

TAS 301 - Mathematics-III

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Unit - I : Integral Transforms

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

Z – transform and its application to solve difference equations.

Unit - II : Functions of a Complex Variable - I

9

Analytic functions, C-R equations and harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouville's theorem, Fundamental theorem of algebra.

Unit - III : Functions of a Complex Variable - II

8

Representation of a function by power series, Taylor's and Laurent's series, Singularities, zeroes and poles, Residue theorem, evaluation of real integrals of type $\int_0^{2\pi} f(\cos\theta, \sin\theta) d\theta$ and $\int_{-\infty}^{+\infty} f(x) dx$, Conformal mapping and bilinear transformations.

Unit - IV : Statistics and Probability

8

Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.

Unit - V : Curve Fitting and Solution of Equations

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Method of least squares and curve fitting of straight line and parabola, Solution of cubic and bi-quadratic equations.

FLUID MECHANICS

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UNIT I:

Introduction: Fluids and continuum; Physical properties of fluids: Viscosity, Compressibility, Surface Tension, Capillarity, Vapour Pressure; Cavitation; Classification of fluids including rheological classification. [03]

Fluid Statics: Pascal's law; Pressure-density-height relationship; Measurement of pressure by Manometers and mechanical gauges; Pressure on plane and curved surfaces; The Hydrostatic law; Total Pressure and Centre of pressure; Buoyancy; Stability of immersed and floating bodies; Fluid masses subjected to uniform horizontal and vertical accelerations. [03]

Dimensional Analysis: Units and Dimensions, Dimensional analysis, Rayleigh's method, Buckingham's Π theorem, Important dimensionless numbers used in fluid mechanics and their significance. [02]

UNIT II:

Hydraulic Similitude and Model Studies: Model and prototype; Similitude; Geometric, Kinematic and Dynamic similarity; Model Laws; Un-distorted model studies. [01]

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, uses and experimental and graphical methods of drawing. [03]

Fluid Dynamics-I: Concept of control volume and control surface, Reynolds Transport Theorem, Introduction to Navier-Stokes Equations, Euler's equation of motion along a streamline and its integration, Bernoulli's equation and its applications – Pitot tube, Flow through orifices, Mouthpieces, Nozzles, Notches, Weirs, Sluice gates under free and submerged flow conditions; Free and Forced vortex motion. [04]

UNIT III:

Fluid Dynamics-II: Impulse-Momentum Principle; Moment of momentum equation; Momentum equation application to stationary and moving vanes, pipe bends, *Problems related to*, combined application of energy and momentum equations, flow measurements, determination of coefficients of discharge, velocity and contraction and energy loss. [02]

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. [03]

Turbulent Flow: Turbulence; Equation for turbulent flow; Reynolds stresses; Eddy viscosity; Mixing length concept and velocity distribution in turbulent flow; Working principle of Hot-wire anemometer and Laser Doppler anemometer (LDA). [03]

UNIT IV:

Boundary Layer Analysis: Boundary layer thicknesses; Boundary layer over a flat plate; Laminar boundary layer; Application of Von-Karman 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. [05]

Flow Through Pipes: Nature of turbulent flow in pipes; Equation for velocity distribution over smooth and rough surfaces; 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. [05]

Unit V:

Compressibility Effects in Pipe Flow: Transmission of pressure waves in rigid and elastic pipes; Water hammer; Analysis of simple surge tank excluding friction. [03]

Ideal (Potential) Fluid Flow: Importance; Elementary concept of the uniform flow, the source flow, the sink flow and the free vortex flow. [03]

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. [03]

REFERENCES:

1. R J Fox: Introduction to Fluid Mechanics
2. Hunter Rouse: Elementary Mechanics of Fluids, John Wiley and sons, Omc/ 1946.
3. L H Shames: Mechanics of Fluids, McGraw Hill, International student edition.
4. Garde, R J and A G Mirajgaonkar: Engineering Fluid Mechanics (including Hydraulic machines), second ed., Nemchand and Bros, Roorkee, 1983.
5. K L Kumar: Engineering Fluid Mechanics
6. Munson, Bruce R, Donald F Young and T H Okishi, Fundamentals of Fluid Mechanics, 2nd ed, wiley Eastern.
7. V Gupta and S K Gupta, Fluid Mechanics and its Applications, Wiley eastern ltd.
8. Som and Biswas: Introduction to Fluid Mechanics and Machines, TMH.
9. R K Bansal: Fluid Mechanics and Hydraulic Machines
10. Modi and Seth: Fluid Mechanics and Fluid Machines

TCE-302

BASIC SURVEYING

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Unit - I

Introduction

Importance of surveying to Engineers –Examples from different fields; Plane and Geodetic Surveying, Control Points, Classification of surveys, Methods of locating a point, Sources and Types of errors, Principle of working from whole to part. (4)

Measurement of Distances

Principle of different methods and their accuracy, Measurement by chain and tape. Sources of errors and precautions, Corrections to tape measurements, Field problems, Use and adjustment of auxiliary instruments, Introduction of modern trends: EDM and Total Stations. (4)

Unit II

Measurements of Angles and Directions

Compass Surveying: Reference meridians, Bearing and azimuths, Magnetic declination and its variations, Use and adjustment of compass (4)

Theodolite Surveying: Vernier theodolite, micro-optic and electronic theodolites, Temporary and permanent adjustments, Measurement of horizontal and vertical angles. (4)

Unit III

Traversing

Principles of traversing by compass and theodolite, Field work and checks, Computation of coordinates, Sources of errors, Precision of traversing, Checking and adjusting of traverse, omitted measurements. (4)

Tacheometry

Definitions, Principles of stadia systems, Instrument constants, Subtense and tangential systems, Construction and use of Reduction Tacheometers, Errors and Precision. (4)

Unit IV

Measurements of Elevation and Contouring

Different methods of determining elevation; Spirit levelling: Definition of terms, Principle, Construction, Temporary and permanent adjustments of levels. Automatic levels, Levelling staves, Methods of spirit levelling, Booking and reduction of field notes, Curvature and refraction, Reciprocal leveling, Construction and field use of altimeter, Trigonometric levelling-simple and reciprocal observations, Sources of errors and precision of levelling procedures. Methods of relief representations, Definition and characteristics of contours, Use of contour maps, Direct and Indirect methods of contouring, Digital Elevation Model. (8)

Unit V

Plane Table Surveying

Principle, Advantages and disadvantages, Plane Table equipment, Use of telescopic alidade and self reducing alidades, Different methods of Plane Table Surveying, Resection-Two and three point problems, Advantages and disadvantages of Plane Table surveying. (6)

Sheet Numbering System

CIM and I & A C series, scales and numbering of Indian topographic maps. (2)

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., 1994.
4. Kennie, T.J.M. and Petrie, G., "Engineering Surveying Technology", Blackie & Sons Ltd., London, 1990.
5. Punmia, B.C., "Surveying", Vol. I & II, Laxmi Publications New Delhi,
6. Duggal, S.K., Surveying Vol. I & II TMH
7. Basak, Surveying TMH.
8. Kanetkar, Surveying Vol. I, II
9. Chandra, A.M. "Plane Surveying", New Age International Publishers, Delhi
10. Chandra, A.M. "Higher Surveying", New Age International Publishers, Delhi

BUILDING MATERIALS & CONSTRUCTION

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Unit –I

Building Materials : Classification, Properties and selection criteria of Bricks Burning of Bricks , tests for bricks, stone Classification, characteristics of good building stone, common building stones in India, lime , IS specifications , Field tests of Building limes, timber, Characteristics of good timber, defects in timber, seasoning of timber, tests on timber, plywood, glass, plastics, P.V.C.

Mortar : Types, classification and strength, I.S. specifications. [8]

Unit –II

Cement , Manufacture of cement ,Different types of cement such as slag Cement, Portland Pozzolona Cement and high Alumina cement, their characteristics, composition, use and properties, Tests on Cements , Admixtures, Aggregates and Testing of Aggregates: Classification, source, physical and mechanical properties. Testing of Aggregates for physical and mechanical properties. [8]

Unit –III

Building Constuction : Classification of buildings, Recommendations of NBC, Building byelaws, modular co-ordination; orientation of buildings, desirable conditions of comforts, components of building area considerations. Types of foundations and selection criteria [04]

Brick masonry, stone masonry. Types of walls, partition and cavity walls. Prefabricated construction. Plastering and pointing. Damp proofing materials and techniques, Antitermite treatment. [05]

Unit – IV

Types floors, construction details and selection criteria [02]

Types of roofs and roof covering, treatment for water proofing. [02]

Stair and staircases : Types, materials, proportions [02]

Doors and windows : sizes and locations, proportions. [02]

Unit –V

Lifts and escalators. White washing, colour washing, painting, distempering. [02]

Shuttering, scaffolding and centering. Expansion and construction joints [03]

Sound and fire proof construction, I.S. specifications [02]

References :

1. Arora, S.P. & Bindra, S.P., 'A text book of Building Construction' Dhanpat Rai & Sons, Delhi, 1977.
2. Jha, J. & Sinha, S.K., "Building Construction", Khanna Publishers, Delhi, 1977.
3. Kulkarni, C.J., "A text book of Engineering Materials", Ahmedabad book Depot, Ahmedabad, 1968.
4. Kulkarni, C.J., "A text book of Engineering Construction", Ahmedabad Book Depot, Ahmedabad, 1968.
5. Kumar Sushil, "Engineering Materials", Standard Publishers Distributors, Delhi, 1994.
6. Kumar Sushil, "Building construction", Standard Publishers, Distributors, Delhi, 1994
7. McKay W.B., "Building Construction, "Vol.1 to 4, Orient Longman Ltd., Hyderabad, Bombay, Madras, Delhi, Vol.1 & 2 -1995, Vol. 3-1996, Vol. 4-1998.
8. Punmia, B.C., "A text book of Building Construction ", Laxmi Publications, Delhi, Madras, 1987.
9. Singh Surendra, "Engineering Materials," Konark Publishers Pvt. Ltd. 1994.
10. Civil Engg. Materials, TTTI Chandigarh, Tata McGraw- New Delhi.

TCE-351

FLUID MECHANICS LAB

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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 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 Darcy's law and to find out the coefficient of permeability of the given medium.
10. To verify the momentum equation.
11. 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.
12. To study the variation of friction factor, 'f' for turbulent flow in smooth and rough commercial pipes.
13. To determine the loss coefficients for the various pipe fittings.
14. To study the flow behaviour in a pipe bend and to calibrate the pipe bend for discharge measurement.

TCE-352

BASIC SURVEY FIELD WORK

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1. Visit to Lab. For the study of:
 - a. Maps from -survey of India publication.
 - b. Conventional Symbol Charts and Different types of maps.
2. To study instruments used in chain surveying and to measure distance between two points by ranging.
3. To determine the bearing of sides of a given traverse using Prismatic Compass, and plotting of the traverse.
4. To plot details using radiation and intersection methods in plane tabling.
5. To solve two point/ three point problem in plane tabling.
6. To find out the reduced levels of given points using level. (Reduction by Height of Collimation method and Rise and Fall Method).
7. To determine and draw the longitudinal and cross-section profiles along a given route.
8. Practice for temporary adjustments of a Vernier Theodolite and taking Horizontal and Vertical angular measurements, by Reiteration method.
9. Measurement of horizontal angles by Repetition method.
10. Determination of the Tacheometric constants of a given theodolite.

TCE-353

CIVIL ENGG. DRAWING LAB.

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1. Symbols used in Civil Engineering drawing, Masoury Bonds
2. Doors, Windows and staircases
3. Plumbing & Electrical fitting drawing.
4. Drafting Using AutoCAD.
5. Comprehensive Drawing of Residential building, (Layout, plan, elevation & sectional elevation)
6. Preparation of Layout planning for different Civil Engg. Projects.
7. Preparation of lay out plan/Maps and building drawing using computer.

TCE- 354

MATERIAL TESTING AND GEOLOGY LAB

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1. Cement:

1. Normal Consistency of cement
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatalier's apparatus.
5. Soundness of cement.
6. Tensile strength.

II. Coarse Aggregate:

1. Crushing value of aggregate
2. Impact value of aggregate
3. Water absorption of aggregate
4. Sieve Analysis of aggregate
5. Specific gravity, bulk density
6. Grading of aggregates.

III. Fine Aggregate:

1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV. Lime:

1. Fineness of lime
2. Setting time and soundness of lime.

V. Physical and mechanical properties of reinforcing steel.

VI. Bricks:

1. Water absorption
2. Dimension Tolerance
3. Compressive Strength
4. Efflorescence.

VII. Geology:

1. Megascopic study of minerals (physical properties and identification).
2. Determination of Specific Gravity of minerals.

3. Megascopic study of the following rocks with special reference to their suitability in Civil Engineering works –
 - (a) Igneous rocks
 - (b) Sedimentary rocks
 - (c) Metamorphic rocks
4. Determination of strike and dip & completion of outcrop.
5. Preparation of geological section and study of geological maps with emphasis on the site selection for dams, tunnels and highways.

TCE-401

HYDRAULICS AND HYDRAULIC MACHINES

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Unit –I

Introduction: Difference between open channel flow and pipe flow, geometrical parameters of a channel, Velocity and pressure distribution in an open channel, Continuity equation. [03]

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. [05]

Unit –II

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. [08]

Unit –III

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. [06]

Mobile Bed Channel Hydraulics: Difference between rigid and alluvial channels, Incipient motion condition, Different approaches to study sediment motion, Tractive force approach, Shields curve, Types of bed forms or regimes of flow, characteristics and types of sediment load. [02]

Unit-IV

Hydraulic Jump, Surges, Water Waves: Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Use of jump as an energy dissipater, End depth in a free overfall, Equation of motion for unsteady flow, open channel surge, celerity of the gravity wave, deep and shallow water waves. [05]

Hydraulic Pumps: Rotodynamic pumps, basic equations, axial and mixed flow pumps, cavitation in pumps, characteristics curves. [03]

Unit –V

Hydraulic Turbines: Introduction, Rotodynamic Machines, Including elementary concept of bulb and tubular turbines pelton Turbine, equations for jet and roter size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, basic equation for type, Head on reaction turbine, basic equation for rotodynamic machines, similarity law and specific speed, cavitation characteristic curves. [08]

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. French, R.H., Open Channel Hydraulics, McGraw Hill International
6. Graf, W.H., Hydraulics of Sediment Transport, McGraw Hill International

STRUCTURAL ANALYSIS – I

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Unit – I

Classification of Structures, stress resultants, degrees of freedom, Static indeterminacy (3)
 Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex) (05)

Unit – II

Rolling loads, influence lines for beams and trusses, Absolute maximum bending moment, Muller-Breslau's principles & its application. (08)

Unit – III

Analysis of Arches, Linear arch, Eddy's theorem, three hinged parabolic arch, two hinged arch, spandrel braced arch, moving load & influence lines. (08)

Unit – IV

Equilibrium of light cable, General cable theorem, uniformly loaded cable, anchor cables, temperature stresses in suspension cables, three hinged stiffening girder, two hinged stiffening girder, temperature stresses in two hinged girder.

Unit – V

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, unit load & Conjugate beam methods. (8)

References

1. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
2. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill.
3. Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures. Vol. I & II Nem Chand.
4. Coates, R.C., Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.
5. Ghali, A. & Neville, M., "Structural Analysis", Chapman & Hall Publications, 1974.
6. Jain, A.K. "Advanced Structural Analysis", Nem Chand & Bors, roorkee, India, 1996.
7. Jain, O.P. & Arya A.S., "Theory of Structure", Vol. II, Nem Chand Bros., Roorkee, 1976.
8. Kinney, J.S., "Intermediate Structural Analysis", McGraw Hill Book Company, 1957.
9. Wang, C.K. "Intermediate Sstructural Analysis", McGraw Hill Book Company, 1983.
10. Nautiyal, B.D., "Introduction to Structural Analysis", New Age International, 2001.

ADVANCE SURVEYING

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Unit I**Triangulation and Trilateration**

Necessity of Control Surveying, Principle of Triangulation and Trilateration classification of Triangulation Systems Station Marks, Towers and Signals, Satellite station, Intersected and Resected points, Reconnaissance, Intervisibility of stations, Angular Measurement, Base line measurement and its extension (8)

Unit II

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, Observations and correlative Normal Equations, Adjustment of triangulation figures and level nets. (8)

Unit III

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. (8)

Unit IV

Project 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 culverts, Bridges and Tunnels; Principles and practice of hydrographic surveys, Layout of culverts, canals, bridges and buildings. (5)

Field Astronomy

Astronomical terms, co-ordinate systems, Spherical trigonometry, Astronomical triangle, Relationship between coordinates. (3)

Unit V

Photogrammetry and Remote Sensing

Photogrammetry-Introduction, Scale of photograph, Tilt and height displacement, Stereoscopic vision and stereoscopes, Techniques of photo-interpretation, Principles of remote sensing, Electro Magnetic Radiation (EMR), energy interaction with atmosphere and earth features, spectral signatures, Remote sensing satellites and their data products, methods of interpretation of remotely sensed data. (5)

GPS and GIS

Global Positioning System (GPS)-Introduction, principle, and applications of GPS in different fields of Surveying, Geographic Information System (GIS) – Introduction, Geographical concepts and terminology, Applications of GIS (3)

References

1. Agor, R., "Surveying", Vol. II & III, Khanna Publications, Delhi, 1995.
2. Arora, K.R., "Surveying", Vol. II & III, Standard Book House, Delhi.
3. Bannister, A. And Baker, R., "Solving Problems in Surveying", "Longman Scientific Technical, U.K., 1994.
4. Kennie, T.J.M. and Petrie, G., "Engineering Surveying Technology", Blackie & Sons Ltd. London, 1990.
5. Punmia, B.C., "Surveying", Vol. II & III Laxmi Publications, New Delhi.
6. Duggal S.K., Surveying Vol. I & II TMH
7. Basak, Surveying TMH.
8. Kanetkar, Surveying
9. Chandra, A.M. "Plane Surveying", New Age International Publisher, Delhi
10. Chandra, A.M. "Higher Surveying", New Age International Publisher, Delhi
11. Lillesand, T.M. and Kiefer, R.W., "Remote Sensing and Image Interpretation".

ENGINEERING GEOLOGY

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UNIT – I

Earth Sciences and its importance in Civil Engg. Minerals and their physical properties. Study of common rock forming minerals. [04]

Internal structure of the earth. Suitability of rocks as engineering materials. Building stones occurrences and characteristics, selection [04]

UNIT – II

Rocks origin, Characteristics, Texture, structure and classification of igneous, sedimentary and metamorphic rocks. Engineering properties of rocks. [08]

UNIT – III

Strike and dip of strata, folds, faults, joints, unconformity and their classification, Causes and relation to engineering behaviour of rock masses. Overlap. [05]

Landslides causes, classification and preventive measures. [03]

UNIT – IV

Earthquake causes, classification, earthquake waves, intensity and magnitude, Seismic zones for India, Geological consideration for construction of building. [04]

Underground water, sources, Aquifer, Aquiclude, Artesian well, Ground water provinces of India and its role as geological hazard. [04]

UNIT – V

Geological investigations for site selection of dams & reservoirs, tunnels, bridges and highways. Reservoir induced seismicity. [05]

Methods of Geophysical explorations-gravity, electrical and seismic, methods. [03]

References

1. Prabin Singh, "Engineering and General Geology", Katson publishing house.
2. Legget, R.F., "Geology and Engineering", McGraw Hill, New York.
3. Blyth, F.G.M., "A Geology for Engineers", Arnold, London.
4. P.K. Mukerjee, "A Text Book of Geology", Calcutta, world publisher.
5. Krynine and Judd: "Principles of Engineering Geology & Geotechnics," Mc Graw Hill, New York.
6. B.S. Sathya, Narayanswamy: "Engg. Geology" Dhanpat Rai & Co. New Delhi.
7. K.S. Valdiya: "Environmental Geology", Tala Mc Graw Hill, New Delhi.

TAS-401: COMPUTER BASED NUMERICAL METHODS

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Unit 1

Problem solving on computer. Algorithms and flow charts.

Introduction to numerical computing, approximations and errors in numerical computations. Truncation and round off errors, propagation of errors.

Root finding: bisection method, regula falsi method, iteration method, Newton Raphson method, Secant method, systems of nonlinear equations.

Unit 2

Matrix algebra, Solution of simultaneous linear algebraic equations: Gauss elimination, Gauss Jordan method, LU decomposition, Jacobi method, Gauss Seidel method, SOR method, convergence of iterative methods. Tridiagonal systems and Thomas algorithm, Condition of a system and stability issues.

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Unit 3

Interpolation and Extrapolation: Newton's forward and backward interpolation formula, Lagrange interpolation formula. Divided differences and Newton's general formula.

Numerical differentiation, Numerical integration : Trapezoidal and Simpson's rules. Newton-Cotes integration formulas, Romberg integration, Gaussian Quadrature.

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Unit 4

Numerical solution of O.D.E.: Taylor series method, Euler's method, Runge Kutta methods.

Multistep methods: Milne's method, Adams method, accuracy, Convergence criteria, stiffness, systems of equations.

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Unit 5

Boundary Value problems: Finite difference method, solving eigenvalue problems, polynomial method, power method.

Numerical solution of Partial Differential equations. Elliptic, Parabolic and hyperbolic PDEs.

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Books Recommended

E. Balagurusamy: Numerical Methods, Tata McGraw hill.

Reference Books

1. **Sastry, S. S.** "Introductory Methods of Numerical Analysis", 3rd ed. Prentice- Hall of India, New Delhi (2002).
2. "Schaum's Outlines: Numerical Analysis", 2nd ed. Tata Mc Graw Hill Publishing Co. Limited (1968)
3. **Kandasamy, P. Thialagawathy, K. & Gumawathy, K.** "Numerical Methods", S. Chand & Company Ltd., New Delhi (1999).
4. **Balaguruswamy, E.** "Numerical Methods. Tata Mc Graw Hill Publishing Company Limited, New Delhi (2001).
5. **V. K. Singh** "Numerical and Statistical Methods in Computer" (2005), Paragon International Publishers, New Delhi.
6. **Jain, Iyengar and Jain,** "Numerical Methods for Scientific and Engineering Computation" (2003), New Age International, New Delhi.
7. **Grewal B.S.,** "Numerical Methods in Engineering and Science", Khanna Publishers, Delhi.

TCE-451

HYDRAULICS AND HYDRAULIC MACHINE LAB

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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 rotodynamic pumps and their characteristics.
9. To study rotodynamic turbines and their characteristics.

TCE-452

ADVANCE SURVEY FIELD WORK

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1. Study and use of different types of micro-optic theodolites and total stations.
2. To carry out Triangulation and Trilateration of a given area.
3. To adjust the angular observations taken in triangulation exercise and compute the adjusted coordinates of triangulation stations.
4. To plot the coordinates at a given scale on Plane Table and their field checking.
5. To Layout a simple circular curve on the ground using linear methods.
6. To Layout a simple circular curve on the ground using Angular methods
7. To Layout a building and a culvert on the ground.
8. Study of satellite imagery and visual image interpretation.
9. GPS demonstration and coordinate observations.
10. GIS demonstration and study of its applications.

Survey Camp

Suggested works which could be included in survey camp:

1. Complete a traverse using chain, tape and compass.
2. To carry out Triangulation of a given area.
3. Plotting of various details using plane table
4. Determination of elevation of points (contouring of an area)

TCE-453

ENGINEERING GEOLOGY LAB

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1. Megascopic study of minerals (physical properties and identification)
2. Determination of Specific gravity of minerals.
3. Megascopic study of the following rocks with special reference to their suitability in Civil Engineering Works:
 - (a) Igneous rocks
 - (b) Sedimentary rocks
 - (c) Metamorphic rocks
4. Determination of strike and dip and completion of out crop.
5. Preparation of geological section and study of geological maps with emphasis on the site selection for dams, tunnels and highways.

NUMERICAL TECHNIQUES LAB
TAS 451

L T P
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Use of following Techniques in C/C++ Language

1. Solution of single non-linear algebraic equations by Newton Raphson method.
2. Solution of single non-linear equations by Regulafalsi method.
3. Solution of system of linear simultaneous by Gauss Elimination method.
4. Solution of system of linear simultaneous equation by gauss seidel method and successive over relaxation method.
5. Solution of single first order ordinary differential equations by fourth order Runge-Kutta method.
6. Solution of Heat equations (Parabolic equations) by finite difference method.
7. Solution of Laplace equations (elliptic equation) by finite difference method.
8. Solution of wave equations (Hyperbolic equation) by finite difference method.
9. Finding Newton's interpolatory polynomial for n points.
10. Finding Newton's interpolatory polynomial based on finite difference table for n points.
11. Simpson's 3/8-rule.

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Revised Syllabus

2nd Year (3rd & 4th Semester)

[Effective from the session 2005-06]

B.TECH. CIVIL ENGINEERING