

**(TMA -302) ENGINEERING MATHEMATICS -III**

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**Unit I: Integral Transforms** **(10)**

Applications of integral transform in engineering, Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations.

**Unit II: Complex Variable** **(10)**

Applications of complex variable in engineering, Analytic functions, C-R equations and harmonic functions, Conformal Mappings ; Translation, Magnification, Rotation, Inversion and Bi-linear Transformation.

**Unit III: Numerical Methods** **(10)**

**Solution of Algebraic and Transcendental Equation:**

Bisection Method, Iteration method, Newton-Raphson method, Method of false position, Rate of convergence of Iterative methods.

**Numerical Integration:** Introduction, Newton Quadrature formula, Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule, Weddle's rule.

**Unit IV: Statistics** **(10)**

Random Variable: Discrete and Continuous, Probability mass and Probability density Functions Bayes' Theorem and its applications, Moments, Moment Generating Functions and their properties, Binomial, Poisson and Normal Distributions,

**Unit V: Curve Fitting and Solution of Equations** **(10)**

Method of least squares and curve fitting of straight line and parabola, Skewness and Kurtosis, Correlation: Carl-Pearson coefficient and Spearman Brown's Rank correlation, Linear Regression, Solution of cubic and bi-quadratic equations.

**Reference:**

1. E. Kreyszing: Advanced Engineering Mathematics, Wiley Eastern
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publication
3. Higher Engineering Mathematics , B.V. Ramana , Tata-McGraw Hill publication
- 4 Text Book of Engineering Mathematics, . Bali, N. P, Narayana Iyengar, Laxmi Publication

## (TCE 301) MECHANICS OF FLUIDS

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### UNIT-I:

(12)

Scope and importance of the subject, Definition of Fluids, Distinction between solids , liquids & gas, fluid continuum.

#### **Fluid Properties and Classification of Fluid**

Mass density, Specific Volume, Specific Weight, Relative density, Viscosity, Shear stress and Newton's law of viscosity, Newtonian and Non-Newtonian Fluids, Ideal and Real fluids, rheological classification. Compressibility, Vapour pressure, Surface tension, Pressure inside a drop and a bubble, capillarity and capillary rise.

#### **Dimensional Analysis & Model Similitude**

Introduction to Dimensional Analysis , units & dimensions, table of Dimensions, Dimensional Homogeneity, Methods of Analysis (Raleigh's & Buckingham's method). Model Studies, Introduction and comparison with Dimensional Analysis, Similitude, Dimensionless parameters. Types of models, Model laws and Principles.

### UNIT II:

(10)

#### **Fluid Pressure and its Measurement**

Definition of pressure, units and dimensions, Pressure at a point, Hydrostatic pressure law, Pressure head, atmospheric pressure, Barometer, Inverted Manometers, Measurement of pressure head , Simple and Differential manometer, Mechanical pressure gauges.

#### **Hydrostatics**

Definition of total pressure, Centre of pressure, depth of centre of pressure for different geometric shapes, Hydrostatic force and depth of centre of pressure on plane surfaces (vertical and inclined), Hydrostatic force on submerged curved surfaces, Pressure diagram. Buoyancy - Concept, Centre of Buoyancy, Meta centre, Stability of immersed and floating bodies

**Fluid Kinematics:** Description of Fluid flow: Lagrangian and Eulerian approach; Types of fluid Flows: Steady and unsteady, Uniform and non-uniform, Laminar and turbulent flows, 1, 2 and 3-D flows; Stream lines, Path lines and Streak lines; Stream tube; Acceleration of a fluid particle along a straight and curved path; Differential and Integral form of Continuity equation; Rotation,

Vorticity and Circulation; Elementary explanation of Stream function and Velocity potential;  
Flow net characteristics and uses

**UNIT III: (10)**

**Dynamics of Fluid Flow:** Definitions, Concept of Inertia force and other forces causing motion, Derivation of Euler's equation and Bernoulli's equation with assumptions and limitations. Modification of Bernoulli's equation, problem on Bernoulli's equation without and with losses. Application of Bernoulli's equation - Pitot tube; Venturimeter and Orificemeter,

**Flow Measurements:** Flow through Orifices; classification, Hydraulic co-efficients of an Orifice and relation between them, Equation for co-efficient of velocity, Flow through mouth pieces, classification, equation for discharge and pressure head, Flow over notches, classification, Equation for discharge over V-notch, rectangular and Cippoletti notches, Types of Nappe, ventilation of weirs, Broad crested weirs, problems, Submerged weirs, equation for discharge.

**UNIT IV: (10)**

Momentum equation and applications to pipe bends, Problems related to combined application of energy and momentum equations,

**Laminar Flow:** Reynolds Experiment; Equation of motion for laminar flow through pipes; Flow between parallel plates; Kinetic energy and Momentum correction factors; Stokes law; Flow through porous media; Darcy's Law; Fluidization; Measurement of viscosity; Transition from laminar to turbulent flow.

**Turbulent Flow:** Turbulence; Equation for turbulent flow; Reynolds stresses; Eddy viscosity; Mixing length concept and velocity distribution in turbulent flow.

**UNIT V: (10)**

**Flow Through Pipes:** Major and Minor energy losses; Resistance coefficient and its variation; Hydraulic gradient and total energy lines; Flow in sudden expansion, contraction, diffusers, bends, valves and siphons; Concept of equivalent length; Branched pipes; Pipes in series and parallel; Simple pipe networks.

## **Water hammer in pipes**

Definition, Equation for pressure rise due to gradual closure of valves. Equation for pressure due to sudden closure of valves in rigid & Elastic pipes, problems, Surge tanks, their functions & types.

### **BOOKS:**

1. “Hydraulics and Fluid Mechanics”- P.N. Modi and S.M. Seth, Standard Book House, New Delhi.
2. “Fluid Mechanics and Hydraulic Machines”- R. K. Bansal, Laxmi Pub., Delhi.
3. “Fluid Mechanics”- Streeter and Victor, McGraw Hill.
4. “Fluid Mechanics and Machinery” Ojha, Berndtsson and Chandramouli, Oxford University Press.

### **REFERENCE BOOKS:**

1. “Elementary Hydraulics (1st Edition)”- James F Cruise, Vijay P. Singh, Mohsan M. Sherif, Thomson Learning.
2. “Fluid Mechanics, Hydraulic and Hydraulics” - K.R. Arora, Standard Book House, New Delhi.
3. “Fluid Mechanics” - John F. Douglas et al., Pearson Education, India.
4. “Fluid Mechanics” - Jain, A.K., Khanna Publishers, New Delhi.
5. K L Kumar, “Engineering Fluid Mechanics”
6. Hunter Rouse, “Elementary Mechanics of Fluids”, John Wiley and sons,
7. L H Shames, “Mechanics of Fluids”, McGraw Hill, International student edition.
8. Garde, R J and A G Mirajgaonkar, “Engineering Fluid Mechanics (including Hydraulic machines)”, second ed., Nemchand and Bros, Roorkee.

## (TCE 302) BASIC SURVEYING

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### Unit-I:

#### Introduction

(6)

Introduction to Surveying, Importance of Surveying to Engineers, Plane and Geodetic Surveying, Control Points, Classification of surveys, Methods of locating a point, Sources and types of errors in measurement, Principle of working from whole to part. Introduction to Maps, Types of Maps and their use, Scale of Map, Plotting accuracy, Coordinate system and map projection, Maps published by Survey of India, Index and numbering of Map sheets, Conventional symbols in maps.

#### Measurement of distances

(8)

Different methods of linear measurement and their accuracy, Measurement by chain and tape, Sources of errors and precautions, Corrections to tape measurements, Field problems in chaining and ranging, Tacheometry: Definitions, Principles of stadia systems, Instruments constants, Subtense and tangential systems, Errors and Precision, Introduction to modern instruments: Electronic Distance Measurement.

### Unit II:

#### Measurements of Angles and Directions

(12)

**Compass:** Magnetic compass, Use and adjustment of compass, Reference meridians, Bearings and azimuths, Magnetic declination and its variations,

**Theodolite Surveying:** Vernier theodolite, micro-optic theodolite, Temporary and permanent adjustments in theodolite, Measurement of horizontal and vertical angles, Accuracy and sources of errors in angle measurement. Electronic theodolite and Total Station.

### Unit III:

(8)

**Traversing:** Introduction, Different methods of Traversing, Field work and checks, Computation of coordinates, Sources of errors in traversing, Checking and adjustment of errors in traversing, Precision of traversing, Problems related to omitted measurements.

#### **Unit IV: Measurement of Elevation and Contouring**

(12)

Different methods of determining elevation; Definition and terms in Spirit leveling, Leveling instruments: Dumpy, Tilting and Auto-set levels, Types of leveling staves, Temporary and permanent adjustments of levels, Methods of spirit leveling, Booking and reduction of field observations, Effect of earth's curvature and refraction, Reciprocal leveling, Trigonometric leveling, simple and reciprocal observations, Sources of errors and precision in leveling, Methods of relief representations, Definition and characteristics of contours, Direct and Indirect methods of contouring, Use of contour maps, Digital Elevation Model.

#### **Unit V:**

##### **Plane Table Surveying**

(6)

Introduction, Equipment for Plane Table survey and their use, Different methods of Plane Table Surveying, Two point and three point problems, Errors in Plane Table Surveying, Advantages and disadvantages of Plane Table Surveying.

#### **Text Books :**

- 1 . Punmia, B.C., "Surveying", Vol. I &II, Laxmi Publications New Delhi
- 2.. Kanetkar T.P. and Kulkarni S.V., "Surveying" Vol. I&II
3. Chandra, A.M., "Plane Surveying", New Age International Publishers, Delhi
4. Chandra, A.M., "Higher Surveying", New Age International Publishers, Delhi
5. Duggal, S.K., "Surveying Vol. I&II

#### **References:**

1. Agor, R. "Surveying", Vol. I&II, Khanna Publications, Delhi
2. Arora, K.R., "surveying" , Vol. I & II, Standard Book House, Delhi
3. Bannister, A. and Baker, R., "Solving Problems in Surveying", Longman Scientific Technical, U.K.
4. Clark, David "Plane Surveying", CBS Publishers & Distributers, New Delhi

## (TCE 303) BUILDING MATERIALS & CONSTRUCTION TECHNOLOGY

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### **Unit I : Building Materials** (10)

**Bricks** : Classification, properties and selection criteria , manufacturing of bricks, burning of bricks: clamp and kiln burning, tests for bricks **Stones**: Classification, characteristics of good building stone, common building stones in India, Tests for stones, Stone quarrying, **Tiles**: Types of tiles and related IS specifications, manufacturing of tiles, characteristics of good tiles..

### **Unit II Building Materials** (10)

**Cement**: Ingredients and manufacture of cement, Different types of cement such as OPC, slag Cement, Portland Pozzolona Cement and high Alumina cement, their characteristics, composition, use and properties, Pre-fabricated concrete blocks , properties **Lime** :constituents of lime various methods of manufacturing of lime. Concrete, ingredients of concrete, lime concrete, cement concrete. Fly ash and its uses. murrum **Mortar**: Types, classification and strength, IS specification, Comparison between lime and mortar.

### **Unit III : Building Materials** (8)

Wood, Timber, Characteristics of good timber, defects in timber, seasoning of timber, various types of used in building construction tests on timber, plywood, Glass, PVC, Plastics, Steel, Damp proofing materials and techniques, Anti termite treatment.

### **Unit IV : Building Construction:** (12)

**Foundation**, Necessity and purpose of foundation, Types of foundations and selection criteria, Column and RCC footing **Masonry**: Brick masonry, stone masonry. English and Flemish bond, ashlar and rubble masonry. **Walls**: Types of walls : load bearing and non-load bearing walls, partition and cavity walls, **Buildings** :Classification of buildings, Recommendations of NBC, Building byelaws, modular co-ordination; orientation of buildings, desirable conditions of comforts, and components of building area considerations Prefabricated construction. Plastering and pointing



## **Unit V : Building Construction**

(12)

Different components of building, sill (wooden, cudappa, marble), lintel (wooden, stone. Brick, RCC)

Types of floors, construction details and selection criteria. Types of roofs and roof covering, Treatment for water proofing.

Staircases: Types, materials, proportions. Doors and windows: sizes and locations, proportions.

Lifts and escalators. White washing, colour washing, painting, distempering. shuttering, scaffolding and centering. Expansion and construction joints. Sound and fire proof construction, I.S. specifications.

### **Text Books:**

- 1.Arora, S.P. & Bindra, S.P., “A text book of Building Construction” Dhanpat Rai & Sons, Delhi,
- 2.Punmia, B.C., “A text book of Building Construction”, Laxmi Publications, Delhi, Madras.
- 3.Singh Surendra, “Engineering Materials”, Konark Publishers Pvt. Ltd.
4. Jha, J. & Sinha, S.K., “Building Construction”, Khanna Publishers, Delhi.

### **References:**

- 1.Kulkarni, C.J., “A text book of Engineering Materials”, Ahmedabad book Depot, Ahmedabad.
- 2.Kulkarni, C.J., “A text book of Engineering Construction”, Ahmedabad Book Depot, Ahmedabad.
- 3.Kumar Sushil, “Engineering Materials”, Standard Publishers Distributors, Delhi.
- 4.Kumar Sushil, “ Building construction”, Standard Publishers, Distributors, Delhi
- 5.McKay W.B., “Building Construction”, Vol.1 to 4, Orient Longman Ltd., Hyderabad, Bombay, Madras, Delhi, Vol.1 & 2 -1995, Vol. 3-1996, Vol. 4.
- 6.Civil Engg. Materials, TTTI Chandigarh, Tata McGraw- New Delhi.
- 7.Allen, E and Iano, J. “Fundamentals of Building construction.” John Willey and sons.

## (TCE 304) STRENGTH OF MATERIALS

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### UNIT I

(12)

**Stress, strain and deformation of solids:** Rigid and deformable bodies – Stability, strength and stiffness - Axial and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Biaxial state of stress – Elastic Constants Stresses at a point - Stresses on inclined planes – Principal stresses and principal planes – Mohr’s circle of stress.

### UNIT II

(12)

**Bending of beams:** Beams – types and transverse loading on beams – shear force and bending moment in beams – Cantilever beams – Simply supported beams and over-hanging beams

**Direct and shear stresses due to bending** -Theory of simple bending – bending stress distribution – Load carrying capacity – Proportioning of sections – Leaf springs – Flitched beams – Shear stress distribution.

### UNIT III

(8)

**Deflection of beams:** Fundamental concepts, Double Integration method – Macaulay’s method for computation of slopes and deflections in determinate beams.

### UNIT IV

(10)

**Torsion:** Theory of simple torsion - Stresses and deformation in circular and hollow shafts – Stepped shafts– Stresses and deflection in helical springs.

### UNIT V

(10)

**Columns and Cylinders: Behaviour** of short and long columns. Euler’s theory of long columns – Critical loads for prismatic columns with different end conditions - Rankine-Gordon Formula – Eccentrically loaded long columns -Eccentrically loaded short columns. Thin and thick cylinders-Thin spherical shells

**TEXT BOOKS:**

1. Egor. P.Popov “Engineering Mechanics of Solids” Prentice Hall of India, New Delhi 2001
2. Vazirani, N, Ratwani, M. “Analysis of Structures” Khanna Publishers, New Delhi 2001
3. Rajput, R.K “Strength of Materials”, S Chand & Company Ltd., New Delhi 2006

**REFERENCES:**

1. Irwing H. Shames, James M. Pitarresi, “Introduction to Solid Mechanics”, Prentice Hall of India, New Delhi, 2002
2. Roger T.Fenner, “Mechanics of Solids”, ELBS, Oseny Mead, Oxford, 1990
3. Malhotra, D.R. Gupta, H.C., “The Strength of Materials”, Satya Prakashan (Tech. India Publications), New Delhi, 1995.
4. Beer.F.P. & Johnston.E.R. “Mechanics of Materials”, Tata McGraw Hill, New Delhi, 2004.

**(PCE 301) FLUID MECHANICS LAB**

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**List of Experiments**

1. To measure the surface tension of a liquid.
2. To determine the metacentric height of a ship model experimentally.
3. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
4. To determine the coefficients of velocity, contraction and discharge of an orifice (or a mouth piece) of a given shape. To plot the flow net for a given model using the concept of electrical analogy.
5. To find the velocity distribution in a pipe and hence to compute the discharge by integrating the velocity profile obtained.
6. To verify the Bernoulli's theorem.
7. To calibrate an orifice meter and/or venturimeter and to study the variation of the coefficient of discharge with the Reynolds number.
8. To calibrate and to determine the coefficient of discharge for rectangular and triangular notches.
9. To verify the momentum equation.
10. To study the boundary layer velocity profile and to determine boundary layer thickness and displacement thickness. Also to determine the exponent in the power law of velocity distribution.
11. To study the variation of friction factor, 'f' for turbulent flow in smooth and rough commercial pipes.

**Text Book:**

1. G.L Asawa, "Laboratory work in Hydraulic Engineering", New Age International publishers, New Delhi

## (PCE 302) BASIC SURVEY FIELD WORK

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### List of Experiments

1. To study different types of maps published by Survey of India and Conventional Symbol Charts.
2. To study instruments used in conventional chain and compass surveying and to measure distance between two points by ranging.
3. To measure the bearing of sides and length of a given traverse by prismatic compass and tape, and plotting of the traverse after adjustment.
4. To conduct temporary adjustments of a Vernier Theodolite and measure Horizontal and Vertical angles by Reiteration method.
5. To measure Horizontal angle by repetition method.
6. To find out the reduced levels of given points using Dumpy/IOP level (Reduction by height of Collimation method and Rise and Fall method) and transfer of bench mark.
7. To determine the Tacheometric constants of a given tacheometric instrument and measurement of distance between two points by Tacheometry.
8. To plot details using radiation and intersection methods in plane tabling.
9. To solve two point/ three point problem in plane table traverse survey.
10. To determine and draw the longitudinal profile and cross-section along a given route.

### References:

1. Agor, R. "Surveying", Vol. I&II, Khanna Publications, Delhi
2. Arora, K.R., "surveying" , Vol. I & II, Standard Book House, Delhi
3. Punmia, B.C., "Surveying", Vol. I &II, Laxmi Publications New Delhi
4. Duggal, S.K., "Surveying Vol. I&II
5. Kanetkar T.P. and Kulkarni S.V., "Surveying" Vol. I&II
6. Chandra, A.M., "Plane Surveying", New Age International Publishers, Delhi

## **(PCE 303) CIVIL ENGINEERING DRAWING**

**L T P C**

**0 0 3 1**

1. Symbols used in Civil Engineering drawing, Masonry Bonds (Brick and Stone masonry), pointing Types, masonry Columns and wall Junctions
2. Doors, Windows and staircases
3. Trusses, wooden and steel Trusses, Detailing of steel Trusses at Joints and Supports.
4. Plumbing & Electrical fitting drawing.
5. Drafting Using AutoCAD.
6. Comprehensive Drawing of Residential building, (Layout, plan, elevation & sectional elevation)
7. Preparation of Layout planning for different Civil Engg. Projects.
8. Preparation of lay out plan/Maps and building drawing using computer.

### **Text Books:**

1. M.M Goyal, Hand book of Building construction, Amrindrea Consultancy (P) Ltd., 220, Sector 21-A Faridabad.
2. S.P. Arora and Bindra S.P., A text book of Building Construction, Dhanpat Rai & Sons, Delhi.
3. B.C. Punmia, A text book of Building Construction, Laxmi P.
4. Beall Christine, Masonry design and detailing for architects. Engineers and builders (5<sup>th</sup> ed.) New York, Mc-Graw-Hill, 2003.

## (TCE 401) HYDRAULICS & HYDRAULIC MACHINES

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### UNIT I

(12)

**Introduction:** Difference between open channel flow and pipe flow, geometrical parameters of a channel, Velocity and pressure distribution in an open channel, Continuity equation.

**Uniform Flow:** Chezy's and Manning's equations for uniform flow in open channel, Equivalent roughness, most efficient channel section, simple problems of compound channel sections.

**Energy and Momentum Principles:** Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

### UNIT II

(10)

**Non-Uniform flow in Open Channel:** Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, flow in curved channels.

**Hydraulic Jump, Surges, Water Waves:** Classification of hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Use of jump, End depth in a free overfall, Open channel surge,.

### Unit III

(10)

**Boundary Layer Analysis:** Boundary layer thicknesses; Boundary layer over a flat plate; Laminar boundary layer; Application of Von-Kerman Integral Momentum Equation; Turbulent boundary layer; Laminar sub-layer; Hydro-dynamically Smooth and rough boundaries; Local and average friction coefficient; Total drag; Boundary layer separation and its control.

**Flow Past Submerged Bodies:** Drag and lift, Types of drag force, Drag on sphere, Cylinder and airfoil; Circulation and Lift on a cylinder and airfoil; Magnus effect.

### Unit IV

(10)

**Impact of jet on flat vanes:** Force exerted by a jet on a fixed target, Force exerted by a Jet on a moving target, Force exerted by a jet on a series of curved vanes, Concept of velocity triangles, Equation for work done & efficiency.

**Centrifugal Pump:** Definition, classification, Description & general principle of working, priming & methods, efficiency, Minimum starting speed Specific speed of Pump and characteristics of a centrifugal pump, Cavitations in pumps.

**Unit V**

**(10)**

**Hydraulic turbines:** Introduction, Types and classifications, Pelton Wheel, theory, equation for work done and efficiency, design parameters, Francis Turbine – Theory, equation for work done and efficiency, design parameters, Kaplan turbine – Theory, equation for work done & efficiency, Design parameters,

Draft tubes types, Equation for efficiency Cavitations in turbines, Governing of turbines, Specific speed of a turbine, Equation for the specific speed, Model studies

Classifications; Unit quantities of a turbine, definitions, equations, Characteristic curves of a turbine.

**TEXT BOOKS:**

1. “Hydraulics & Fluid Mechanics”- Modi & Seth., Standard Book House, New Delhi
2. “Fluid Mechanics and Hydraulic Machines”- R. K. Bansal, Laxmi Pub., Delhi
3. “Flow in Open Channels”-Subramanya K., Tata McGRAW HILL
4. “Flow Through Open Channels”-Ranga Raju, Tata McGRAW HILL

**REFERENCE BOOKS:**

1. Fluid Mechanics and Hydraulic Machines - S.C. Gupta, Pearson Education, India
2. Elementary Hydraulics - James F Cruise, Vijay P. Singh, Mohsan M. Sherif, Thomson Learning, 1st Edition.
3. Chow, V.T., “Open channel Hydraulics”, McGraw Hill International
4. Hydraulics & Fluid Mechanics - , K.R. Arora, Standard Book house, New Delhi.
5. Fluid Mechanics & Machinery - Raghunath. H M., CBS Publishers
6. Text Book on Fluid mechanics & Hydraulic Machines - Bansal R.K., Laxmi publications.
7. French, R.H., “Open Channel Hydraulics”, McGraw Hill International



## (TCE 402) STRUCTURAL ANALYSIS-I

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### **UNIT-1 (10)**

Review of basic concept of mechanics: Concept of Equilibrium, Free body diagram, Determinate and Indeterminate structures, Degree of Static and kinematic indeterminacy for different types of structures: Beams, Frames, Trusses, Analysis of truss by method of joints and method of section.

### **UNIT-II (14)**

Slope and deflections of determinate beams: Conjugate beam method,(theory & application), Moment area method( theory & application), Strain energy method ( theory & application), Unit load method theory & application), Deflection of truss and simple portal frames.

### **UNIT-III (10)**

Concept of Strain energy: Due to axial load, Bending and shear, Torsion, Theorem of minimum potential energy, Castigliano's theorems (1&2)-application, Principle of virtual work-application, Maxwell's theorem of reciprocal deflection, Betti's law-application

### **UNIT- IV (10)**

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

### **UNIT- V (8)**

Cable and arches: Arches as structural forms – Examples of arch structures , Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches, Settlement and temperature

### **TEXT BOOKS**

1. L.S. Negi & R.S. Jangid, “Structural Analysis”, Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003.
2. B.C.Punamia, Theory of Structures (SMTS) Vol 1 Laxmi Publishing Pvt Ltd, New Delhi, 2004.
3. BhavaiKatti, S.S, Structural Analysis , Vol. 1 & Vol. 2, Vikas Publishing Pvt Ltd., New Delhi, 2008
- 4- Gupta and Pandit : Theory of structures volume-1 Tata McGraw- Hill Publications, New Delhi, Sixth Edition, 2011

### **REFERENCES**

- 1- R.C Hibbler, Sstructural Analysis, Pearson prentice hall New Delhi.
- 2- Devdas Menon , Structural Analysis, Narosa publishing house , New Delhi.

(TCE 403) ADVANCED SURVEYING

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**Unit-I**

(10)

**Triangulation and Trilateration:** Control Surveying and its necessity, Principle of Triangulation and Trilateration, Classification of Triangulation System, Station Marks, Towers and Signals, Satellite station, Intersected and Resected points, Reconnaissance, Intervisibility of stations, Base line measurement and its extension.

**Unit II**

(10)

**Adjustment Computations:** Treatment of random errors, Normal law of errors, Most Probable Value, Weight of observations, Propagation of errors and variances, Principle of least squares, Observation and correlative Normal Equations, Adjustment of triangulation figures and level nets.

**Unit III**

(10)

**Curves:** Classification of curves, Elements of Simple Circular, Transition and Vertical curves, Theory and methods of setting out circular, transition and vertical curves, special field problems.

**Unit IV**

(14)

**Basic Astronomy:** Astronomical terms, co-ordinate systems, Spherical trigonometry, Astronomical triangle, Determination of Azimuth by the method of observation of a star at equal altitude,

**Global Positioning System (GPS) :** Introduction, Principle , Three segments, Measurement System, Instrument, application of GPS in different fields of Surveying.

**Photogrammetry:** Introduction to photogrammetry, Scale of photograph, Tilt and height displacement, Stereoscopic vision, use of stereoscope and parallax bar, Techniques of photo-interpretation, Mapping from aerial photographs

**Remote Sensing:** Aerospace images, aerial photography and Satellite images. Introduction, Electro Magnetic radiation (EMR), energy interaction with atmosphere and earth features, spectral signatures, Remote sensing satellite and their data products, methods of interpretation of remotely sensed data, Digital Image Processing of Remote Sensing data.)-Introduction, principle, and applications of GPS in different fields of Surveying

## Unit V

(8)

**Geographic Information System(GIS)** - Introduction, Elements of GIS, Hardware and Software for GIS, Data structure, Data input, Data manipulation & analysis, Data output, GIS applications.

**Engineering Project and Route Surveys:** General requirements and specifications for Engineering Project surveys, Reconnaissance, Preliminary and Location surveys for highways, railways and canals, Correlation of surface and underground surveys in case of Mines and Tunnels, Basics of Hydrographic surveys, Layout of culverts, canals, bridges and buildings.

### Text Books:

1. Arora, I. K.R., “surveying” , Vol. II & III Standard Book House, Delhi
2. Agor, R. “Surveying”, Vol. II&III Khanna Publications, Delhi
3. Bannister, A. and Baker, R., “Solving Problems in Surveying”, Longman Scientific Technical, U.K.
4. Chandra, A.M., “Higher Surveying”, New Age International Publishers, Delhi
5. Clark, David “Higher Surveying”, CBS Publishers & Distributors, New Delhi
6. Duggal, S.K., “Surveying Vol. I, II
7. Kanetkar T.P. and Kulkarni S.V., “Surveying” Vol. I&II
8. Lillesand, T.M. and Kiefer, R.W., “Remote Sensing and Image Interpretation”
9. Punmia, B.C., “Surveying”, Vol. II & III, Laxmi Publications New Delhi

## (TCE 404) ENGINEERING GEOLOGY

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(8)

### Unit I

Earth Science and its importance in Civil Engg. Minerals and their physical properties. Study of common rock forming minerals. Internal structure of the earth. Suitability of rocks as engineering materials.

### Unit II

(6)

Rocks: Origin, Characteristics, Texture, Structure and classification of igneous, sedimentary and metamorphic rocks. Engineering properties of rocks.

### Unit III

(8)

Strike and dip of strata, folds, faults, joints, unconformity and their classification, Causes and relation to engineering behaviour of rock masses. Overlap,. Landslides: Causes, classification and preventive measures.

### Unit IV

(8)

Earthquake: Causes, classification, earthquake waves, intensity and magnitude, Seismic zones for India, Reservoir induced seismicity. Geological consideration for construction of buildings

### Unit V

(8)

Geological investigations for site selection of dams & reservoirs, tunnels, bridges and highways. Methods of Geophysical explorations - gravity, electrical and seismic methods.

### Text Books:

1. Prabin Singh, "Engineering and General Geology", Katson publishing house.
2. B.S. Sathya, Narayanswamy, "Engg. Geology" Dhanpat Rai & Co. New Delhi.

### References:

1. Legget, R.F., "Geology and Engineering", McGraw Hill, New York.
2. Blyth, F.G.M., "A Geology for Engineers", Arnold, London.
3. P.K. Mukerjee, "A Text Book of Geology", Calcutta, world publisher.
4. K.S. Valdiya: "Environmental Geology", Tata Mc Graw Hill, New Delhi

5. Krynine and Judd: "Principles of Engineering Geology & Geotechnics," Mc Graw Hill, New York.

## (TCE 405) GEOTECHNICAL ENGINEERING – I

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(14)

### Unit I

Introduction: Definition of soil mechanics, Origin and formation of soil, Major soil deposits in India, Application areas of soil mechanics. Phase Diagram, Volumetric relationship, Volume-mass relationship, Volume weight relationship, Index properties, Specific Gravity of soil, Densities and Unit weights, Particle size distribution, Relative Density, Consistency limits and Atterberg Indices, Determination of in-situ density, Determination of field Density, Density Index, Laboratory methods of determination of index properties of soil: Water content (Oven Drying method & Rapid Moisture method), Specific gravity of soil solids (Pycnometer and density bottle method), Particle size distribution (Sieve analysis and Hydrometer analysis only, Liquid Limit- (Casagrande and Cone penetration methods), Plastic limit and shrinkage limit.

Soil classification: Purpose of soil classification, Unified soil classification, AASHTO soil classification, Classification based on particle size, IS classification and Plasticity chart

Clay mineralogy and soil structure: Single grained, honey combed, flocculent and dispersed structures, base-exchange capacity, Isomorphous substitution, Common clay minerals in soil and their structures, Sensitivity and Thixotropy of clay, Activity of Clay

### Unit II

(8)

Flow of water through soils: Mode of occurrence of water in soil. Darcy's law, Capillary Water, Capillarity Flow, Permeability: Measurement by Laboratory methods (Constant head, Falling head) and by Field Method. Factors affecting permeability, permeability of stratified soils, Seepage velocity, Seepage Pressure, Quicksand Condition, Laplace's equation, Flownet : Properties, its construction by Graphical method and application.

### Unit III

(10)

Shear strength of soil: Concept and importance of shear strength, Effective stress and total stress, Pore pressure, Mohr circle, Mohr diagram of stresses, Important Characteristics of Mohr circle, Mohr-Coulomb theory, Total and effective shear strength parameters, Different types of tests and Drainage condition-Direct shear Test, Triaxial test, Unconfined compressive strength, Vane shear Test.

**Unit IV****(12)**

Compaction of soil: Introduction, Principle of compaction, Standard and Modified Proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control – compactive effort & method, lift thickness and number of passes, Proctor's needle, Compacting equipment and measurement of field density by various methods.

Compressibility and consolidation:- Introduction, Mechanism of consolidation, Component of total settlement, Consolidation characteristic of soil( only formulae for  $C_c, a_v, m_v, C_v$ ) Estimation of settlement due to consolidation, Terzaghi's Theory of one dimensional consolidation, Consolidation test , determination of coefficient of consolidation by square root of time fitting and logarithm of time fitting method, Time rate of consolidation.

**Unit V****(8)**

Lateral earth pressure: Active and passive earth pressures, Earth pressure at rest. Graphical solutions for active earth pressure (cohesionless soil only), Lateral earth pressure in cohesive and cohesionless soils, Rankine's theory & its Limitation , Coulomb wedge theory, Types of earth retaining structure, Gravity wall, Flexible Walls, Sheet filled wall.

**TEXT BOOKS:**

1. Basic and Applied Soil Mechanics- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., New Delhi.
2. Soil Mechanics and Foundation Engineering- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. Soil Mechanics and Foundation Engg.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.
4. Soil Mechanics and Foundation Engineering : K.R. Arora : Pub : Standard Publishers & Distributors.



## (XCS- 401) CAREER SKILLS

(Analytical Reasoning, Quantitative ability, Data Interpretation and Data Sufficiency)

### Objectives:

- 1) To enhance and sharpen the reasoning abilities and mental aptitude
- 2) To enhance quantitative skills
- 3) To sharpen the ability to analyze and interpret data
- 4) More importantly enhance quality of career opportunities available to GEU students

### ANALYTICAL REASONING, DATA INTERPRETATION AND DATA SUFFICIENCY

L T P C

2 1 0 2

#### Unit 1

(5)

Basic approach to Logical Reasoning, Logical Deductions, Logical Connectives , Critical reasoning, Visual reasoning, Assumption-Premise-Conclusion, Assertion and reasons, Statements and assumptions

#### Unit 2

(5)

Identifying valid inferences, identifying Strong arguments and Weak arguments, Statements and conclusions, Cause and Effect, Identifying Probably true, Probably false, definitely true, definitely false kind of statement, Linear arrangements, Matrix arrangements

#### Unit 3

(5)

Family tree problem, Cubes, Number series, letter series analogies, coding and decoding, Symbol Based problems, Coding and decoding, Sequencing, identifying next number in series etc.

#### Unit 4

(5)

Data interpretation and Data Sufficiency

#### Unit 5

(5)

Introduction to Puzzles, Shakuntala Devi's Puzzles, George Summer Teaser and Puzzles

### **TEXTS / REFERENCES (latest editions)**

1. Non-Verbal Reasoning by R S Aggarwal (S. Chand Publications)
2. All books of Puzzles To Puzzle You by Shakuntala Devi
3. All puzzle books of George J. Summers

### **Guidelines**

1. Questions have to be set from all the units. The level of questions shall be based on campus placement papers of different streams of Engineering. Papers may be customized for a particular branch reflecting the current trends in recruitment.
2. The level of papers shall be of Campus placements and competitive exams like GATE, UPSC, IES, CAT, GRE, and GMAT.
3. Midterm exams shall be conducted after completion of 3 Units and shall be of 30 Marks and 45 Minutes duration.
4. Main exam shall be of 60 Marks and 60 Minutes.
5. Minimum attendance of 80% is required to obtain 10 marks. Attendance below 80% shall not be condoned under any circumstances.

**(PCE 401) HYDRAULICS AND HYDRAULIC MACHINE LAB**

**L T P C**

**0 0 3 1**

**List of Experiments**

1. To determine the Manning's coefficient of roughness 'n' for the given channel bed.
2. To study the velocity distribution in an open channel and to find the energy and momentum correction factors.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir and study the pressure distribution on the upstream face of the weir.
6. To study the characteristics of free hydraulic jump.
7. To study the flow over an abrupt drop and to determine the end (brink) depth for a free over fall in an open channel.
8. To study centrifugal pumps and their characteristics.
9. To study turbines and their characteristics.

## (PCE 402) ADVANCED SURVEY FIELD WORK

L T P C

0 0 3 1

1. Study and use of different types of micro-optic theodolite and total station, and carry out Triangulation and Trilateration of a given area, compute the adjusted coordinates of triangulation stations.
2. To plot the coordinates of triangulation stations at a given scale on Plane Table and checking them in field.
3. To Layout a simple circular curve on the ground using linear methods.
4. To Layout a simple circular curve on the ground using Angular methods.
5. Setting out works for construction of building and a culvert on the ground.
6. Study of aerial photographs, to find out scale and flying height of a photograph.
7. Use of mirror stereoscope and parallax bar for measurements on aerial photographs and plotting details on a tracing paper.
8. Study of satellite imagery and visual image interpretation and prepare a base map on a tracing paper.
9. Use of GPS for measurement of coordinates and GPS survey of small area.
10. Study and familiarization of GIS and its applications in Civil Engineering.

### References:

1. Arora, K.R., "surveying" , Vol. II & III Standard Book House, Delhi
2. Agor, R. "Surveying", Vol. II&III Khanna Publications, Delhi
4. Chandra, A.M., "Higher Surveying", New Age International Publishers, Delhi
5. Clark, David "Higher Surveying", CBS Publishers & Distributors, New Delhi
6. Duggal, S.K., "Surveying Vol. I, II
7. Lillesand, T.M. and Kiefer, R.W., "Remote Sensing and Image Interpretation"
8. Punmia, B.C., "Surveying", Vol. II & III, Laxmi Publications New Delhi

**(PCE 403) GEOTECHNICAL ENGINEERING LAB**

**L T P C**

**0 0 3 1**

**List of Experiments**

1. Determination of Specific gravity (for coarse and fine grained soils) and Water content (Oven drying method).
2. Grain size analysis of soil sample (sieve analysis), Hydrometer analysis.
3. In situ density by core cutter and sand replacement methods.
4. Consistency Limits – Liquid Limit (Casagrande and Cone Penetration Methods), plastic limit and shrinkage limit.
5. Standard Proctor Compaction Test and Modified Proctor Compaction Test.
6. Coefficient of permeability by constant head and variable head methods.
7. Capillary permeability test to find coefficient of permeability and capillary rise.
8. Strength Tests
  - a. Unconfined Compression Test
  - b. Direct Shear Test
  - c. Triaxial Compression Test (undrained)
9.
  - a. Demonstration of Standard Penetration Test.
  - b. Demonstration of Direct Cone Penetration Test.
  - c. Demonstration of Consolidation Test.
10. Preparation of consolidated report of Index Property and Strength property of soil.

**REFERENCE BOOKS:**

1. Soil Mechanics and Foundation Engg.- Punmia B.C. (2005), 16<sup>th</sup> Edition Laxmi Publications Co. , New Delhi.
2. BIS Codes of Practice: IS 2720 (Part 3/Sec. 1) – 1987; IS 2720 (Part 2)- 1973; IS 2720 (Part 4) – 1985; IS 2720 (Part 5) – 1985; IS 2720 (Part 6) – 1972; IS 2720 (Part 7) – 1980; IS 2720 (Part 8) – 1983; IS 2720 (Part 17) – 1986; IS 2720 (Part 10) – 1973; IS 2720 (Part 13) – 1986; IS 2720 (Part 11) – 1971; IS2720 (Part 15) – 1986; IS 2720 (Part

30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part 14) – 1983; IS 2720 (Part 28) – 1974; IS 2720 (Part 29) – 1966, IS 2720 (Part 60) - 1965.

3. Soil Testing for Engineers- Lambe T.W., Wiley Eastern Ltd., New Delhi.
4. Manual of Soil Laboratory Testing- Head K.H., (1986)- Vol. I, II, III, Princeton Press, London.
5. Engineering Properties of Soil and Their Measurements- Bowles J.E. (1988), - McGraw Hill Book Co. New York.

**(TCE 501) ENVIRONMENTAL ENGINEERING – I**

**L T P C**

**3 1 0 4**

**Unit I** **(12)**

Water supply: Water demand and domestic use, variation in demand; population forecasting by various methods using logistic curve method; per capita supply, basic needs and factors affecting consumption; design period.

Sources of water: Kinds of water sources and their characteristics, collection of surface and ground water; quality of surface and ground waters; factors governing the selection of a source of water supply; intakes and their design for lakes, streams and rivers, impounding reservoir and canal; determination of the capacity of impounding reservoir.

**Unit II** **(8)**

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control; water hammer and its control measures.

**Unit III** **(10)**

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, Newton - Raphson method and equivalent pipe method of pipe network analysis; rural water supply distribution system.

Water supply, plumbing systems in buildings and houses: water connections, different cocks and pipe fittings, hot water installation. Institutional and industrial water supply.

**Unit IV** **(11)**

Drinking water standard and quality, Water treatment system, design of sedimentation, filtration and disinfection units. Detailing and maintenance of treatment units.

**Unit V** **(11)**

Air pollution: Composition and structure of atmosphere; units of measurement, sources of pollutants, classification of pollutants and their effects, air quality monitoring and standards. Brief introduction to Control devices for particulate contaminants – gravitational settling chambers, centrifugal collectors, wet collectors, fabric filters and electrostatic precipitators;

control devices for gaseous contaminants; automotive emission control, concept of clean and biofuels.

Noise pollution: Definition of decibel, sound power level, sound intensity level and sound pressure level; measurement of noise level; basic concept of community noise, transportation noise and industrial noise; acceptable outdoor and indoor noise levels; effects of noise and control measures.

**Text Books:**

1. H.S. Peavy, DR Rowe and G. Tchobanoglous: Environmental Engineering
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Fair and Geyer: Water Supply and Wastewater Disposal
4. Birdie: Water Supply and Sanitary Engineering

**References:**

1. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
2. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).
3. ET Chanlef; McGraw, Hill Ltd.,
4. Manual on Water Supply and Treatment, C.P.H.E.E.O., Ministry of Urban Development, Government of India, New Delhi
5. Manual on Sewerage and Sewage Treatment, C.P.H.E.E.O., Ministry of Urban Development, Government of India, New Delhi
6. Steel and McGhee: Water Supply and Sewerage
7. Arceivala: Wastewater Treatment for Pollution Control
8. Hammer and Hammer Jr.: Water and Wastewater Technology
9. Raju: Water Supply and Wastewater Engineering
10. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II



## (TCE 502) REINFORCED CEMENT CONCRETE - I

L T P C  
3 1 0 4

### Unit I

(8)

**Properties of Concrete:** Compressive strength, Tensile strength, stress-strain curve, Modulus of Elasticity, shrinkage and creep, workability, ingredient of concrete, Characteristic strength, Grades of concrete, Design stress – Strain curve and non-destructive test.

**Reinforcing Steel:** Types and Grades, stress strain curves, Design stress-strain curve.

### Unit II

(4)

**Basic concepts of Reinforced concrete design:** Working stress and Limit State methods.

### Unit III

(16)

**Behaviour of RC Beams in flexure, Design for flexure:** Singly / Doubly reinforced sections (Rectangular and Flanged) by both working stress and limit state methods.

Behaviour of RC Beams in Shear and Bond, Design for Shear, Anchorage and Splicing of Reinforcement. Limit States of Deflection and Cracking.

### Unit IV

(12)

Design and Detailing of Beams (Simply supported & Cantilever Beams). Design and detailing of Slabs: One way / two way Rectangular Slabs, Staircases.

### Unit V

(12)

**Design of Columns:** Column – Interaction curves, short/ slender columns, slenderness effect, use of design charts

**Column footings:** Types, Design of isolated footings.

**Note: The Designs will be done using Limit State Method only.**

### Text Books:

1. S. Unnikrishna Pillai & D. Menon, “Reinforced Concrete Design”, Tata Mc-Graw Hill Book Publishing Company Limited, New Delhi.
2. O. P. Jain & Jai Krishna, “Plain and Reinforced Concrete”, Vol. I & II Nem Chand & Bros.
3. A. K. Jain, “Reinforced Concrete – Limit State Design” Nem Chand & Bros., Roorkee.

### References:

1. R. Park and Pauley, “Reinforced Concrete Structures”
2. P. Dayaratnam, “Reinforced Concrete Design”
3. IS : 456 .

## (TCE 503) GEOTECHNICAL ENGINEERING – II

L T P C

3 1 0 4

### Unit I (8)

**Stability of earth slopes:** Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes by Method of slices and Friction Circle method, Fellenius method. Taylor's stability number and its uses. Slope protection measures.

### Unit II (14)

**Bearing capacity:** Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations - assumptions and limitations, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Bearing capacity of footing on layered soil. Field methods of evaluation of bearing capacity, their limitations- Plate load test, Standard penetration test and cone penetration test.

**Stress Distribution under loaded area:** Boussinesq's and Westergaard's theories for concentrated, circular and rectangular loads. Pressure distribution diagrams, Contact pressure, Newmark's chart. Approximate methods.

### Unit III (10)

**Shallow Foundations-** Settlement and Proportioning: Importance and Concept of Settlement Analysis, Immediate, Consolidation and Secondary settlements (no derivations, but, computation using relevant formula for Normally Consolidated soils), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

Allowable Bearing Pressure, Factors influencing the selection of depth of foundation, Factors influencing Allowable Bearing Pressure, Factors influencing the choice of foundation, Proportioning isolated, combined, strip and mat foundations.

### Unit IV (10)

**Pile foundations:** Classification and their suitability, pile capacity by static methods, Negative skin friction, pile capacity by dynamic formulae, their limitations. Group action of piles, Number and spacing of piles in group. Group efficiency, Under-reamed piles- design, equipment and construction.

Well & Caissons foundation: Types- grip length, well sinking remedial measures,  
Sheet Piles: Types, analysis of cantilever and anchored sheet Piles, retaining walls, counterforts.  
Cofferdams: Types and Application , introduction to machine foundation.

## **Unit V** **(10)**

**Subsurface exploration and ground improvement techniques:** Importance of exploration program, Methods of exploration: Boring, Seismic refraction method of geophysical exploration, Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report. Ground water level determination by Hvorslev's method, Control of ground water during excavation: Dewatering - Ditches and sumps, well point system, Vacuum method, Electro-Osmosis method. Problematic soils. Mechanical Stabilisation methods, Preloading, Sand drains, Grouting, Vibroflotation, Dewatering, Geosynthetics. Chemical Stabilisation by Cement, Lime.

### **TEXT BOOKS:**

1. Soil Mechanics and Foundation Engg.- Punmia B.C. (2005), Laxmi Publications Co. , New Delhi.
2. Soil Engineering in Theory and Practice- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
3. Design of sub-structures- Swami Saran(2009) IK international.
4. Foundation Engineering - Braja M. Das – Thomson
5. Wells and Caissons – Vijay Singh

### **REFERENCES:**

1. Foundation Analysis and Design- Bowles J.E. (1996), 5<sup>th</sup> Ed., McGraw Hills Pub. Co.
2. Foundation Design by W.C. Teng, PHI Publishers Ltd.
3. Basic and Applied Soil Mechanics- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., New Delhi.
4. Soil Dynamics- Shamsher Prakash Wiley Eastern
5. Soil Mechanics- Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.

**(TCE 504) WATER RESOURCES ENGINEERING  
(HYDROLOGY+WATER CONVEYANCE SYSTEM)**

**L T P C  
3 1 0 4**

**Unit I** **(10)**

**Introduction:** Scope of Hydrology, Occurrence of water. Historical developments, Hydrological cycle, Hydrological processes.

**Evaporation:** Physics involved, factors affecting measurement & control of evaporation on reservoirs, Evapotranspiration, definition and measurement.

**Precipitation:** Definition and forms of precipitation, Types of precipitation, Measurement of precipitation - Non recording and recording type rain gauges, Computation of average depth of precipitation over an area, Optimum number of rain gauges, Estimation of missing precipitation record, Mass curve and consistency of rainfall data, Rain gauges networks, Rainfall distribution in India, I-D, D-A-D Curves, Frequency and return period

**Process of infiltration,** Factors affecting infiltration, infiltration indices, Application to a practical problem.

**Unit II** **(10)**

**Surface runoff:** Determination of factors affecting yield calculations.

**Hydrograph:** Components of hydrograph, Separation of base flow, flow recession, Unit hydrograph theory, assumptions limitations Derivation and application of unit hydrograph, Computation of unit hydrographs ordinates of different durations, S-Curve and its use.

**Floods:** Definition, factors affecting, determination by formulae, curves, gauging, design flood hydrograph, Recurrence period.

**Unit III** **(10)**

**Ground water Hydrology and well hydraulics:**

Scope and importance of ground water hydrology, Occurrence of ground water, Aquifer parameters, Darcy's law and its validity, Steady radial flow into a well in confined and unconfined aquifers, Safe yield, yield of an open well, recuperation test.

**Demand for waters for crops -** water requirements of different crops, Definition of consumptive use, duty, delta and base period, KOR depth, Factor affecting duty of water,

Definition of gross command area, culturable command area, intensity of irrigation, time factor, crop factor, Irrigation efficiencies ,calculation of water required.

**Unit IV** (10)

Definition and necessity of irrigation, Different systems of irrigation, Flow, Lift, Inundation, Bandhara, Storage, Percolation of tank, Sources of water, River, Well, Tank.

**Methods of lifting water** and application of water to soils, sprinkler, drip, basin, furrow.

**Storage calculation**, Selection of site, Area capacity curve – preparation and use, Determination of live, dead flood carry – over storage, Determination of control levels in Reservoir, Determination of height of dam, Silting of reservoirs, Losses in reservoirs.

**Lift irrigation**, Necessity, general layout, Main components. Simple design of a scheme.

**Unit V** (12)

**Canals** - Types of canals, alignment of canals, Design of canals in non-alluvial and alluvial soils, Kennedy's and Lacey's silt theories. Tractive force theory, canal losses, silt control in canals, typical section of canals in cutting, embankment partial cutting, canal lining purpose types, selection and economics.

**Canal structures** – Necessity, Aqueduct culvert, Super-passage, level crossing, Head regulator, cross regulator, canal siphon, canal fall, canal escape and standing waves flume.

**Text Books:**

1. G.L. Asawa, "Irrigation and water Resources Engg." New age International Publishers.
2. Bharat Singh, "Irrigation Engineering"
3. S.K. Garg, "Irrigation Engineering".

**References:**

1. Larry W. Mays, "Water Resources Engg.", John Wiley India
2. Wurbs and James, "Water Resources Engg.", John Wiley India
3. R.K. Linsley, "Water Resources Engg.", McGraw Hill
4. AM Michel , "Irrigation Theory and Practices"
5. Justine, Creager and Hinds, "Engineering for dams", Vol.I, II, III.
6. Varshney & Gupta, "Irrigation Engineering", Vol. I & II.
7. Leliavsky "Design of Hydraulic Structures", – Vol. I & II.
8. U.S.B.R, "Design of small dams".

## (TCE 505) CONSTRUCTION COSTING AND QUANTITY SURVEYING

L T P C

3 1 0 4

### Unit I (4)

**Introduction:** Different type of estimates, various types of drawings required for preparation of estimates, important terms used in estimates, units of measurement.

### Unit II (20)

**Estimation of buildings:** Methods of taking out quantities – centre line method, long wall and short wall method or crossing method, preparation of detailed and abstract estimates for Residential buildings, (Two and three bed room houses, GF and FF), Masonry structures, Framed structures with flat & sloping roof, AC sheet roofing,

### Unit III (6)

**Specifications:** Definition of specifications, objective of writing specifications, General and detailed specifications of general items of works in buildings.

### Unit IV (10)

**Rate analysis:** Definition, purpose, working out data procedure for quantities and rates of cement concrete of different mixes, Brick and size stone masonry, Flooring, plastering, painting, form work for different RCC items, Doors, windows & ventilators, various types of claddings

### Unit V (12)

**Cost estimation of civil engineering structures:** Estimation of Civil structures like septic tank, man hole, and slab culvert water tank resting on ground rigid and flexible pavements, different types of pavement.

#### REFERENCES:

1. B.N. Dutta, Estimating and Costing in Civil Engineering Theory and Practice. - 2010
2. M. Chakroborti, Estimating, Costing & Specifications in Civil Engineering. - 2007
3. S. C. Rangawala - Valuation of Real Properties, Charotar Publishing House - 2008
4. K. K. Chitkara – Construction project management, Tata Mc Graw –Hill - 2009

**(XCS 501) CAREER SKILLS-II**

**QUANTITATIVE APTITUDE (ARITHMETIC,  
ELEMENTARY ALGEBRA, BASIC GEOMETRY)**

	<b>L T P C</b>
<b>Unit 1</b>	<b>(5)</b>
Percentages, Profit and Loss, Interest Calculation (SI, CI, EMI)	
<b>Unit 2</b>	<b>(5)</b>
Time and Work, Time and Distance, Average and Mixtures	
<b>Unit 3</b>	<b>(8)</b>
<b>Numerical Ability</b> , Numerical computation, numerical estimation, numerical reasoning , Fractions and Decimals, Ratio and proportion, Clocks and Calendars, Problems on Ages and Numbers	
<b>Unit 4</b>	<b>(5)</b>
Permutation & Combination, Probability, Arithmetic & Geometric Progression	
<b>Unit 5</b>	<b>(3)</b>
Quadratic Equations, Set Theory, Inequalities and Basic statistics,	

**TEXTS / REFERENCES (latest editions)**

1. A Modern approach to Verbal Reasoning by R S Aggarwal (S. Chand Publications)
2. Non-Verbal Reasoning by R S Aggarwal (S. Chand Publications)
3. Quantitative Aptitude by R S Aggarwal (S. Chand Publications)
4. All books of Puzzles To Puzzle You by Shakuntala Devi
5. All puzzle books of George J. Summers

## **Guidelines**

1. Questions have to be set from all the units. The level of questions shall be based on campus placement papers of different streams of Engineering. Papers may be customized for a particular branch reflecting the current trends in recruitment.
2. The level of papers shall be of Campus placements and competitive exams like GATE, UPSC, IES, CAT, GRE, and GMAT.
3. Midterm exams shall be conducted after completion of 3 Units and shall be of 30 Marks and 45 Minutes duration.
4. Main exam shall be of 25 Marks and shall be of 60 Minutes duration.
5. Minimum attendance of 80% is required to obtain 10 marks. Attendance below 80% shall not be condoned under any circumstances.



**(PCE 501) MATERIAL TESTING LAB**

**L T P C**

**0 0 3 1**

1. Tension test on mild steel / tor steel rod (Tensile strength-Density-Proof Stress- Stress Strain Curve -Youngs Modulus-)
2. Compression test on wood
3. Double shear test on metal
4. Torsion test on mild steel rod
5. Impact test on metal specimen
6. Hardness test on metals
7. Deflection test on metal beam
8. Compression test on helical spring
9. Deflection test on carriage spring
10. Tests on bricks, concrete cubes and tiles

**REFERENCE:**

1. Relevant Indian Standards

**(PCE 502) STRUCTURAL ANALYSIS LAB**

**L T P C**

**0 0 3 1**

**List of Experiments**

1. To find the Flexural Stiffness (E.I) of a given beam and compare it with the theoretical value.
2. To verify Clark Manwell's theorem by means of a mild steel beam.
3. To verify the Maxwell's reciprocal theorem using a two hinged arch.
4. To determine the forces in the members of a three bar suspension system and the component displacement of the loaded joint D for vertical loads. Comparison of experimental & theoretical results.
5. To determine the deflection of a truss analytically and graphically and verify the same experimentally.
6. To determine the horizontal thrust in a three hinged arch for a given system of loads experimentally and verify the same with calculated values. Also, to obtain influence in diagram for horizontal thrust in a three hinged arch experimentally and to compare it with the calculated values.
7. To determine experimentally the horizontal displacement of the roller end of a two hinged arch for a given load and the influence line for horizontal thrust in a two hinged arch by moving a load along the span.
8. To find the experimental values of deflection of a cantilever beam subjected to symmetrical and unsymmetrical bending and to compare the same with theoretically calculated values.
9. To calculate experimentally and theoretically the loads in the three suspension rods supporting an elastic beam with a concentrated load hung midway between two of the suspension rods under two conditions.
  - a. When the suspension rods are attached at their upper ends to rigid supports.
  - b. When upper end of the central suspension rod is attached to the centre of a similar elastic beam.
10. To obtain the influence line diagram for reactions in indeterminate structures by introducing large measurable deformation and using Muller Breslau's principle.

**Text Books:**

1. Jain, O.P. and Jain, B.K, “Theory and Analysis of Structures”, Nem Chand and Bros, Roorkee.
2. Reddy, C.S., “Basic Structural Analysis”, Tata Mc Graw Hill Publishing Co., New Delhi.

## **(PCE 503) QUANTITY SURVEYING PRACTICE LAB**

**L T P C**

**0 0 3 1**

### **List of experiments**

1. Prepare a detailed estimate of the framed structure of building
2. Prepare a detailed estimate of the sub structure of the building
3. Prepare a detailed estimate for the brick work and plastering of a building
4. Prepare a detailed estimate for the flooring and painting of a building
5. Prepare a detailed estimate for waterproofing of sub structures
6. Prepare a detailed estimate for waterproofing of terrace, tanks and toilets
7. Prepare a detailed estimate of the culvert
8. Prepare a detailed estimate of a small commercial building
9. Prepare a detailed estimate for the water supply of a building
10. Prepare a detailed estimate of a road
11. Prepare a detailed estimate of a septic tank
12. Prepare a detailed estimate of the manhole

### **TEXT BOOKS**

1. Dutta, B.N., “Estimating and Costing in Civil Engineering”, UBS Publishers & Distributors Pvt. Ltd., 2003
2. Kohli, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand & Company Ltd., 2004

### **REFERENCE**

1. PWD Data Book.

## **(PCE 504) SURVEY CAMP**

**L T P C**

**0 0 0 2**

Twenty one days survey camp using Theodolite, leveling, tapes, plane table and total station. The camp must involve work on a large area of not less than 100 hectares. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots for:

- (i) Triangulation
- (ii) GPS observation to determine latitude, longitude and azimuth
- (iv) Plotting the details by plane table survey

### **PREPARATION OF TOPOGRAPHIC PLAN:**

Reconnaissance, establishment of control points, computation/determination of coordinates of stations, surveying the details using total station, data transfer and map compilation using appropriate software.

Area selected should be such that important features such as agriculture land, orchards, roads, water bodies etc. exist. Students shall submit a map (with appropriate symbols and colours) of the area showing topographic features.