Slate, Quartzite, Marble.

### Module III

**Structural Geology:** Outcrop - stratification - dip and strike. *Folds* - definition and parts of fold - classification - recognition in the field. *Faults* - definition and parts of a fault structure - classification - recognition in the field - effects of faulting on outcrops.

### Module IV

**Engineering Geology:** Engineering Geology of Dam Sites and Reservoirs, Bridge sites and tunnels. Stability of hill slopes and tunnels - stability of hill slopes and cuttings - Engineering properties of rocks.

### Module V

**Indian Stratigraphy:** Geologic and time scale, the three geomorphic division of India, Brief study of Archean, Cuddapha, Vindhyan & Gondwana formation of India, Tertories of Kerala.

**Economic Geology:** Distribution of the following major ore deposits and industrial minerals in India. Gold, diamond, Magnetite, Haematite, Limonite, Pyrite, Galena, Bauxite, Rutite Monazite, Illemnite, Petroleum & Coal, Refractories and Abrasives - Brief idea about geological prospecting - Application of remote sensing in geology.

### Laboratory Work:

Identification of the above mentioned rock -forming minerals by megascoping studies, Megascopic identification of the above mentioned economic minerals. Megascopic identification of the above mentioned major rock types with special reference to their engineering properties.

Elementary study of crystal systems.

Simple dip - strike problems - Tracing outcrops - Interpretation of Geological maps.

**Reference:**

- 1) Parbin Singh : A text book of Engineering and General Geology (Katson Pub. Ludhiana)
- 2) Arthur Holles : Principles of Physical Geology. (Thomas Nelson)
- 3) H.H. Read : Rutley's Elements of Mineralogy.
- 4) G.W. Tyrrel : The Principle of Petrology.
- 5) M.P. Billings : Structural Geology. (Prentice Hall)
- 6) W.R. Judo : Principles of Engg. Geology and Geotechnics (McGraw Hill)
- 7) M.S. Krishan : Geology of India and Burma (Higgin Bothams).
- 8) P.K. Mukerjee : A text book of geology (World Press Ltd., Calcutta)



**CE 406A SURVEY PRACTICALS - II**

1. Study of Theodolite.
2. Permanent adjustments of Theodolite.
3. Determination of Tacheometric Constants.
4. Heights and distances by stadia tacheometry.
5. Heights and distances by tangential tacheometry.
6. Heights and distances by solution of triangles.
7. Setting out simple curve-linear methods.
8. Setting out simple curve-angular methods.  
Setting out a transition curve.
9. Solution of Three Point problem - analytical method.

## CE 407A CONSTRUCTION ENGINEERING LABORATORY

1. Test on aggregates
  - a) Sieve analysis of coarse and fine aggregates
  - b) Bulk density, void ratio and porosity
  - c) Specific gravity of aggregates
  - d) Bulking of fine aggregates
  - e) Flakiness and elongation index
2. Test on cement
  - a) Specific gravity of cement
  - b) Fineness of cement
  - c) Normal consistency
  - d) Setting time
  - e) Soundness of cement
  - f) Compressive strength of cement
3. Flooring and Roofing Tiles and bricks
  - a) Transverse flexural strength
  - b) Water absorption
4. Preparation of concrete specimens
5. Test on fresh concrete- workability of concrete- slump, C.F., Vee - Bee Test
6. Test on hardened concrete
  - a) Compressive strength of concrete cubes
  - b) Compressive strength of concrete cylinders
  - c) Flexural strength of concrete
  - d) Split Tensile strength of concrete
  - e) Modulus of elasticity
7. Concrete mix design practice
8. Test on masonry assemblage

## CE 401 B ORGANISATION AND MANAGEMNT IN CONSTRUCTION

### Module I

Concept of Organisation – importance of organization – characteristics of organization – elements of organization – Organisation –process theory-principles –structure –design – Organisation Chart.

### Module II

Organisation Structure and its Comparability to Manageemnt-Objectives-Departmentation-Authority-Responsibility-Delegation of Authority-Decentralisation. Group dynamics- Grouts structure – Organisational change-Organisational development-Organisational conflict-Managerial leadership – Recruitment and selection – Man power planning-performance appraisal.

### Module III

Construction Organisation Structure and its function-Definition of key construction individuals and groups-Broad definition of a construction company Organisation and its function-The structure of Construction Organisation-Typical Construction Orga nisation management level – Linking Organisation Structure – Management functions and responsibilities.

### Module IV

Detailed Descriptions of Functions and Responsibilites of Key Construction Personnel.  
Introduction-Board of Directors Level-The President's level-Construction Business Organisational forms-relevance-single proprietor ship-Partnership-Corporatiuon-Joint Venture.  
Development and Organisation of Projects.  
Introduction-Organistion Concpets-Organisational Alternatives-The project Life Cycle.

### Referrences:

- 1) Louis A Allen : Management and Organisation
- 2) Malpin & R.W. Wood head : Construction Management
- 3) Roy Pilcher M : Principles of Construction Management.
- 4) Rwaku A Tenah/Joise' M Guevara: Fundamentals of Construction Management and Organisation.
- 5) O.P. Khanna : Industrial Engineering and Management.



## CE 405 B FLUID MECHANICS

### Module I

Fluid Properties : Density, Specific volume, specific weight and relative density, Viscosity, Newtons law of Viscosity. Classification of fluids based on Viscosity, Surface tension and Capillarity.

Fluid statics: Pascal's law, pressure variation in a static fluid piezometer, manometers-simple, differential, inclined and micromanometers, pressure gauge, Forces on plane and Curved surface, Centre of Pressure, buoyancy and stability of floating bodies.

### Module III

Fluid flow Concepts: Stream lines, Path lines and stream tubes, steady, unsteady, uniform and non uniform flows. One two and three dimensional flows. Laminar and turbulent flows. Rotational and irrotational flows. Continuity equation, Eulers equation and Bernoullis equation.

Discharge Measuring Devices: Application of Bernoullis equation-Pitor tube, Venturimeter and orifice meter, orifice and mouthpieces. Rectangular, triangular and Cippolettinotch, sharp crested, submerged, curved and Proportional weirs.

### Module IV

Flow in Piles : Turbulent flow through Pipes, Fluid friction in Pipes head loss due to friction. Darcy Weisbach equation. Friction factor for commercial Pipes, minor losses in Pipes, pipes in series and Parallel, Syphon and negative Pressure in Pipes.

Similitude : Geometric, Kinematic and dynamic similarities, Special model laws – Froude and Reynolds Lw, Weber Cauchy and Mach numbers Applications involving only Froude's and Reynold's laws.

### Module V

Fundamentals of open channel flow:- Scope and importance, characteristics of open channel flow, distinction between Pipe flow and open channel flow. Types of pen channels, geometric elements.

Steady uniform flow: Characteristics , Chezy's and Manning's formulas, Hydraulically efficient rectangular and trapezoidal sections.

Specific energy – Definition Diagram Critical subcritical and super critical flows. Establishment of Critical flow, specific force – Definition Diagram.

### Module VI

Hydraulic turbines: Importance of hydropower classification of turbines Description typical dimensions and working principles of Pelton, Francis and Kaplan tubribes (details design need not be death with). Description and function of drafts tube.

Pumps: classification of Pumps, Description and general principle of working of Centrifugal and reciprocating Pumps (detailed design need not be deal with). Cavitation in pumps and turbines.

### References:

- 1) Dr. P.N. Modi & Dr. S.M. Seth : Hydraulics & Fluid Mechanics
- 2) N.S. Govinda Rao : Hydraulics
- 3) Dr. Jagdish Lal : Hydrulics
- 4) V.L. Streeter : Fluid Mechanics
- 5) Ven Te Chow : Open channel Hydrulics.

**CE 406B SURVEY PRACTICALS - II**

1. Study of Theodolite.
2. Permanent adjustments of Theodolite.
3. Determination of Tacheometric Constants.
4. Heights and distances by stadia tacheometry.
5. Heights and distances by tangential tacheometry.
6. Heights and distances by solution of triangles.
7. Setting out simple curve-angular methods.

**CE 407B CONSTRUCTION ENGINEERING LABORATORY**

1. Test on aggregates
    - a) Sieve analysis of coarse and fine aggregates
    - b) Bulk density, void ratio and porosity
    - c) Specific gravity of aggregates
    - d) Bulking of fine aggregates
    - e) Flakiness and elongation index
  2. Test on cement
    - f) Specific gravity of cement
    - g) Fineness of cement
    - h) Normal consistency
    - i) Compressive strength of cement
  3. Flooring and Roofing Tiles and bricks
    - a. Transverse flexural strength
    - b. Water absorpt
  4. Test on fresh concrete- workability of concrete- slump, C.F., Vee - Bee Test
  5. Test on hardened concrete
    - a. Compressive strength of concrete cubes
    - b. Compressive strength of concrete cylinders
    - c. Flexural strength of concrete
    - d. Split Tensile strength of concrete
    - e. Modulus of elasticity
- Concrete mix design practice

**CE 501 A/B GEOTECHNICAL ENGINEERING –I****Module I**

Nature of soil and functional relationships: Soil types – residual soil and transported soil. Three phased system – void ratio – specific – specific gravity- dry density – porosity-water content-saturate unit weight-submerged unit weight – degree of saturation Concepts of single grained, honey combed and flocculant structure and their effects on the basic soil properties.

Laboratory and field identification of soils : Determination of water content by oven drying – specific gravity using Pyenometer and specific gravity bottle – grain size analysis by sieve analysis, hydrometer analysis and pipette analysis – Atterberg limit and indices sensitivity & thixotropy field density by core cutter, sand replacement and wax coating methods.

Classification of Soils: Necessity – Principles of classification – I.S. classification – plasticity chart.

**Module II**

Soil water system : Classification of soil water – capillarity of soils – effective stress- pressure diagrams for different conditions **Permeability** : Definition-Darcy's law-factors affecting permeability - Laboratory determination –permeability of stratified deposits.

Flow through porous media: Confined and unconfined aquifers – determination of field permeability by pumping test – seepage-quick sand condition – flownet diagrams for isotropic and anisotropic soils – Seepage through earth dams – phreatic line

**Module III**

Consideration: Definition – difference between compaction and consolidation – consideration process – laboratory consolidation Test-Void ratio-pressure relationship-coefficient of compressibility, coefficient of volume change and compression index-Normally consolidated and Over consolidated deposits – determination of pre-consolidation pressure – Terzaghi's theory of one dimensional consolidation – time rate of consolidation – percentage consolidation determination of coefficient of consolidation – settlement analysis secondary compression methods of accelerating consolidation.

**Module IV**

Shear strength: Definition – State of stress at a point- Mohr's stress circle-Mohr –Coulomb strength theory – failure plane and failure envelope – Relation between principal stresses at failure-Methods for measurement of shear strength –Direct shear test – Triaxial compression test-drainage conditions in triaxial tests –UU, CU and CD tests total and effective stress parameters for normally consolidated and over consolidated clays –shear characteristics of sand-critical void ratio and liquefaction –Unconfined compression test-Vane shear test.

**Module V**

Compaction : Definition and objectives of compaction – Proctor Test and Modified Protector Test – Concept of O.M.G. and maximum dry density –zero air voids line-compaction of sand-factors affecting compaction-field compaction methods –degree of compaction – control of compaction.

Stability of slopes: slope failure, base failure-Swedish circle method- $\phi = 0$  analysis and  $c = 0$  analysis-friction circle methods – Taylor's stability number and stability charts.

**References:**

- 1) Terzaghi and Peck : Soil Mechanics in Engineering Practice.
- 2) Alam Singh : Soil Engineering-Theory and Practice
- 3) B.C. Punmia : Soil Mechanics and Foundations
- 4) V.N.S. Murthy : Soil Mechanics and Foundations.
- 5) Gopal Ranja & A.S.R. Rao : Basic and Applied Soil Mechanics

## CE 502 A/B DESIGN OF STRUCTURES –I

### Module I

Stress – strain properties of concrete and reinforcements. Standard loading on structures-

Design concept –working stress method, Ultimate load method –limit state method.

**Limit State Method:** Introduction to various limit states- characteristic strength, characteristic load – Design values ,partial Safety factors,factored loads.

Analysis & design of rectangular, T and L sections in flexure- moment capacity – under reinforced, over reinforced and balanced sections- singly reinforced and doubly reinforced sections

### Module II

**Limit State Method:-** Factors contributing to shear resistance – types of shear reinforcements- bent up bars & Stirrups – design of reinforcement for shear. Bond and Anchorages- Pull out test – flexural bond – anchorage bond – positions of curtailment of tension reinforcement. Design for torsion in beams – torsion combined with flexure and shear.

Design of rectangular slabs: Simply supported one way and two-way slabs-Continuous slabs.  
Design of beam supported floor system

### Module III

**Limit State Method:** Types – Simply supported flights – cantilever steps

**Design of Columns:** Rectangular, and circular columns short and long columns for axial loading uniaxial bending & biaxial bending. Use of design charts of SP-16

### Reference:

- 1) Relevant IS Codes
- 2) SP-16, code of practice for IS 456-2000
- 3) Park R and Paulay T : Reinforced Concrete Structures, John Wiley & Sons
- 4) Ashok K. Jain : Reinforced Concrete – Limit state Design, New Chand & Bres.
- 5) V.L. Shah & S.R.Karve, limit state theory and Design of Reinforce concrete, Structures Publications,
- 6) Unnikrishnan Pillais & D Menon: Reinforced Concrete Design (Tata Mc Graw Hill Publishing company Ltd.,)
- 7) Purushotaman R, Reinforced Concrete Structural elements – Behaviour, Analysis & Design (Tata Mc Graw Hill Pub.com. Ltd.,)
- 8) Mallik .S.K & Gupta A.P Reinforced Concrete, Oxford & I B H Publishing group
- 9) Varghese P.C. : Limit State Design of Reinforced Concrete, Prentice Hall of India Pvt. Ltd.,

## CE 503 A/B ANALYSIS OF STRUCTURES –II

### Module I

Statically determinate and indeterminate structures: degree of indeterminacy – force and displacement methods of analysis.

Force method of analysis of statically indeterminate structures: analysis of statically indeterminate structures – analysis of fixed beams, continuous beams, rigid frames and pin-jointed trusses by consistent deformation method-strain energy method.

Three Moment Equation: Derivation of three moment equation – application of three moment equation for analysis of continuous beams due to applied loads and uneven support settlement.

### Module II

Displacement method of analysis of statically indeterminate structures: slope Deflection, Moment Distribution – analysis of continuous beams and rigid frames by the above methods for various loading cases – including frames with and without sway.

### Module III

Approximate methods of analysis of building frames: Approximate methods for the analysis of rigid frames subjected to lateral loads – Portal method, cantilever method and substitute frame method for vertical loads. Calculation of earthquake loading on building frames based on IS code.

### Module IV

Beams curved in Plan: Analysis of cantilever beam curved in plan – analysis of curved balcony beams – analysis of circular beams over simple supports.

Location of shear center.

### Module V

Plastic theory: Introduction-plastic hinge concept-plastic modulus –shape factor-redistribution of moments –collapse mechanism- plastic analysis of beams and portal frames- equilibrium and mechanism methods.

### References:

- 1) J.C. Kinney : Indeterminate structural analysis (Oxford & IBH)
- 2) C.K. Wang : Intermediate structural analysis (McGraw Hill)
- 3) Vazirani and Ratwani : Analysis of Structures – Vol.II (Khanna Publishers)
- 4) Norris and Wilbur : Elementary Structural analysis (McGraw Hill)
- 5) C.S. Reddy : Analysis & Structures (McGraw Hill)

## CE 504 A TRANSPORTATION ENGINEERING - I

### Module I

Classification, Alignment & surveys

Classification of highways – typical cross sectional roads in embankment and in cutting, definition of various cross sectional elements – requirements and factors controlling alignment of roads.

**Geometrical Design of Highways:** Camber – sight distances – Stopping, passing and overtaking Sight distances, Overtaking zone requirements, worked out problems – design of horizontal alignments, design speed – horizontal curves – Super elevation – Super elevation design – radius of horizontal Curve – extra widening of pavement – transition curves and methods of provision of super elevation and design of horizontal alignment – design of vertical alignment – gradient and grade Compensation Vertical curves – summit curves – length of summit curve - valley curves – length of valley curve

### Module II

Traffic Engineering: Traffic Characteristics – various traffic studies and their application- traffic regulations and controls – Traffic control Devices – Traffic Signals – classification of signals – carriage way markings – traffic islands – Highway intersections .

### Module III

Highway Materials, Testing & Design :Road aggregates – Desirable props & tests – Bituminous materials – Types of bituminous materials used in highway construction – requirements – desirable properties and tests.

Highway construction & Maintenance : Construction of earth roads, Gravel roads WBM roads, Bituminous pavements, Bituminous construction Procedures – Construction of Cement concrete pavements. Joints in Concrete pavements – types and causes of failures in flexible and rigid pavements – Highway drainage.

Pavement Design –Basic difference between flexible and rigid pavements – factors to be considered in Design of pavements – Design of flexible pavements by CBR and method only.

### Module IV

Aircraft characteristics – Regional planning airport site selection – Surveys for site selection Airport obstructions zoning laws-classification of obstructions – Imaginary surfaces. Runway orientation- wind, rose diagram-basic runway length and corrections required- Airport classification – runway configurations. Taxiway Design requirements.

### Module V

Apron-factors controlling size and number of gate positions –Aircraft parking System –Hangar site location – facilities required in the terminal building-Blast fences-Typical airport layout-airport marking-airport lighting. Air traffic control- Airway aids and landing aids.

### References:

- 1) S.K. Khanna & C.E.G. Justo : Highway Engineering
- 2) L.R. Khadiyali : TrafficEngg. And Transport Planning
- 3) S.K. Khanna, M.G. Arora & S.S. Jain : Airport Planning & Design
- 4) S.C. Rangwala : Airport Engineering
- 5) Horenjeef Robert & Francis : Planning & design of airport.

## CE 505A FLUID MECHANICS –II

### Module I

Flow in open channels: Qualifications for uniform flow-equations for uniform flow-Chezy's formula – Manning's formula – most efficient cross section – circular cross section not flowing full-velocity distribution in open channels – conveyance of a canal cross section – normal depth-normal discharge curve – hydraulic exponent for uniform flow computation – determination of normal depth and velocity-algebraic method-graphical method.

### Module II

Gradually varied flow: Basic assumptions- dynamic equation for gradually varied flow- different forms of the dynamic equation characteristics of flow profiles in prismatic channels-types of flow in prismatic channels. **Backwater curve**: Computation of length backwater curve- approximate formula- modified Bernoulli's formula-graphical integration method-direct step method-direct integration method-Bresses, Bakhmeteff, Chow methods.

### Module III

Rapidly varied flow: Characteristics of the flow-hydraulic jump-initial and sequent depths-non-dimensional equation –practical application of hydraulic jump-types of jump in horizontal floor-basic characteristics of the jump-energy loss-efficiency-height of jump-jump as energy dissipater – stilling basins-jump position-tail water conditions-jump types-stilling basins of generalized design (No detailed study) Unsteady flow in open channels: shallow water waves-capillary waves-gravity waves – translatory waves – celerity of small solitary waves- surge and bore.

### Module IV

Hydraulic machines: Impact of jet-force of jet on fixed and moving plates. **Turbines**: classification of turbines-velocity triangles for Pelton, Francis and Kaplan Turbine –specific speed-selecting turbines-draft tubes-penstocks-surge tanks-tail race.

### Module V

Centrifugal pumps: Types-volute and whirlpool chambers-velocity triangle for pumps-least starting speed-efficiency – specific speed-selection and installation of pumps for various purposes-multistage pump. **Positive displacement machines**: Reciprocating pumps-types- work cone-effect of acceleration and frictional resistance-slip and coefficient of discharge – separation in such and delivery pipes-air vessels-work save by air vessel-Rate of flow into and from air vessel.

### Reference:

- |                                  |  |
|----------------------------------|--|
| 1) K. Subramanya                 | : Flow in Open Channels (Tata McGraw Hill) |
| 2) A. Bakhmeteff                 | : Hydraulics of Open Channels              |
| 3) V.T. Chow                     | : Open Channels Hydraulics                 |
| 4) Dr. P.N. Modi & Dr. S.M. Seth | : Hydraulics                               |
| 5) Dr. S. Jagdish Lal            | : Hydraulic Machines                       |



## CE 506 A CIVIL ENGINEERING DRAWING

### Module I

Roof trusses – king post truss, Queen post truss, roof truss in structural steel sections

Stairs – RCC stairs- quarter turn stairs, dog legged stairs

### Module II

Buildings – Preparation of working drawings (from line sketches or from specifications) of the following types of buildings,

- (i) Residential buildings with flat and pitched roof (single storeyed and double storeyed)
- (ii) Factory building with trusses.

### Module III

Technical terms in building planning, Building rules, preparation of site plans & service plans as per building Rules.

Plumbing and House Drainage – water supply and drainage drawing for building

Planning and designing from given requirements of areas and specifications and preparation of working drawings for Residential Buildings.

### Reference:

- 1) National Building code of India ( Relevant sections)
- 2) Local Building Bye – Laws
- 3) Shah & Kale - Building Drawing (TMH)
- 4) Balagopal & T S Prabhu – Building Drawing & Detailing (SPADES, Calicut)

**CE 507 A FLUID MECHANICS LABORATORY**

1. Study of instruments: Pressure gauge, Piezometer, Manometer, Pressure transducers, Pitot tubes, Current meter
2. Demonstration: Bernoulli's theorem – Phreatic lines – Fluming horizontally and vertically.
3. Steady flow through pipes: Determination of friction factor for various types of pipes.
4. Orifices and mouthpieces: various types – steady case.
5. Notches and weirs: various types – steady case.
6. Time of emptying: unsteady flow.
7. Discharged measurements: Venturimeter, Venturi flume, orifice meter, water meter.
8. Open channel flow: determination of Manning's coefficient.
9. Plotting the specific energy curve.
10. Determination of hydraulic exponents.
11. Tracing back water profiles.
12. Tracing draw down profiles.
13. Hydraulic jump parameters.
14. Study of Pelton wheel, Francis, Kaplan turbines.
15. Study of centrifugal pumps, reciprocating pumps, jet pumps, deep well pumps.

## CE 504 B TRANSPORTATION ENGINEERING

### Module I

Classification of highways – typical cross section of roads in embankment and in cutting, definition of various cross sectional elements – requirements and factors controlling alignment of roads.

Camber – sight distances – Stopping, passing and overtaking Sight distances, Overtaking zone requirements, worked out problems – design of horizontal alignment, design speed – horizontal curves – Super elevation – Super elevation design – radius of horizontal Curve – extra widening of pavement – transition curves and methods of provision of super elevation and design of horizontal alignment – design of vertical alignment – gradient and grade Compensation Vertical curves – summit curves – valley curves ( length of summit curve & valley curve only)

### Module II

Road aggregates – Desirable properties and tests Bituminous materials – Types of bituminous materials used in highway construction – requirements – desirable properties and test.

Construction of WBM roads, Bituminous roads Cement concrete roads – Joints in Concrete pavements – types and causes of failures in flexible and rigid pavements – Basic difference between flexible and rigid pavements – factors to be considered in design of pavements – design of flexible pavement by CBR method only.

### Module III

Aircraft characteristics – airport site selection – Surveys for site selection – Airport obstruction – zoning laws.

Runway orientation – Wind rose diagram – basic runway length and corrections required – problems – Runway Configurations – Aircraft parking system – airport marking and lighting.

### Module IV

Railway Engineering, Permanent way – main requirements – Component parts – rails – functions of rails- requirements of a good rail – weight and length – defects in rails – coning of wheels – creep & wear of rails – Sleeper – its functions and requirements – sleeper density – Ballast – function and requirements

Super elevation, negative super elevation in branches – widening of gauge on curves – Principle of track circuiting – control of train movement by Centralized traffic Control systems.

Tunnel Engineering

Tunnel alignment – transferring Center grade into tunnel – tunneling through hard and soft rock (only full-face method and Neeble beam Method) – tunnel ventilation and drainage.

### Module V

Harbours Engineering: Classification of harbours – Breakwaters – necessity and functions – different types – Construction of break waters.

Dock Engineering Functions & type of docks – dry docks – floating docks – Dredging – Mechanical and hydraulic dredgers – general study of bucket ladder – Dredger, grab dredger and dipper dredgers.

### References:

- 1) S.K. Khanna & C.E.G. Justo : Highway Engineering
- 2) S.K. Khanna, M.G. Arora & S.S. Jain : Airport Planning & Design
- 3) S.C. Rangwala : Airport Engineering
- 4) S.C. Rangwala : Railway Engineering
- 5) Subhash .C. Saxena : Harbour, Dock & Tunnel Engg.
- 6) Dr. S.D. Bindra : A Course in Docks & Harbour Engg.

## **CE 505 B CONSTRUCTION NETWORKING MONITORING & CONTROL**

### **Module I**

Time schedule – general scheduling procedure – match schedule – listing materials – columnar charts-Gantt charts

Introduction to critical path methods – advantages – project break down – Network diagram and model utility data – time-cost curves – critical path determination – Network logic – preparation of time cost curves for activities – Network calculation - floats – critical path.

### **Module II**

Network Compression – Compression limited by crashing – float – parallel critical paths – crashed critical paths – most economical solutions.

Complex compression and decompression – activity decompression – determination of optional teast time solutions – decompression calculation.

### **Module III**

Scheduling & Resource levelling – activity shifting for resource levelling – scheduling for time limitations – Resource limitation – optimum solution – practical planning with critical path methods.

### **Module IV**

PERT Networks scheduling – PERT critical paths – PERT Network compression –selection of network techniques.

### **References:**

- 1) H.N. Ahuja - Construction Performance Control by Network.
- 2) A.A. James & R.W. Wood hed – Critical Path Methods in Construction Practice
- 3) James .J.O. Rein – CPM in Construction Management.
- 4) Roy Pilcher M – Principles of Construction Management

## **CE 506B CAD IN CIVIL ENGINEERING**

### **Module I**

Technical terms in building planning, Building rules, preparation of site plans, service plans. Planning and designing from given requirements of areas and specification and preparation of working drawings for residential buildings.

### **Module II**

Introduction to computers – Operating systems, graphic displays and peripherals.

Creation of drawings – Selection of work area, units, measurements system, layers, hatching, dimensioning, 2D drawings etc

Using 3D: Meshing, surface of revolution, co-ordinate systems, multiple viewing, Dynamic view, sectional view, Isometric view, multi colour plotting etc. Surface fitting Commands, solid modeling, creation of real life problems in civil modeling.

Planning and designing from given requirements of areas and specification and preparation of working drawings using package(s) for:- Residential buildings; flat and pitched roof, cottages, bungalows, flats.

Public buildings: Small public utility shelters, dispensaries, banks, school, offices, libraries, hostels etc.

### **References:**

- 1) National Building code of India (Relevant Sections)
- 2) Local Building Bye-laws
- 3) Balagopas T.S. Prabhu – Building Drawing and Detailing.
- 4) Shah & Kale – Building Drawing.

### **CE 507 B FLUID MECHANICS LABORATORY**

1. Study of instruments: Pressure gauge, Piezometer, Manometer, Pressure transducers, Pitot tubes, Current meter
2. Demonstration: Bernoulli's theorem – Phreatic lines – Fluming horizontally and vertically.
3. Steady flow through pipes: Determination of friction factor for various types of pipes.
4. Orifices and mouthpieces: various types – steady case.
5. Notches and weirs: various types – steady case.
6. Time of emptying: unsteady flow.
7. Discharged measurements: Venturimeter, Venturi flume, orifice meter, water meter.
8. Open channel flow: determination of Manning's coefficient.
9. Plotting the specific energy curve.
10. Determination of hydraulic exponents.
11. Tracing back water profiles.
12. Tracing draw down profiles.
13. Hydraulic jump parameters.
14. Study of Pelton wheel, Francis, Kaplan turbines.
15. Study of centrifugal pumps, reciprocating pumps, jet pumps, deep well pumps.

## CE 601A/B GEOTECHNICAL ENGINEERING-II

### Module I

**Site Investigation and soil exploration:** Objectives-planning-reconnaissance-methods of subsurface exploration-test pits, auger borings,-rotary drilling-depth of boring-bore log-soil profile-location of water table-sampling-disturbed and undisturbed samples.

Standard Penetration Test-dynamic Cone Penetration Test-Static cone Penetration Test-Plate Load Test-Field Vane Shear Test-Field CBR test –Pressure meter test- Geophysical methods.

### Module II

**Foundations:** Shallow and Deep foundations- different types of foundations- selection of type of foundation.

**Bearing Capacity:** Ultimate and allowable bearing capacity-Terzaghi's equation for bearing capacity for continuous, circular and square footings- bearing capacity factors and charts- skempton's formulae – Meyerhoffs formula – effect of water table on bearing capacity.

**Footings:** Types of footings-individual, continuous and combined footings-design consideration footing subjected to eccentric loading

### Module III

**Stress Distribution:** Boussinesque's and Westergaard's equations for vertical pressure due to point loads and uniformly distribute loads-assumptions and limitations pressure bulb –Newmark charts and their use.

**Settlement analysis:** Distribution of contact pressure-estimation of settlements –causes of settlement – permissible, total and differential settlements.

Allowable soil Pressure – Proportioning of footings for equal settlement.

Raft foundations: Bearing Capacity equations-design considerations-conventional design procedure for rigid mat-floating foundations.

### Module IV

**Pile foundations:** Uses of piles-Classification of piles based on purpose and material determination of type and length of piles-determination of the bearing capacity of axially loaded single vertical pile(static and dynamic formulae) – determination of bearing capacity by penetration tests and pile load tests (I.S. methods) – negative skin friction group action and pile spacing-settlement of pile group.

**Caissons:** Open (well) caissons, box (floating) caissons, pneumatic caissons- construction details and design considerations of well foundations.

### Module V

Earth Pressure-General and local states of plastic equilibrium – Rankines and coulomb's theories for active and passive conditions-influence of surcharge – Rebhann's and Culmann's graphical methods.

**Sheet Piles:** Common types of sheet piles – types and use of sheet piling walls-lateral pressure acting on sheet piling walls

Note: Structural designs of foundation are not contemplated in this course.

### References:

- 1) Joseph f. Bowles : foundation Analysis and Design.
- 2) W.C. Teng : foundations Design
- 3) Gopal Rajan & A.S.R.Rao : Basic and Applied Soil Mechanics
- 4) B.C. Punmia : Soil Mechanics and Foundations
- 5) M.J. Tomlinson : Foundations Design and Construction.
- 6) Vijay Singh : Wells and Caissons
- 7) N.P. Kurian : Design of foundation system

## CE 602 A/B DESIGN OF STRUCTURES –II

### Module I

**Column footing:** Design of square, rectangular & circular footing:- combined footing rectangular & trapezoidal and strap footing by limit state method

**Retaining walls:** Types-Design of Cantilever and counterfort retaining walls by limit state method.

### Module II

**Water tanks:** Design of underground, ground and overhead water tanks as per IS codes – rectangular water tanks – Circular Water tanks – Design concept of sidewalls, base slab & ring beam. Analysis and Design of staging.

### Module III

#### **Prestressed Concrete:**

Introduction –Basic concept of prestressing – Advantages of prestressed concrete over reinforced concrete. Materials for prestressed concrete – their characteristics. Systems and methods of prestressing – pretensioning systems and post - tensioning systems. Thermo electric prestressing – chemical prestressing. Analysis of prestress and bending stress.

Losses of prestress-elastic loss, loss due to creep, loss due to shrinkage, loss due to relaxation of steel, loss due to friction and anchorage slip.

Elastic design of Sections for flexure and shear. Analysis and design of End block in post-tensioned members

#### **Reference:**

- 1) Relevant IS codes
- 2) Park R and Paulay T, Reinforced concrete Structures, John Wiley and Sons Inc
- 3) T.Y.Lin Design of Prestressed Concrete Structures, Asian Publishing House
- 4) A.K.Jain – Reinforced Concrete Limit State Design, Newchand & Bros
- 5) V.L.Shah & S.r. Karve, Limit State theory and Design of Reinforced concrete, Structures Publication Purie.
- 6) Unnikrishnan Pillai s & D. Menon, Reinforced concrete design, Tata Mc Graw Hill Publishing Company Ltd.
- 7) Purushotaman R Reinforced Concrete Structural elements – Behaviour, Analysis & Design, Tata Mc Graw Hill Publishing Company Ltd.
- 8) Mallik .S.K & Gupta A.P; Reinforced concrete oxford & IBH publishing company.
- 9) Varghese P.C, Limit state Design of Reinforced concrete, Prentice Hall of India Pvt. Ltd.,
- 10) Sinha, Prestressed concrete, Tata Mc Graw Hill Company.



## CE 603A/B WATER RESOURCES AND IRRIGATION ENGINEERING

### Module I

**Introduction:** Hydrologic cycle, scope, application of hydrology. **Precipitation:** Formation of precipitation types of precipitation- measurement of precipitation – recording and non recording gauges – gauges network – adjustments of precipitation data – average depth of precipitation over an area Arithmetic mean, theissen polygon and isohyetal method – Hyetograph- Mass curve- Depth area duration curves. **Water Losses:** Evaporation transpiration and infiltration – Factors affecting evaporation – measurement of evaporation – Evapoaration formulae – Infiltration Factors affectin infiltration . Determination of infiltration rate – Effect of infiltration on run-off-Recharge Oof ground water. **Ruf off:** Factors affecting run-off – empirical formulae – Run-off hydrograph – Components of hydrograph – Separation of base flow – Hydrograph for isolated storm and complez storm – Unit hydrograph for different durations – Shydrograph.

### Module II

Ground water Hydrology: Occurrence, distribution of ground water – Darcy’s law-Permeability, safe yield Location and development of ground water supplies – Hydrology of wells – Steay flow in confined and unconfined aquifers – open well – yield of an open well – Effect of partial penetration – Interference of wells – Boundary effect – poecific capacity of wells – tube wells – Yield from a tube wells – Strainers –Site for tube well.

### Module III

Flow and Lift Irrigation – Perennial and Inundation Irrigation – Important Crops and Crop seasons – duty and Delta - Methods of Cultivation – Water requirement Irrigation efficiency Multipurposes projects. **Reservoirs:** Investigation and Planning – Selection of site – Engineering, Geological, and Hydrological Investigations fixation of storage capacity Contours – Mass curve – Operation of reservoirs – Reservoir sedimentation Head works: Storage and diversion works – Layout of head works – Selection of site – Weirs – Types pf Weirs – Weirs on permeable foundation Uplift and piping Bligh’s creep theory Lane’s weighted creep theory Khosla’s theory of independent variables – Design of aprons – Body wall-Vertical drop wire – Design of sloping glacis weir, river regulators – Site excluder – Silt vane.

### Module IV

Storage works: Type of dams – Gravity dams – Force acting on a gravity dam- Elementary profile – single step method of design- Safety criteria galleries in dams – Arch Dams – Types of arch dams – Forces acting on arch dams – design of arch dam by cylinder theory – Introduction of trail analysis Butteress dams – Types of Buttress dams – Force acting on buttress dams.Earthe and rockfill Dams – Types of earthen dams.

### Module V

**Surplussing Arrangement:** spillways – types and Functions – Design of Ogee Spillway and siphon Spillway energy dissipation below Spillways stilling basin – spillway Crest gates. **Distribution works:** classification of canals Design of canals Erodible canals – Canals in alluvial soils-/regime thory- Kennedy, Lacey traction theories – Manning’s formula – silting in canals and prevention Scour protection against scour.

### References:

1. B.C. Punmia & P.B. Lal : Irrigation and Water power
2. V.B.Priyani :The Fundamental Principles of irrigation Engineering
3. P.K.Sharma : Hydrology and Water Resources.
4. Dr. P.N.Modi : Irrigation Water Resource & Water Power
5. S.F. Sahasrabudhe : Irrigation in Engg. & Hydraulic Structure.

## CE 604 A TRANSPORTATION ENGINEERING –II

### Module I

Railway Engineering : Permanent way – main requirements – Component parts.

Rails –functions of rails –requirements of a good rail, weight and length., defects in rails, rail joint and other fastenings, check and guard rails, coning of wheels, creep of rail. Sleeper-its functions and requirements, types of sleepers, sleeper density. Ballast-functions and requirements, different types used.

Geometric Design

Design of horizontal curves-Super elevation, negative super elevation in branches, length of transition curves –grade compensation on curves, widening of gauge on curves.

### Module II

Railway Operation control: Points and Crossings-Design features of a turn out-Types of railway track-points –Details of station yards and Marshalling yards-Signaling and interlocking – Principles of track circuiting-Control of train movement by absolute block system-automatic block system-Centralized traffic control systems.

### Module III

Tunnel Engineering: Tunnel sections-types size and shapes-tunnel surveying-Alignment, transferring center grade in to tunnel-tunnel driving procedure-tunneling through hard and soft soils(Only Full face Method and Needle Beam Method) –Tunnel lining ventilation lighting and drainage of tunnels.

### Module IV

Harbor Engineering:

Classification of harbours Breakwaters-necessity and functions-different types-forces acting on breakwater-design principles-construction of breakwaters-general study of pier heads, quays, landing stages-wharves, jetties, transit sheds and warehouses-channel demarcation-signal characteristics (Beacons,buoys,channel-lighting,light houses).

### Module V

Dock Engineering

Function and types of docks, dry docks, floating docks slipways, dock gates and caissons-s Dredging-Mechanical and hydraulic dredgers-general study of bucket ladder-Dredger, grab dredger and dipper dredgers.

### References:

- 1) S.C.RANGWALA - Railway Engineering (CharoterPublishing House)
- 2) SAXENA & ARORA - Railway Engineering(Dhanpatrai & Sons).
- 3) SUBASHC.CAXENA - Railway Engineering (Dhanpatrai&Sons) Harbour, dock & (Charoter Publishing House)
- 1) DR.S.P.BINDRA – A Course in Docks & harbor Engg. (Dhanpatrai & Sons)

## CE 604 B CONSTRUCTION EQUIPMENTS & MATERIAL MANAGEMENT

### Module I

Construction Equipments : Engineering Fundamentals – Tractors and related equipments – excavating equipments – Bull dozer, power shovel, dragline, Clam shells, scrapers – Hauling and Conveying equipments – Trucks and Wagons - Belt conveyor systems – Cranes.

### Module II

Drilling and blasting equipments – Tunneling equipments – equipments for the production of crushed aggregates – Factors affecting selection of equipments.

Managing construction equipments – equipment economics – owning costs – operating costs- replacement decision – equipment cost control – plant layout.

### Module III

Materials Management

Introduction: Scope and Objectives, phases in materials management, requisition, procurement and distribution,

Procurement: Purchase procedure, tender, earnest money, security deposit, purchase order, Vendor rating.

Receipt: Invoice, cash memo, inspection.

Storage: Methods of storage, bin, rack, piling and special arrangements, stock verification

Issue: issue vouchers, FIFO & LIFO systems, imprets stores, consumable stores, custody stores.

### Module IV

Selective control techniques of inventory – definition – techniques like ABC, VED, FSN etc inventory control systems – Transportation model and its application for distribution of materials.

### Refernces:

- 1) R.L. Pewrifooy : Construction Planning, equipment and methods.
- 2) J.A. Havers : Hand book of heavy construction
- 3) P. Gopalakrishnan & M. Sunderesan : Materials Management – an integrated approach
- 4) A. Deb : Materials Management – Academic Publishers
- 5) Starr & Miller : Inventory Control- theory and practice.

## CE 605A/B ARCHITECTURE AND TOWN PLANNING

### Module I

**Principles of Architectural Design:** Definition of Architecture – factors influencing architectural development-characteristic features of a style –historical examples.

Creative Principles – function, strength and aesthetics deciding the space and form-detailed analysis of factors influencing the space, activity space, circulation space and tolerance space –factors influencing form –from perception – from expressive of function, form related with material and structural system.

Design principles –elements of composition - point, line, plane, texture, colour etc, mass and scale, proportions – rhythm, balance and unity – iconic, pragmatic and analogue design.

### Module II

**Functional Planning of Buildings:** Occupancy classification of buildings – general requirements of site and building- building codes and rules – licensing of building works.

Functional planning of buildings such as residential, institutional, public, commercial and industrial buildings – the process of identifying activity area & linkages – drawing built diagrams – checking for circulation, ventilation, structural requirements and other constraints – preparing sketchplans and working drawing – site plants .

Presentation techniques –pictorial drawings –perspective and rendering – model making introduction to computer aided design and drafting.

Consideration of comfort factors such as acoustics, lighting, ventilation and thermal aspects.

A project on library, fast food center, any three volume space.

### Module III

#### **Town Planning Theory:**

Evolution of towns – problems of urban growth-beginning of town planning acts – ideal towns –garden city movement – concept of new towns and conservative singeory-comprehensive planing of towns.

Survey and analysis of town-base maps-land used classification – transportation network-housing-demographic and social surveys – economic studies – environmental aspects- theories of land use planning transportation planning and housing development.

Urban area delineation –urban influence zone –urban region-concept of regional planning.

### Module IV

Concept of master plan, structure plan, detailed town planning scheme and action plan. Estimating future needs – planning standards for different land use allocation for commerce, industries, public amenities, open areas etc, - planning standards for density distributions – density zones –planning standards for traffic network – standard of roads Plan implementation –town planning legislations and municipal acts – panning of control development schemes – urban financing – land acquisition –slum clearance schemes – pollution control aspects.

#### **Rerefrences:**

- 1) Barister Fletcher – A History of world Architecture
- 2) Percy Brown – Indian Architecture Vols. I & II.
- 3) Scot –Design Fundamentals
- 4) Broadbent – Theory of Architecture Design
- 5) Gallien – Urban Pattern
- 6) Nelson P. Lewis – Planning the Modern City.

## CE 606A CAD IN CIVIL ENGINEERING

Introduction to computers, operating systems, Graphic displays and peripherals.

Creation of drawings – selection of work area, units, measurements system, layers, hatching, dimensioning, 2D drawing etc.

Using 3D: Meshing, surface of revolution, co-ordinate systems, multiple viewing, Dynamic view, sectional view, Isometric view, multi colour plotting etc. Surface fitting commands, solid modeling, creation of real life problems in civil modeling.

Planning and designing form given requirements of areas and specifications and preparation of sketch designs and working drawings using package(s) for:-

Residential buildings: flat and pitched roof, economic, domestic units, cottages, bungalows, flats.

Public buildings: Small public utility shelters, dispensaries, banks, school, offices, libraries, hostels, restaurants, commercial complex, factories etc

Term Project – To prepare sketch designs for client and submission drawings for approval (using National Building Code Provisions and Local Building Rules).

### References:

- 1) National Building code of India (Relevant Sections)
- 2) Local Building Bye-laws
- 3) Shah & Kale –Building Drawing (Tatx Mc Graw Hill)
- 4) Balagopal & T.s .Prabhu – Building Drawing and Detailing(SPADES, Calicut )

## CE 606 B COMPUTER APPLICATIONS IN PROJECT MANAGEMENT

Project Management using CPM/PERT Software.  
(Microsoft Project or any equivalent software)

1. Practice on the GUI of the software and input of data.
2. Practice on Creating Bar charts/ Gantt chart.
3. Practice on Creating CPM/PERT charts and finding out critical path.
4. Practice on resource allocation and leveling of resources
5. Practice on project Monitoring
6. Plotting and printing of various charts and reports.

**Note:-** This student has to practice the above topics by doing project Management for ten key projects related to civil Engineering applications.

### References:

- 1) Project Management reference Manual
- 2) Organization and Management in construction
- 3) Construction Networking Monitoring and Control
- 4) Construction Equipments and material Management
- 5) MIS and Finance Management
- 6) High rise buildings – Problems associated with high rise buildings: Advanced construction techniques and field quality control
- 7) Construction contracts and legal aspects in construction
- 8) Computer applications in project management

**CE 607A GEOTECHNICAL ENGINEERING LABORATORY**

1. Determination of Specific gravity, water content and particle size distribution by hydrometer method.
2. Determination of field density by core cutter and sand replacement method.
3. Determination of Attenberg Limits.
4. Compaction Tests –I.S. light and heavy compaction.
5. Permeability test- constant head and variable head methods.
6. Consolidation test.
7. Direct shear test.
8. Triaxial compression test.
9. Unconfined compression test and Vane shear test.
10. Study on collection and field identification of soil and sampling techniques.
11. Demonstration of field tests like Standard Penetration Test, dynamic cone Penetration Test, Static Cone Penetration Test, Electrical Resistivity method, Pressure meter test, Plate load test.

## **CE 607 B GEOTECHNICAL ENGINEERING LABORATORY**

1. Determination of Specific gravity, water content and particle size distribution by hydrometer method.
2. Determination of field density by core cutter and sand replacement method.
3. Determination of Attenberg Limits.
4. Compaction tests – I.S. light and heavy compaction.
5. Permeability tests – constant head and variable head methods.
6. Consolidation test.
7. Shear strength tests – Direct shear, Triaxial, UCC & Vane Shear Test
8. Study on collection and field identification of soil and sampling techniques.
9. Demonstration of field tests like Standard Penetration Test, Dynamic Cone Penetration Test, Static Cone Penetration Test, Electrical Receptivity method, Pressure meter test, Plate load test.



## CE 701A/B ENVIRONMENTAL ENGINEERING

### Module I

Scope of environmental engineering, Health effects, effects on resources, effect on the balance of ecosystem natural resources. *Global environmental issues*. Water supply engineering, Quantity of water. Water demands – various types, total requirements of water for a town/city, per capita demand, variation in demand and their effects on the design of various components of a water supply scheme, design periods, population growth, population forecasting methods *Water supply scheme*. Gravitational, pumping and combined schemes, pumps, classification, hand pumps, well pumps Quality of water. Drinking water standards, physical, chemical and bacteriological analysis of water.

### Module II

Water Treatment. Screening Sedimentation – theory of sedimentation, plain sedimentation, design of sedimentation tanks, coagulation and flocculation, design of flash mixers, flocculators, clariflocculators, Filtration, theory, filtering media, design, construction, control and operation of slow, rapid sand and pressure filters, dual media filters. Disinfection, methods of disinfection, chlorination, prechlorination, superchlorination, dechlorination, chloramine process, break point chlorination. Miscellaneous treatments, Colour, odour and taste removal, iron and manganese removal, flouridation and deflouridation, removal of hardness. Aeration, application in removal of iron and manganese.

### Module III

Wastewater engineering. Sanitary pumping, closets, urinals, wash basins, sinks, baths, traps, soil pipes, antisiphonage pipes, wastewater pipes, systems of piping pipe joints, pipe fittings. House drainage, principles of house drainage, inspection chambers, ventilation, testing of drains, connection of house drains and street sewers. *Systems of sewerage*. Separate, combined and partially combined system. conservancy and water carriage system. *Quantity of sanitary sewage*. Source of sewage, relation to water consumption, ground water infiltration, fluctuation of sewage flow. Quantity of storm sewage, factors affecting storm water drainage, determination of storm water flow, time of concentration. Sewers and sewer appurtenances, materials used in construction of sewers, shapes of sewers, hydraulics of sewers, design of sewers, manholes, inlets, catch basins, flushing devices, regulators, leaping weirs, side weirs, syphon spillway, inverted syphons, sewage pumps, pumping stations, ejectors, sewer junctions, outlets, maintenance of sewers, inspections and repairs, ventilation of sewers.

### Module IV

Wastewater treatment. Characteristics of sewage, physical, chemical and biological characteristics, physical and chemical analysis, sampling. Sewage disposal, dilution, disposal into stream, pollution assimilation capacity of streams, disposal by irrigation, surface and subsurface irrigation. Treatment of wastewater. Screens, grit chambers, detritus tanks, skimming tanks sedimentation tanks, oxidation ponds, design, construction and operation of these units. Design construction and operation of trickling filter and activated sludge treatment units. Sludge treatment and disposal, anaerobic digestion, sludge drying beds, sludge disposal. Design of septic tanks as per BIS specifications.

### Module V

Solid waste management. Collection, transportation and processing. Types and sources of solid wastes, vehicles for solid waste collection and transportation, solid waste characteristics, disposal, composting, incineration, sanitary landfill. Air pollution. Types of pollutants, sources, health effects, Air pollution control, Noise pollution, Sources, effects, control

**References:**

- 1) K.N. Duggal : Elements of public health engineering (S.Chand&Col., Delhi)
- 2) S.K.Hussain : A text book of water supply and sanitary engineering  
1. (Oxford I.B.Hpub.Co.,New Delhi)
- 3) Emil T. Cchanlett : Environmental protection (2<sup>nd</sup> Ed.) Mc Graw Hill)
- 4) Fair Geyer & Okun : Water supply Wastewater Engineering
- 5) Earnest W. Steel : Water supply and Sewage
- 6) Ehlers & Steel : Municipal & Rural sanitation (Mc Graw Hill)
- 7) Sawyer & Mc Ganty : Chemistry for Environmental Engineering (Mc Graw Hill)
- 8) Metcaif & Eddy Inc: Waste water Engg-Treatment, disposal and reuse  
(2<sup>nd</sup> Ed.) McGraw Hill)

## CE 702 A/B DESIGN OF STRUCTURES –III

### Module I

Properties of Structural steel – Hot rolled steel section – Design of tension and compression members – Bolted and welded connection for axial forces. Design of simple beams (laterally supported) of rolled sections for flexure, shear, web crippling, buckling and deflection Design of connections – beam to beam – beam to column and Moment resisting connection. Built-up beams – beams with unrestrained compression flange – Welded and riveted plate girder, gantry girder – curtailment of flange, stiffeners and splices. **Light – gauge Section:** Types of reaction, material, local buckling of thin elements – stiffened elements – laterally supported and Unsupported flexural members – connection- flexible semi-rigid and rigid or moment resisting connections.

### Module II

**Columns** – Design of built –up compression members - Design of lacings and battens – Eccentrically loaded column-column splices – Column bases for axial and eccentric load– Grillage foundation. **Roof trusses-** types of trusses for different spans – Design of roof trusses for - dead, live and wind loads. Connection at supports – design of purlins .

### Module III

**Chimney** –Self supporting chimney including foundation. **Water tanks** – Design of over head rectangular, cylindrical with hemispherical bottom and pressed steel tanks including design of staging.

### References:

- 1) Relevant IS codes
- 2) SP: 6(1) ISI Hand book for structural Engineers Structural Steel Section, BIS, 1964.
- 3) Joseph E. Bowler, Structural Steel Design Mc Graw Hill International book Company 1982.
- 4) Bresler & Lin, Design of Steel Structures, Wiley Eastern Pvt. Ltd., New Delhi 1980.
- 5) Vazirani V.N, & Ratwani N.M, Steel and Timber Structures, Khanna Publishers.
- 6) Ramamrutham s. & Narayanan R. , Design of Structures, Dhanpat Rai & Sons, Delhi.
- 7) Ramachandra, Design of Steel Structures Volume I and Volume II, Standards Publishing House, New Delhi.
- 8) Hool and Kinne, Steel & Timber Structures. Mc Graw Hill International Bool Company 1980.
- 9) A.S.Arya and J.L.Ajamani, Design of Steel Structures,Nemchand and Bros. Roorkee.

## CE 703 A CONSTRUCTION MANAGEMENT

### Module I

Organisation : Concept of organisation, characteristics of organisation, elements of organisation, organisational structures, organisation charts, Types of organisation - formal line, military or scalar organisation, functional organisation, line and staff organisation, project organisation, matrix organisation, authority and responsibility, span of control, Delegation of authority. Management: Concept of management and administration difference and relationship between management, administration and organisation, evolution of management theory, principles of scientific management, levels in management, introduction to project management and MIS.

### Module II

Time schedule – general scheduling procedures – match schedule – listing materials – columnar charts-Gantt charts.

Introduction to critical path methods – advantages – project break down – Network diagram – time – cost curves. Critical path determination –network logic – preparation of time cost curves for activities. Network calculation – floats – critical paths.

### Module III

Network compression – compression limited by crashing float – parallel critical paths – crashed critical paths – most economical solutions. PERT Network scheduling – PERT critical paths – Selection of network techniques.

### Module IV

Concept of materials management – functions – inventory; definition – selective inventory control techniques like ABC, VED, FSN etc – inventory control systems. Transportation model and its application for distribution of materials

### Module V

Construction Equipments : Tractors and related equipments – excavating equipments – scrapers – shovels and cranes – belt conveyor systems – balancing of equipments.

### References:

- 1) R.L. Pewrifooy : Construction planning, equipment & methods,
- 2) P.Gopalakrishnan & M. Sunderesan : Materials management – an integrated approach.
- 3) Louis A Allen : Management and organisation.
- 4) James J.O. Rein : CPM in Construction Management.
- 5) Ahuja H.N. : Construction Performance Control by Network.

**CE 704 A/B (a) ADVANCED STRUCTURAL ANALYSIS**

**Module I**

**Fore method of analysis** – Influence coefficient – flexibility influence coefficient – review of method of consistent deformation. **Flexibility method:** coordinate system – equivalent joint loads – equilibrium matrix – element flexibility matrix – Structure flexibility matrix – displacement of statically determinate Structure- analysis of statically indeterminate Structures – continuous beams – portal frames and pin jointed truss

**Module II**

Displacement method of analysis – Stiffness influence Coefficient – review of method of slope deflection. **Stiffness method:** Element stiffness matrix– Compatibility matrix – Structure stiffness matrix – analysis of continuous beams, portal frames and Pin-jointed trusses **Direct stiffness method :** Assembly of Structure stiffness matrix from element Stiffness matrices – incorporation of boundary condition – analysis of beams, Portal frames and Pin-jointed trusses

**Module III**

Introduction to Finite element method- outline of the procedure- Element properties – displacement models – shape function – truss and beam elements – Convergence requirements.

**Module IV**

Elementary Structural dynamics – single degree of freedom system – Damping – forced vibration – Earthquake motion- Introduction to multi degree of freedom systems.

**Reference:**

- 1) Manickaselvam :- elementary matrix analysis of Structures (Dhanpat Rai & Sons)
- 2) Desai C.S and Abel J.F:- Introduction to the Finite element method (Affiliated East west press)
- 3) Krishnamurthy C.S. Finite element method (Tata Mc Graw Hill)
- 4) Manickaselvan V.K. :- Elementary Structural dynamics (Dhanpat Rai & Sons)
- 5) Anil K. Chopra ÷ Dynamcis of Structures – Theory and application to earthquake Engineering (Printice Hall of India Pvt. Ltd.)

## CE 704 A/B (b) TRADITIONAL ARCHITECTURE & VASTU VIDYA

### Module I

#### *Conceptual framework of Vastu Vidya*

- a) Definition of Vastu Vidya- resource material – division of Silpis and their roles and duties- evolutionary nature of the discipline – basic units of measurements- Purusha Pramanam, Hastam, Padam, Angulam and Yavam – Vertical Proportioning and the Thalam concept – Astathalam, Nava thalam and Dassthalam.
- b) Concept of Vastu- Vastu of basic geometrical shapes- division of Vastu by Orthogonals and diagonals- Vastu Purusha mandala and the prime padas- concept of Aavrithi or vedhi- adaptability of the basic concept of vastu for town planning, temple construction and secular buildings.

### Module II

#### *Planning and Design of Temples & Hills*

- a) Investigation of land – different types of tests for suitability- Su[adma, Bhadra, Pooma and Dumra types- determination of cardinal direction – classification of villages and towns- types of planned settlement – land use pattern of settlement- position of temples and other uses- street pattern and widths.
- b) Planning and Design aspects of Temple, Mandapas and Natyagrihas – plan shapes- vertical proportion – basic parts of the structure- treatment of basement, columns and roof- case study of typical architectural forms of Temples, Mandapas and Natyasalas.

### Module III

#### *Residential Buildings*

- a) Planning residential buildings- evolution of different residential types from the Vastu purusha Mandala- sites suitable for house building, building location – main building and ancillary facilities- the role of perimeter- the Yoni concept – preferred dimensions- standardization.
- b) The flexible nature of domestic buildings- the core house and extensions, Alindams-Ekasala, Dwisaleas, Triasalas and cjatrusalas- General distribution of functional areas- case study of domestic plans.

### Module IV

#### *Technology in Vastu Vidya*

- a) Materials for construction – classification of materials – brief description of the characteristics and uses of Sila, Ikstake, Daru, Loha, Mrilsna and Sudha- the technology of assembly and joinery.
- b) Construction method- functions, walls, column, Uttaram and roof structure- the system of proportional measurements and thumb rules- Decorative treatment of sculpture, murals and fenestration – Analysis of the basic structural system tools and techniques of construction.

### References:

- 1) Silpa Ratna (Mala) : Panjangam book Depot, Kunnamkulam
- 2) Tantrasamuchayam (Mala) : Panjangam book Depot, Kunnamkulam
- 3) Manushyalaya Chandrika (mala) : Panjangam book Depot, Kunnamkulam
- 4) Bhasha Silparathnam (Mala) : Oriental Manuscript Library, kerala University
- 5) Vastuvidya : Oriental Manuscript Library, kerala University
- 6) Architecture of Manasara(4 vol. Set) : P.K. Acharya Oriental books Reprint Corporation ,New Delhi

## CE 704 A/B (c) GROUND IMPROVEMENT TECHNIQUES

### Module I

Insitu densification methods in cohesive soils –dewatering –well point system, electro osmosis – reloading – sand drains and methods of their installation – sand drain design – stone columns – electrical methods – thermal methods.

### Module II

Chemical sabilisation – cement stabilisation – factors affecting soil cement mixing, admixtures, field compaction. Line stabilization – effect of lime on soil properties.

Construction of lime stabilized bases. Bituminous stabilization.

Insitu densification methods in granular soils: introduction – vibration at the ground surface, Mechanical stabilization, factors affecting compaction – impact at the ground surface, deep dynamic compaction, vibration at depth – vibro compaction. Impact at depth – blasting.

### Module III

Introduction to grouts and grouting – basic functions – groutability ratio – classification of grouts.

Properties of grouts – fluidity, bleeding potential, rigidity and thixotropy, strength and permeance.

Grouting applications – seepage control in soil under dams and for cut off walls- seepage control in rock under dams – stabilization grouting for underpinning.

### Module IV

Earth reinforcement – mechanism and concept – stress-strain relationship of reinforces soil – design theories and stability analysis of retaining wall –tie back analysis – coherent gravity analysis – application areas of earth reinforcement

### Module V

Soil reinforcement with geotextiles – classification – concepts – geotextiles as separators – geotextiles as reinforcement – geotextiles as filters – geotextiles for drainage – damage and durability of geotextiles

### References:

- 1) M.J. Tomlinson - Foundation design and construction
- 2) Alam Singh - Modern Geotechnical Engineering
- 3) Robert M. Koerner - Construction and Geotechnical Methods in Foundation Engineering
- 4) M.G. Spangler and R.L. Hardy - Soil Engineering.
- 5) C.J.F.P Jones - Earth Reinforcement and soil structures
- 6) R.A. Jewell - Soil Reinforcement with geotextiles

## CE 704A/B (d) GROUNDWATER POLLUTION AND CONTROL

### Module I

Groundwater resources, groundwater in hydrologic cycle, occurrence of groundwater, groundwater in India. Aquifer properties and groundwater flow, determination of specific yield, storage coefficient, piezometric test, pumping test. Land subsidence due to withdrawals, movement of groundwater, factors affecting permeability, water table contour maps and flownet analysis

### Module II

Well hydraulics: Steady radial flow into a well, unsteady radial flow into a well, Theis solution, leaky artesian aquifer, unsteady radial flow in unconfined, confined and leaky aquifers, Hantush and Jacob solution. Fluctuation in groundwater levels, multiple well systems, hydraulics of open wells.

### Module III

General mechanism of groundwater contamination - infiltration, direct migration, inter aquifer exchange, recharge from surface water. Sources of groundwater contamination. Movement of contaminants in groundwater – advection, dispersion and retardation. Groundwater tracers. Introduction to seawater intrusion.

### Module IV

Ground water quality: Water quality standards for different uses – drinking, agricultural, industrial. Type of groundwater quality investigations – regional, local and site investigation Groundwater sampling

Important groundwater pollutants, - chemical and microbiological, organic pollutants and metals, iron, arsenic, fluorides. Treatment technologies

### Module V

Groundwater restoration – Physical containment techniques, removal, barrier to groundwater flow, surface water control, limitations of physical containment. Hydrodynamic control – Well systems, limitations. Withdrawal and treatment – physical, chemical and biological, limitations, In-situ treatment techniques – chemical, physical, bioremediation, microbial system for bioremediation, site characteristics, solid and slurry phase bioremediation.. Management of groundwater protection programmes, Case studies.

### References:

- 1) Raghunath H.M., Groundwater, Wiley Eastern Limited
- 2) Cookson J.T, Bioremediation Engineering
- 3) Barcelona M., Contamination of Groundwater, Noyes Data Corporation



## CE 704 A/B (e) HIGHWAY AND AIRFIELD PAVEMENTS

### Module I

Pavement types: Stress distribution in pavements – theoretical subgrade conditions and traffic loadings  
Basic difference between flexible and rigid pavements – design factors-wheel load – equivalent single wheel load-repetition of loads-elastic modulus-climatic variations.

### Module II

Design of flexible pavements: group index method –CBR method –IRC recommendations- McLeod method-Burmister's layer theory.

### Module III

Design of rigid pavements: radius of relative stiffness –critical load positions-Westergaard's stress equation – Bradley's stress coefficients – design charts.

### Module IV

Temperature stress in concrete pavements: Westergaard's concept-wrapping stress – functional stress – combination of stresses.

Design of joints in concrete pavements: expansion joints – construction joints- design of dowel bars – tie bars-IRC recommendation.

### Module V

Evaluation of pavement condition: pavement instrumentation – types of pavement distress-roughness and skid resistance. Environmental influence and effects – pavements maintenance and overlays.

### Reference:

- 1) Bindra B.S, Highway Engineering, Danpat Rai and Sons.
- 2) H.J.Yoder, Principles of Pavement Design, John Wiley and Sons
- 3) Khanna O.P, Justo C.G., Highway Engineering, Nem Chand Publishers
- 4) IRC Standard specification for Construction of Flexible and rigid pavements

## CE 705A CAD IN CIVIL ENGINEERING –II

### Module I

Structural analysis & Design using STAAD or equivalent package. *Modeling of Geometry*: Modeling of framed Structures – water tanks industrial structures. Property specification – support specification – constants – Using GUI of the software.

Loading: Joint load-member load – area load/floor load- fixed and member load moving load – wind load – seismic load. *Analysis of the modeled structure*: interpretation of the results – Joint displacements – member and forces – section displacements – force envelopes – shear/ bending moment diagrams displacement profile – animation. *Design of modeled structure*- Concrete design based on IS 456 – beams, columns, footings – steel design based on IS 800- Indian steel table – Design Parameters – Member selection – Optimization.

**Note:-** The students has to practice the above topics by working out problems in

- (i) Analysis and design of steel trusses, steel and RCC framed structures(2D & 3D)
- (ii) Analysis and design of multi – storeyed framed structures.
- (iii) Analysis and design of RCC and steel water tanks

### References:

- 1) STAAD Reference Manual / Equivalent package reference manual.

## CE 706(A) HIGHWAY ENGINEERING LABORATORY

### Test on Road Aggregates

1. Grain size distribution of aggregates
2. Specific gravity test.
3. Water absorption and bulking of aggregates.
4. Aggregate Crushing Value
5. Aggregate Impact Value
6. Aggregate Abrasion Value

### Test on Bitumen

7. Softening point of Bitumen.
8. Ductility test on Bitumen.
9. Specific gravity of Bitumen
10. Flash and fire point test.
11. Stripping Value Test.
12. Viscosity using Viscometer.
13. Marshall stability Value.
14. Determination of bitumen content by bitumen extractor.

### Test on Soil

15. California Bearing Ratio value tests.

**CE 707A ENVIRONMENTAL ENGINEERING LABORATORY**

I Determination of the following in water / wastewater

- |                 |                        |
|-----------------|------------------------|
| 1. Conductivity | 7. Sulphates/Sulphides |
| 2. pH           | 8. Chlorides           |
| 3. Turbidity    | 9. BOD                 |
| 4. Hardness     | 10. COD                |
| 5. Solids       | 11. Dissolved Oxygen   |
| 6. Alkalinity   | 12. Iron               |

II Determination of available chlorine.

III Microbiological quality of water – coliforms MPN

IV Sludge volume index of wastewater

V Jar test for coagulant dose

## CE 703 B MIS & FINANCE MANAGEMENT

### Module I

**Introduction to MIS** Classification of computers-hardware & software details –introduction to networking-concepts of networking- Configuration –types and inter connection of various networks(LAN/MAN/WAN)

Data base: definition- n analysis of DBMS- classification of data items –coding considerations –types of coded structures.

### Module II

**Concept of data and information** –role of MIS for managing information system for decision making –phases in the information system life cycle .File storage : composition of data files classification – selection consideration for file media and file organization methods –file design considerations.

### Module III

**Finance Management** : Tasks evolution of corporate management , long term financing equity, preference and debenture, term loans ,dividends and share valuation, legal aspects of dividends, short term financing, working capital, influencing factors, cash budgeting, ,terms of liquidity, management of receivable and inventories, budgets and budgetary control-objectives of budgeting classification ratio analysis.

### Module IV

**Management of Accounting:** Fundamentals of book keeping , journalizing ledger accounts, subdivision of journal cash book, banking transactions, trail balance, preparation of trading profit and loss account and bank balance sheet ,adjustments.

### References:

- 1) Murdick & Rose : Information systems of Modern Management, Prentice Hall
- 2) Prasanna Chandra Tata: Financial Management, Mc Graw Hill
- 3) V.Rajaraman : Analysis and design of information systems
- 4) Stefan K & Staney : Theory and Practice of relational data bases.

**CE 705 B ADVANCED CONSTRUCTION TECHNIQUES & FIELD QUALITY CONTROL****Module I**

Advanced Construction Techniques: Light construction Techniques – Foundation, Framing Accoustical ceiling, Doors & Windows , Stairs, Thermal, insulation, Plumbing, Heating & Air conditioning, Launching precast bridge girders, Prestressing Techniques, Transportation of concrete by conveyers, pumping, cranes etc. Improved Building Technologies – Walls, Roofs, Prefabrication.

**Module II**

Heavy construction - Rock drilling, Conveying equipments, Pneumatic equipments, Rock blasting, Tunneling, Concrete forming, Asphaltting, Soil Reinforcement & application of geosynthetics, Application of Ferro cement. Use of new Construction chemicals - Ready mix concrete and grouting materials .

**Module III**

Inspection of works and checklists – Survey works, Excavation, Backfilling, Site Development, Blasting, Demolition, Piling, Caissons and well foundation and other underwater works, Under ground works, Stone Masonry, Brick masonry, Preparation of mortar, Concrete, Centering & Shuttering, Reinforcement, Concreting, Plastering, Painting Scaffolding, Plumbing & sanitary works, Flooring, Roofing, Structural steel works, Precasting & prestressing works, Field QA/QC plan, Records.

**Module IV**

Quality control in Road works: Introduction to IRC and MOST standards – General system Requirements, Field Laboratory, Material specifications, Design Standards. Railway Design Standards – Introduction to RDSO standards. Introduction to CPWD Standards on roads and buildings.

**Module V**

Introduction to ISO 9000/IS 14000 Series – Relevance to Construction, Overview, Interpretation of important clauses, Elements / System Requirements of ISO 9001 – Quality Policy, Quality System, Contract Review Process, Design control. Control of documents, Purchasing Standards, Product Identification and Traceability, Process Control Standards to prevent nonconformities, Inspection and Testing Standards, Standards for personnel training. Building the ISO System – Quality Manual, Procedure Manual, Quality Documentation. Implementation – Quality System Management, Auditing, follow up audits.

**References:**

1. John E.Ball - Light Construction Techniques
2. S.P Brahma - Foundation Engineering
3. A.G. Madhava Rao -Appropriate Technologies for Low-cost housing  
D.s. Ramachandra Murthy
4. V.N. Vazirani, S.P Chadola –Heavy Construction
5. James E. Russel - Construction Equipment
6. Robert L. Pecrifoy, W.B. Ledbeffer,- Construction Planning, Equipment and methods  
Clifford J Schexnayder
7. R. Chudley -Construction Technology
8. A.C. Panchadhari -Construction Inspection
9. O.Brein - Construction Inspection Hand Book
10. James E. Russel - Construction Equipments
11. MOST Standards Hand Book
12. RDSO Standards
13. CPWD Standards

**CE 706 (B) HIGHWAY ENGINEERING LABORATORY**

**Test on road Aggregates**

1. Aggregate Crushing value
2. Aggregate Impact Value
3. Aggregate Abrasion Value

**Test on Bitumen**

4. Softening point of Bitumen
5. Ductility test on Bitumen
6. Specific Gravity of Bitumen
7. Flash and fire point test
8. Stripping Value test
9. Viscosity Using Viscometer
10. Marshall Stability Value
11. Determination of bitumen Content by bitumen extractor.

**Test on Soil**

12. California Bearing Ratio test

**CE 707 B ENVIRONMENTAL ENGINEERING LABORATORY**

- I Determination of the following in water / wastewater
- |                 |                        |
|-----------------|------------------------|
| 1. Conductivity | 7. Sulphates/Sulphides |
| 2. pH           | 8. Chlorides           |
| 3. Turbidity    | 9. BOD                 |
| 4. Hardness     | 10. COD                |
| 5. Solids       | 11. Dissolved Oxygen   |
| 6. Alkalinity   | 12. Iron               |
- II Determination of available chlorine.
- III Microbiological quality of water – coliforms MPN
- IV Sludge volume index of wastewater
- V Jar test for coagulant dose
- VI Determination of particulates in ambient air
- VII Simulation of Filtration
- VIII Test on Sedimentation



## CE 801 A/B QUANTITY SURVEYING AND VALUATION

### QUANTITY SURVEYING

#### Module I

Preparation of detailed estimates for building, reinforced concrete and steel structures, roads, irrigation structures, sanitary and water supply works.

#### Module II

Preparation of specifications for common materials of construction and items of work with reference to Indian Standard Specifications.

Analysis of rates and preparation of abstract of estimates for building and other engineering structures. Estimate of material costs at various stages of construction. Preparation of reports accompanying estimates.

#### Module III

Valuation – explanation of items – value, market value, rate, years purchase –free hold and lease hold purchase p depreciation-methods of calculating depreciation –straight line method, constant percentage method, sinking fund method and quantity survey method – sinking fund.

Method of valuation of land-comparative method-abstractive method

Methods of valuation of property-rental method-direct comparison with capital cost-valuation based on profit-valuation based on cost-development method-depreciation method.

Method of valuation of landed property-gilt edge security as the base returns as investment-capital value-value of land-investment basis of valuation-Belt method-front land and recessed land-valuation of lease land based on hypothetical building schemes-cost of development, financing charges and price fixation of developed land. Valuation of 1) residential properties 2) offices 3) shop premises 4) commercial properties 5) industrial properties and 6) agricultural land-valuation of lease hold properties and land with circumstances like easement.

#### References:

- 1) B.N.Dutta : Estimating and Costing in Civil Engineering
- 2) Chakrabarth : Estimating Costing and Specifications in Civil Engg.
- 3) N.A.Shah : Quantity Surveying and Valuation.
- 4) Ranagawala : Valuation of Real Properties
- 5) I.S.1200 (1968) : Methods of Measurements of Building and Civil Engg.

## CE 802 A/B CONSTRUCTION SAFETY & FIRE ENGINEERING

### Module I

Introduction to Construction Industry and Safety: Basic concepts – accident – injury –lost time accidents, reportable accident, frequency rate, seniority rate, incidence rate. Technological, Organisation and Behavioral Aspects of safety in construction. Impediments to safety in construction, measures to overcome. Human factors. Planning for safety. Roles of different groups in ensuring safety, health, welfare and social security. Steps to be taken in construction sites in case of accidents. Introduction to ergonomics and its relevance to construction.

### Module II

Contents of National Building Code of India to construction safety. Study of major Indian Standards on construction safety. Safety in various construction operations such as excavation, under-pinning, shoring, dewatering, under-water works, piling, blasting, tunnelling, demolition, Ladders & Scaffolds, Confined Spaces, temporary structures, electrical works. Safety in material handling- storage, stacking, construction equipments like excavators, trucks, cranes & lifting tackles, safe handling of hazardous construction materials. Personal protective equipment's for construction.

### Module III

Chemistry of fire – Composition of combustion- Heat Transfer from fire, Flammability limits and range, Flash point, Fire point – Flash over and Back draft. Classification of fire. Effect of high temperature on the properties of concrete, steel, masonry wood. Non-combustibility test on building materials. Fire Resistance of building elements and Test of Fire Resistance. Fire resistant walls, ceilings – design concepts. Fire - stopped area. Use of National Building Code for fire resistant design of elements of various types of construction buildings

### Module IV

National Building code of India and fire protection in buildings – Classification based on occupancy, types of construction, fire zones, General Requirements of fire protection for all individual occupancies – Maximum height – floor area ratio, Open spaces – Openings, Electrical Installations, fire Stop, Detection & Extinguishment system, fixed fire fighting installation – minimum requirements, study of typical arrangements for downcomer, wet-riser, water storage tanks for fire fighting, air conditioning and Ventilation, smoke wending, Heating, Additional precautions, Interior Surface finishes, glazing, skylights, fire lift.

### Module V

Life safety aspects of building fires – Exit Requirements as per NBC of India, Requirements other than general requirements of Residential Buildings, Educational Buildings, Institutional Buildings, Assembly Buildings, Business Building, Mercantile Buildings, Industrial Buildings, Storage Buildings & Hazardous Buildings. Post-fire Assessment of fire severity, damage to concrete, steel, masonry, timber. Feasibility of repair and repair techniques for columns, beams, floors etc made of various materials.

### References:

1. National Building Code of India, Part –IV and VII
2. K N Vaid :Construction Safety Management
3. Linger L. :Modern Methods of Material Handling.
4. R T Ratay :Handbook of Temporary Structures in Construction
5. M.Ya. Roytman :Principles of Fire Safety Standards for Building Construction
6. E.W. Merchant :A Complete Guide to Fire & Buildings
7. Smith & Harmathy : Design of Buildings for Fire Safety
8. A K Jain : Fire Safety in Buildings
9. R S Gupta :A Hand Book of Fire Technology

## CE 803 A/B (a) ADVANCED DESIGN OF STRUCTURES

### Module I

Design of flat slabs by direct design method as per IS code, ribbed slabs, deep beams in R C C

Design of R C Chimneys : Uncracked & cracked Sections, use of code charts, temperature stresses.

### Module II

RC shells and domes -Types of shells-membrane theory-Beam method for circular cylindrical shells

Analysis of folded plats – Simpson’s method – Iteration method, Design & detailing

### Module III

Bridges: Types of bridge –IRC loadings – load distribution on floor system – load combination- Design of slab decks-slab decks spanning in one direction and slab decks spanning in two direction –Design of T beam bridge deck

### Note:-

1. All design shall be done as per IS specification
2. Special importance shall be given to detailing
3. SI units shall be followed
4. I.S. design shall be practiced wherever possible
5. Use of S P :16 will be permitted

### Reference:

- 1) S.N. Sinha : Reinforced concrete design (Tata Mc Graw Hill)
- 2) Jai & Jaikrishna : Plain & reinforced concrete Volume II(Nem Chnad Bros)
- 3) Park and Paulay: R.C. Structures (John wiley & Son)
- 4) Chandrashekara : Analysis of thin concrete shells (New age International Ltd.)
- 5) N. Krishnaraju : Structural design and drawing (University Prem India Ltd.)
- 6) B.C.Punmia: R.C. Structures Volume II (Laxmi Publication, New Delhi)

## CE 803 A/B (b) INTERIOR DESIGN

### Module I

**Characteristics of Indoor Space :** Effect of enclosures on space perception – size, volume, proportion and shape of enclosures, Ideal space proportions –use of scales for space representation, psychological effects of space, modulation of space – design elements, criteria for different situations.

### Module II

**Principles of Interior Design:** Background for applied decoration – colour, texture, plane and fixtures in relation to background – principles of composition of visual elements – Modulation of interior space with art objects and modulating thermal and sonic environment of space through design-Space modulation through artificial and natural lighting, emphasizing of focal points – Unity in interior design. A project on any particular interior space.

### Module III

**Furniture Design :** Role of furniture, evolution of furniture styles, ergonomic factors of furniture design, materials used, functional classification, barrier free design, matching of furniture to the decorative style, fitted furniture, its characteristics and applications

### Module IV

**Structural treatments :** Decorative materials for ceiling, walls and floors, sources and collecting product information's, Decorative furnishes and fabrics – Methods of application, elements and application of Interior landscape, special structural form to emphasis space.

### references:

- 1) Scott –Design Fundamentals
- 2) Colin Boyne and Lancewright –The best of Architects' working details, Vol.2
- 3) Halse – The Use of Colour in Interiors
- 4) Lan Grant – Great Interiors (Spring books)
- 5) Francis D ching – Interior Design – form, space & order.

## CE 803A/B (c) ADVANCED FOUNDATION DESIGN

### Module I

**Machine foundations:** Basic theory of vibration – free and forced vibration of single degree of freedom with and without damping –two degrees of freedom with and without damping-dynamic soil properties-Mass spring model and constants-elastic half space approach-determination of dynamic soil constants in laboratory and field based on I.S code provisions.

Modes of vibration of block foundation.

Natural frequency of foundation of soil system by Barkan's approach. Methods of analysis. Barkan's method –Verticles – Translation, sliding, rocking and yawing. (I.S.Code method)

### Module II

**Design of Machine foundations:** Static and dynamic design criteria-permissible amplitude of vibrations for different types of machines. Foundations for reciprocating machines –design criteria-calculation of induced forces and moments –Multi-cylinder Engines.

Foundations subjected to impact type of forces-(Hammer)-Design data-Design criteria- Foundation resting on soil- Analysis of vertical vibration-foundations on vibration absorbers-vibration isolation.

### Module III

**Shell foundations:** Structural form and efficiency-different types of shell foundations – General principles of design of shell foundations – Construction of shell foundations.

### Module IV

**Special foundations:** Foundations for special structures such as water tanks, silos, cooling towers, guyed structures, ground storage tanks, chimneys, telecommunication towers, transmission line towers, foundations for underground conduits, foundations for coastal and offshore structures- foundation in special soils-prestressed foundation.

### References:

- 1) G.A.Leonards - Foundation Engineering (McGraw Hill Co)
- 2) N.P.Kurian - Modern Foundations (Tata McGraw Hill)
- 3) Alexander Major - Dynamics in soil Engineering – Voll.2 and 3
- 4) Srinivasulu P. & Vaidyanatha C.V.- Handbook of Machine Foundations (Tata McGraw Hill)
- 5) IS.2974-Part I to Part V
- 6) IS 5249 – Method of test for determination of dynamic properties of soils.

## CE 803 A/B (d) INDUSTRIAL WASTE ENGINEERING AND MANAGEMENT

### Module I

Effect of industrial waste on stream, land and air, Stream quality criteria for public water supply and effluent standards, characterisation studies, Variation in wastewater flowrates and constituents, Objective of wastewater treatment, Plant analysis and design, General layout of an effluent treatment plant, Volume reduction, Strength reduction, Neutralisation, Equalisation and Proportioning.

### Module II

Disposal of treated waste into rivers, lake, reservoirs and estuaries, De-oxygenation and Re-oxygenation in river and Streams, Development of Oxygen sag model, Application of Streeter Phelp's equation, Estimation of assimilation capacity of stream. Design of river out fall, Ocean disposal, Water reclamation and reuse.

### Module III

Physio-chemical treatment methods, Application of sedimentation. coagulation, flocculation, adsorption, chemical precipitation, ion exchange, reverse osmosis and electro dialysis process, Biological treatment methods, Principle, Attached and suspended culture systems, modification of activated sludge process, rotating biological contactors, biotower, stabilisation pond, oxidation ditch, aerated lagoon, sequencing batch reactors Conventional and high rate anaerobic treatment concept of anaerobic contact process, anaerobic rotating biological contractors, Anaerobic Expanded/Fluidised bed reactors, Upflow anaerobic sludge blanket reactors and modifications.

### Module IV

Manufacturing process, Characterization and treatment of Industrial waste, paper and pulp mill waste, breweries and distilleries waste, tannery waste, textile mill waste, pharmaceutical plant wastes, Fertiliser plant waste, sugar mill waste, Flow diagram for treatment

### Module V

Removal and control of particulate matter and gaseous pollutants, Waste management techniques. Control of Volatile organic compounds by absorption, adsorption, combustion and biofiltration. Environmental management through ISO 14000, Environmental Auditing procedures, Auditing for waste minimisation, Ecolabelling and Life Cycle Assessment.

### Reference:

- 1) N.L. Nemerow, Liquid Waste Industry – Theory, Practice and Treatment McGraw Hill Publications.
- 2) Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw Hill Publications
- 3) Rao M.N and Datta A.K, Waste Water Treatment Oxford IBH Publication
- 4) Mahajan S.P, Pollution Control in Process industry, Tata McGraw Hill Publication.
- 5) Wark and Warner, Air Pollution, Harper and Row Publication.
- 6) Eckenfelder W.W, Industrial Water Pollution Control, McGraw Hill Publication.

## CE 803 A/B (e) COST EFFECTIVE BUILDING TECHNIQUES

### Module I

Cost Reduction Techniques – Planning aspects – construction aspect – maintenance and longevity aspect – cost factor of different types of buildings with respect to land, building and services – single units, semi – detached, row houses etc –design of dwelling units.

### Module II

Construction aspects – locally available building materials and their usability, Natural materials. Coconut fibers – Coir and related waste products, Bamboos, treated timber, Industrial waste – Flyash, Lime sludge, raw dust quarry waste. Energy efficient Construction techniques. Cost reduction techniques developed by research institutes like CBRI, SERC etc.

### Module III

Mud Construction – Mud as building and building material – classification and engineering properties admixtures for stabilisation of mud-lime, cement, bitumen and chemicals. Preparation and testing of mud blocks -Block making machines-mud wall construction reinforcement for mud wall construction. Performance of mud walls-finishes and protective treatments – emerging techniques for mud stabilisation.

### Module IV

Prefabricated building components – advantages of prefabrication. Areas where prefabrication can be introduced, Stabilised Soil blocks, Store masonry blocks, Lato blocks, Hollow concrete blocks, Solid concrete blocks. Sand lime bricks, Ferro cement products etc.

### References:

- 1) F.S. Merrit : Building Construction Hand book.
- 2) D.J.Perry & P.S.Brandew : Cost planning of buildings.
- 3) K.Thomas Poulouse : Innovative approaches to Housing the Poor.
- 4) Advances in Building Construction : CBRI Rookie Publications.

**CE 804 A BUILDING TECHNOLOGY LABORATORY**

1. Study of equipments
2. Measurements of sound levels in a hall
3. Determination of absorption coefficient using standing wave apparatus
4. Measurement of illumination levels from a point source
5. Determination of isolux contours in a room
6. Determination of air circulation in a room
7. Measurement of solar radiation
8. Building shadow studies using Heliodon
9. Measurement of temperature and humidity.
10. Measurement of thermal insulation
11. Nondestructive testing of concrete using ultrasonic testing apparatus and hammer.



## CE 804 B CONTRACTS & LEGAL ASPECTS IN CONSTRUCTION

### Module I

Law of contracts: Indian Contract Act, 1872- Definitions, Communication, Acceptance, Revocation, Contract, Void Agreement, Contingent contracts, Performance, Breach of contract. Bidding process –Methods of bidding, Negotiation. Arbitration clauses in contract - Arbitration process, Benefits of arbitration.

### Module II

Contract Labour Act, 1970, and Central Rules 1971 – Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties and procedures, Rules regarding wages, Register and Records and Collection of statistics, Familiarisation with important forms such as Form I, II, IV, V, VI, VI –A, VI-B, VII, VIII, XII, XIII, XVI, XVII, XVIII, XX, XXI, XXIV, XXV appended to Central Rules.

### Module III

Buildings & other Construction Workers (RE & CS ) Act, 1996 and Central Rules, 1998 – Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, OSH provisions, Social Security Provisions, Penalties, Familiarisation with important forms appended to the Rules.

### Module IV

Payment of Wages Act 1936 – Responsibility for payment of wages, fixation of wage period, Time of payment of wages, Deductions, Settlement of claims, Penalty. Minimum Wages Act, 1948 – Definition, fixing of minimum rates of wages, procedure for fixing and revising minimum wages, wages in kind, Fixing hours for normal working day, Overtime, Penalty. Equal Remuneration Act, 1976 – Discrimination while recruiting men and women workers, Claims & complaints, Maintaining Register as per Form- D. Employment of Children Act – Prohibition of employment of children in certain occupation, Disputes as to age, Penalty. Children (pledging of Labour) Act, 1933 – Definitions, Void ability of contrary agreements, Penalty for parents/guardian and employer. Interstate Migrant Workmen Act, 1979 – Definition, Registration, Licensing of Contractors, Wage rates, Displacement allowance, Journey allowance, Responsibility for payment of wages, Liability of Principal Employer, Penalty for contravention.

### Module V

Workmen's Compensation Act 1923- Definitions, Employer's liability for compensation, Calculation of amount of compensation. ESI Act and Rules – Applicability to Construction, Definition, Benefits as per the Act & Rules. Employer's Liability Act, 1938 - Grounds for barring defense of common employment, Contracting out etc. EPF and Miscellaneous Provisions Act 1952 – Introduction to the Act and EPS –95 scheme.

### References:

- 1) Law of Contracts - M Krishanan Nair (Orient Longman)
- 2) Law of Contracts & Specific Relief – Avtar Singh (Eastern Book Co.)
- 3) Law of Contracts - P.S Narayanan & SRC Nair (Gogia Law Agency)
- 4) Law of Arbitration & Conciliation –Avtar Singh (Eastern Book Co.)
- 5) Lectures on Arbitration, Conciliation and - Dr. Rega Surya Rao (Andhra Law House)
- 6) Alternative Dispute Resolution system
- 7) Labour Laws – HL Kumar (Universal Law Publishing Co.)
- 8) Acts & Rules mentioned above with latest amendments,