B. TECH.

CIVIL ENGINEERING

Third & Fourth Semester

EVALUATION SCHEME & SYLLABUS

Effective from session (2018-19)

FACULTY OF ENGINEERING
UNIVERSITY OF LUCKNOW
LUCKNOW

UNIVERSITY OF LUCKNOW
FACULTY OF ENGINEERING

Evaluation Scheme for B. Tech.
(Effective from session 2018-19)

Branch: Civil Engineering

SEMESTER - III

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
		Theory							
1.	AS – 301	Mathematics – III	3--1--0	20	10	30	70	100	4
2.	CE - 301	Fluid Mechanics	3--1--0	20	10	30	70	100	4
3.	ME - 301	Strength of Materials	3--0--0	20	10	30	70	100	3
4.	CE - 302	Building Materials & Construction	3--0--0	20	10	30	70	100	3
5.	CE - 303	Surveying	3--0--0	20	10	30	70	100	3
6.	AS – 302/ AS - 303	Human Values & Ethics / Environment & Ecology	3—0--0	20	10	30	70	100	3
		Practical							
7.	CE - 351	Fluid Mechanics Lab	0--0--2	-	20	20	30	50	1
8.	ME - 351	Strength of Materials Lab	0--0--2	-	20	20	30	50	1
9.	CE - 352	Building Materials & Construction Lab	0--0--2	-	20	20	30	50	1
10.	CE - 353	Surveying Lab	0--0--2	-	20	20	30	50	1
11.	GP - 301	General Proficiency				50		50	
Total			18-2-8					800	24

UNIVERSITY OF LUCKNOW
FACULTY OF ENGINEERING

Evaluation Scheme for B. Tech.

(Effective from session 2018-19)

Branch: Civil Engineering

SEMESTER - IV

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
		Theory							
1.	AS – 401	Computer Oriented Numerical Techniques	3--1--0	20	10	30	70	100	4
3.	CE – 401	Hydraulics & Hydraulic Machines	3--1--0	20	10	30	70	100	4
4.	CE – 402	Engineering Geology	3--0--0	20	10	30	70	100	3
5.	CE- 403	Geo-infomatics	3--0--0	20	10	30	70	100	3
	CE - 404	Structural Analysis - I	3--0--0	20	10	30	70	100	3
6.	AS – 402/ AS - 403	Human Values & Ethics/ Environment & Ecology	3—0--0	20	10	30	70	100	3
		Practical							
7.	CE – 451	Hydraulics & Hydraulic Machines Lab	0--0--2	-	20	20	30	50	1
8.	CE – 452	Structural Analysis Lab - I	0--0--2	-	20	20	30	50	1
9.	CE- 453	Geo-infomatics Lab	0--0--2	-	20	20	30	50	1
10.	CE – 454	Numerical Technique Lab	0--0--2	-	20	20	30	50	1
11.	GP - 401	General Proficiency				50		50	
Total			**18-2-8**					**800**	**24**

AS - 301
MATHEMATICS- III

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Unit- I: Sequences and Series   08

Sequences, Limit of a sequence, Convergence, Divergence and Oscillation of a sequence, Infinite series, Necessary condition for convergence, Standard infinite series, Geometric series and Harmonic series. Tests for convergence and divergence, Comparison test (only for series with positive terms), Cauchy's integral test, D'alembert's ratio test, Cauchy's nth root test, Raabe's test (higher ratio test), Logarithmic test, Demorgan's and Bertrand's tests, Alternating series Leibnitz's theorem (without proof), Absolute convergence and Conditional convergence, Power series.

Unit- II: Function of Complex variable   08

Analytic function, C-R equations, Harmonic functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities, Zeroes and Poles, Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(cos\theta, \ sin\theta)d\theta$ and $\int_{-\infty}^{+\infty} f(x)dx$.

Unit- III: Integral Transforms   08

Fourier integral, Complex Fourier transform, Inverse transform, Convolution theorem, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations, Z- transform and its application to solve difference equations.

Unit- IV: Statistical Techniques – I   08

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non- linear and multiple regression analysis, Probability theory.

Unit- V: Statistical Techniques – II   08

Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tets of significations: Chi- square test, t-test, Analysis of variance (one way), Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi- averages), Statistical quality control methods, Control charts, $\bar{X}$, R, p, np and c charts.

Test Books :-
1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. J.N. Kanpur, Mathematical Statistics, S. Chand & company Ttd., 2000

Reference Books :-
1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.
2. Chandika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Gra Hill Education, 2016.
4. E. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
6. S.P. Gupta, Statistical Methods, Sultan and Sons, New Delhi, 2004.
7. Devore, Probability and Statistics, Thomson (Cengage) Learning, 2007.
8. Walpole, Myers, Myers & Ye, Probability and Statistics for Engineers & Scientists, Pearson Education, 2003.

CE – 301
Fluid Mechanics

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Unit - I   08

Introduction: Fluid and continuum, physical properties of fluids, rheology of fluids.

Fluid Statics: Pressure-density-height relationship, manometers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Unit - II   08

Kinematics of Fluid Flow: Continuum and free molecular flows, steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, ideal and real flow.

System versus control volume approach, fundamentals of flow visualization, streamlines, streak lines and path lines, continuity equation in Cartesian and polar co-ordinate system, rotation and circulation, stream function and potential function, flow nets.

Dimensional Analysis and Hydraulic Similitude: Rayleigh's method, Buckingham's Pi theorem, important dimensionless numbers and their significance, geometric, kinematics and dynamic similarity, model studies, distorted and undistorted models.

Unit - III   08

Potential flow: source, sink, doublet and half-body, free and forced vortex flow.

Dynamics of Fluid Flow: Euler's Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, flow through orifices, mouthpieces, notches and weirs, aeration of nappe, momentum equation and its application to pipe –bends, flow through nozzles.

Unit - IV   08

Laminar Flow: Relation between shear and pressure gradient in laminar flow, introduction toNavier-Stokes equations, Reynolds experiment**,** equation of motion for laminar flow through pipes, flow between parallel plates, Kinetic energy and Momentum correction factors.

Turbulent Flow: Types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, Prandtl's mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces.

Flow through Pipes: Major and minor losses, energy and hydraulic grade lines, combination of pipes, flow through siphon pipes, pipe network, power transmission through pipes, surge tanks, water hammer.

Unit - V   **08**
Theory of Boundary Layer: Boundary layer thickness, boundary layer over a flat plate, application of Von-Karman integral momentum equation, laminar sub-layer, boundary layer separation and its control.
Forces on Submerged Bodies: Drag and lift, drag on a sphere and on a cylinder, development of lift on a circular cylinder and an aerofoil, Magnus effect.
Compressible Flow: Thermodynamic relations, basic equations of compressible flow, expression for velocity of sound wave in a fluid.

Text Books:
1. Bansal, R.K., 'Fluid Mechanics and Hydraulics Machines', Laxmi Pub. Ltd., New Delhi
2. Cengel & Cinbala,' Fluid Mechanics', TMH, New Delhi.

Reference Books:
1. Modi, L.P.N, Seth, S.M., 'Hydraulics and Fluid Mechanics', Std. Book House Pub.
2. Ojha, C.S.P., Berndtsson, R., Chandramouli, P.N. 'Fluid Mechanics and Machinery', Oxford University Press.
3. R. W. Fox, P. J. Pritchard, A. T Mcdonald, Introduction to Fluid Mechanics, John Wiley
4. F. M White, Fluid Mechanics, Tata McGraw Hill Eduction.
5. Munsan et.al, 'Fundamentals of Fluid Mechanics', Wilay New York.
6. Garde, R.J., 'Fluid Mechanics'.
7. Jain, A.K., Fluid Mechanics, Khanna Publishers, New Delhi.

ME - 301
STRENGTH OF MATERIALS

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Unit I   **10**
Stresses in Beams: Review of pure Bending. Direct and shear stresses in beams due to transverse and axial loads, composite beams.
Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

Unit II   **10**
Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.
Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method Fixed beams. Castigliano's Theorem.

Unit III   **07**
Helical and Leaf Springs: deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

Unit IV   **07**
Columns and Struts: Combined bending and direct stress, middle third and middle quarter rules. Struts with different end conditions, Euler's theory and experimental results, Ranking Gardon Formulae, Examples of columns in mechanical equipments and machines.

Unit V   **06**
Thin cylinders & spheres: Hoop and axial stresses and strain. Volumetric strain. Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders Stresses due to interference fits.

Text Books:
1. Strength of Materials by G.H. Ryder, Macmillan
2. Strength of Materials: Elementary Theory and Problems - Vol. I and Vol. II by Stephen Timoshenko, CBS Publishers
3. Strength of materials R. K. Rajput, S.Chand Publications

Reference Books:
1. Mechanics of Materials by Bear Johnston, McGraw Hill
2. Advanced Mechanics of Solids by L.S. Srinath, McGraw Hill
3. Mechanics of Materials by E P Popov, Pearson

CE- 302
Building Materials and Construction

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UNIT I   10
Scope of Study of Building Materials: Building materials and their performance, economics of the building materials. **Stones:** Requirement of good building stones, characteristics of building stones and their testing. Common building stones. Method of preservation of stones. **Bricks:** Manufacturing process of clay bricks, classification of clay bricks. Properties of clay bricks, testing methods for clay bricks. Problems of efflorescence & lime bursting in bricks & tiles. **Gypsum:** properties of gypsum plaster, building products made of gypsum and their uses. **Lime:** Manufacture of limes, classification of limes, properties of limes. **Cement:** raw materials used, Process of manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement. **Cement Concrete:** Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Method of Curing of concrete. **Pozzolona:** Chemical composition and requirements for uses, Natural and Artificial flyash, Surkhi (burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction, **Timber:** Classification and identification of timber, fundamental Engineering Properties of timber, Defects in timber, factors affecting strength of timber, Methods of seasoning and preservation of timber. Wood based products. **Asphalt:** Bitumen and tar: Terminology, specifications and uses, Bituminous materials.

UNIT II   08
Plastics: classification, advantages of plastics, Mechanical properties and use of plastic in construction. **Paints, Varnishes and Distemper:** Common constituents, types and desirable properties, Cement paints. **Ferrous Metals:** Desirable characteristics of reinforcing steel. Principles of cold working. Reinforcing telemechanical & physical properties and chemical composition. Brief discussion on properties and uses of Aluminum and Lead. **Glass:** Ingredients, properties, types and use in construction. **Insulating Materials:** Thermal and sound insulating material, desirable properties and types.

UNIT III   08
Buildings: Components of building, area considerations, Construction Principle and Methods for layout, Damp proofing, antitermite treatment in buildings, Vertical circulation: stair cases and their types, design and construction. Different types of floors, and flooring materials (Ground floor and upper floors). Bricks and stone masonary construction. Cavity wall & hollow block construction.

UNIT IV   07
Doors and Windows: Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof and roof treatments, Lintel and Chhajja, Principles of building Planning.

UNIT V   **07**

Natural Ventilation, Water supply and Sanitary fittings (Plumbing), Electric Fittings. Heating Ventilation & Air conditioning (HVAC), Mechanical Lifts and Escalators, Fire Fighting and Fire Protection of Buildings. Acoustics. Plastering and its types, pointing, distempering, colour washing, painting etc. Principles & Methods of building maintenance.

Text Books:
1. SK Duggal, "Building Materials" New Age International
2. PC Varghese, " Building Materials" PHI
3. Sushil Kumar, "Building Construction" Standard Publisher.
4. BC Punmia, "Building Construction" Laxmi Publication.

Reference Books:
5. Purushothama Raj, "Building Construction Materials & Techniques" Pearson Edu.
6. Rangwala, "Building Materials" Charotar Publishing House.
7. Domone, "Construction Materials" 4/e, CRC Press Taylor & Francis Group.
8. Adams, "Adams' Building Construction Adams" CRC Press Taylor & Francis Group.
9. Jha & Sinha, "Building Construction" Khanna Publisher
10. Sahu, "Building Materials and Cionstruction" Mc Grew Hill Education
11. Deodhar, "Civil Engineering Materials" Khanna Publisher
12. Mehta, "building Construction Principles, Materials & Systems" 2/e, Pearson Education Noida.
13. Sandeep Mantri, "Practical building Construction and its Management" Satya Publisher, New Delhi.

CE - 303
Surveying

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UNIT-1   08
Introduction, Classification of Survey, Principles of Surveying, Plans and Maps, Scale
Accuracy and Errors
Horizontal Distance Measurement: Chain Surveying, Chains, Tapes, Accuracy of Chaining, Running Survey lines, Linear measurements with chains, Errors in chaining

UNIT-2   08
Compass Surveying: Bearing and Angles, Theory of Magnetic Compass , The Prismatic Compass, The Surveyor's Compass, Magnetic Declination, Local Attraction, Error in Compass Surveying
Theodolite Surveying: Classification of Theodolite, Temporary adjustments, Permanent adjustments, measurement of horizontal angles, measurement of vertical angles, Electronic theodolite
Traversing: Methods of Traversing, Plotting Traverse Survey, Checks, Closing Errors, Balancing Traverse, Adjustment of Bearings, Omitted measurements

UNIT-3   08
Levelling: Mehods of Levelling, Temporary adjustment of a level, Theory of direct leveling, Differential leveling, Balancing Back sight and Fore sight, Curvature and Refraction, Reciprocal Levelling, Cross Sectioning
Contouring: Contour Interval, Characteristics of Contours, Methods of Locating contours, Interpolation of contours, Contour gradient, Uses of Contour Maps
Trigonometric Levelling, Methods of Trigonometric Levelling

UNIT-4   08
Plane Table Surveying: Description of Plane Table, Methods of Plane Table Surveying, Radiation, Traversing, Intersection, Resection, The three-point problem, Two point problem, Advantages and disadvantages of Plane Tabling
Tachaeometric Surveying: Methods of Tachaeometry, Fixed hair methods, Anallactic Lens, Subtense Method, Tangential Method, Range Finding

UNIT-5   08
Curves: Classification, Simple Circular Curves, Compound Curves, Reverse Curves, Transition Curves, Vertical Curves
Triangulation: Geodetic Surveying, Classification of Triangulation System, Reconnaissance, Signals and Towers, Base Line Measurements, Measurement of Horizontal Angles, Sattelite Station, Extension of Base

Text Books:
1. S K Duggal : Surveying Vol 1 & 2 , TMH
2. B C Punamia : Surveying & Leveling
References Books:
3. R Subramanian : Surveying & Leveling , Oxford University Press
4. C Venkatramaih : Text Book of Surveying , University Press
5. H .Kanitkar : Surveying &Levelling

AS – 302/402
HUMAN VALUES AND ETHICS

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UNIT 1   08
Course Introduction
1. Understanding: Why humans are ethical, why they are not;
2. Understanding the need, basic guidelines, content and process for Value Education;
3. Self Exploration–what is it? – It's content and process;
4. 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration;
5. Right understanding of Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority;
6. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario;
7. Method to fulfil the above human aspirations: understanding and living in **harmony** at various levels

UNIT 2   08
Understanding of Human Values and Ethics
1. Understanding the needs of Self ('I') and Body ('Me');
2. Understanding values in human-human relationship;
3. Meaning of Co-existence and Mutual Satisfaction;
4. Understanding Respect;
5. Understanding Comprehensive Human Goals;

UNIT 3   08
Effects of Holistic Harmony on Professional Ethics
1. World as a Nation;
2. Definitiveness of Ethical Human Conduct;
3. Basis for Humanistic Education and Humanistic Universal Order;
4. Competence in professional ethics:
   a) Ability to utilize the professional competence for augmenting universal human order;
   b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,;
   c) Ability to identify and develop appropriate technologies and management patterns for above production system;
5. Strategy for transition from the present state to Universal Human Order:
   a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers;
   b) At the level of society: as mutually enriching institutions and organizations;

UNIT 4   08
Effects of Holistic Personality for Success
1. Negotiation as a tool for success;
2. Leadership as an attribute of a successful Professional;

3. Managing Stress and Time;
4. Team Building--creating a harmonious environment with apathy to each other;
5. Understanding difference between evolution and revolution;

UNIT 5   **08**
Managing Relationship for Success
1. Understanding and valuing Cross-Cultural Ethics;
2. Managing Relationships (Networking), Personal Effectiveness and Self Leadership;
3. Theory of Constraints;
4. A Decision Making Model: Ethics as making decisions and choices;
5. Conflicts and Ethical Dilemmas;
6. Entrepreneurship and Ethics: A sense of business Ethics;
7. Pragmatic Behaviour of Business to its Colleagues/Competitors

Text Books:

1. Kazuo Ishiguro, 1989, *The Remains of the Day*, Faber and Faber
2. B. L. Bajpai, 2004, *Indian Ethos and Modern Management*. New Royal Book Co., Lucknow. Reprinted 2008;
3. Sussan George, 1976, *How the Other Half Dies*. Penguin Press, Reprint 1991;

Reference Books:
1. Amitabh Ghosh, 2008, *Sea of Poppies*. John Murray Publications.
2. R. K. Narayan, 1958, *The Guide*, Viking Press.
3. P. L. Dhar, R. R. Gour, 1990, *Science and Humanism*, Commonwealth Publishers;
4. R. R. Gaur, R. Sangal and G. P. Bagaria, 2010, *A Foundation Course in Human Values and Professional Ethics*, Excel Books.

Relevant movies and documentaries:

1. Story of Stuff (Documentary);
2. The Remains of the Day (Movie);
3. Pursuit of Happyness (Movie);
4. Fences (Movie);
5. Gifted (Movie)

AS – 303/ AS - 403
ENVIRONMENT AND ECOLOGY

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Unit I- Fundamentals of Environment & Ecology   08

Definition, Scope & Importance and Need for public awareness.
Ecosystem- Definition, Energy flow in ecosystem, Ecological succession and Balanced ecosystem.
Effect of human activities on food, Shelter, Economic and social security.
Effect of human activities on environment - Agriculture, Housing, Industry, Mining and Transportation activities.
Basics of Environmental Impact, Assessment and Sustainable development.

Unit II- Natural Resources & Environmental Quality standard   09

Water resources- Availability and quality aspects. Mineral resources, Material Cycle- Carbon, Nitrogen & Sulphur cycles, DO, BOD and COD.
Modern techniques used in analysis of Pollutants- Determination of disinfectants, Pesticides, Ambient Quality standards, Water quality parameters and standards, Turbidity, pH, Suspended solids and hardness,

Unit III- Environmental Pollution & Current Environmental issues   09

Environmental Pollution-Definition, Causes, Effects and control measure of:
1. Air Pollution
2. Water Pollution
3. Soil pollution
4. Marine Pollution

Current environmental issues of importance: Population growth, Climate change & Global warming- effects, Urbanization, Cause of global warming, Acid rain. Ozone layer depletion- causes and effects on health, Control measures. Photochemical smog, Solid waste management, Waste water treatment.

Unit IV- Energy-Types , Sources and Uses   08

Different types of energy, Conventional and nonconventional sources- Hydro-electric, Fossil fuel based, Nuclear, Solar, Biomass, Geothermal energy and Biogas. Hydrogen as alternative future source of energy.

Unit V- Environmental protection   06

Role of Government, Legal aspects, Environment protection Act, Introduction to ISO 14000, Green building concept.

Text Book-
1. Environmental Studies- Dr. D. L. Manjunath, Pearson Education
2. Text book of Environment Science and Engineering- M. Anji Reddy- B S Publication
3. Elements of Environmental Science and Engineering- Dr. P. Meenakshi- Prentice-Hall of India Pvt Ltd, New Delhi, 2008.
4. Environment and Ecology- P.D. Sharma- Rastogi publication 2009.

Reference Books-
1. Principle of Environmental Science and Engineering- P. Venugopalan Rao, Prentice Hall of India.
2. Environmental studies- R. Rajagopalan- Oxford Publication-2005.

CE-351
Fluid Mechanics Lab.

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Note :- At least **ten** experiments are to be conducted from the following list.

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the metacentric height of a ship model experimentally.
3. To determine the coefficient of contraction, velocity and discharge of an orifice.
4. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
7. To verify the Bernoulli's theorem.
8. To calibrate and to determine the coefficient of discharge for rectangular and triangular notches.
9. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number using Reynolds apparatus.
10. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile for steady laminar flow..
11. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
12. To determine the loss coefficients for a sudden enlargement in a pipe.
13. To determine the loss coefficients for a sudden contraction in a pipe.
14. To determine the loss coefficients for a pipe bend.

ME – 351
STRENGTH OF MATERIALS LAB

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LIST OF EXPERIMENTS

Note :- At least **ten** experiments are to be conducted from the following list.

1. To conduct Tensile test of the given specimen on UTM and draw stress-strain diagram.
2. To conduct Compression test of the given specimen on UTM.
3. To conduct Torsion test of the given specimen.
4. To conduct Bend test of the given sample on UTM.
5. To conduct impact test of the given sample by Charpy and determine the impact strength of given specimen.
6. To conduct impact test of the given sample by Izod and determine the impact strength of given specimen.
7. To determine the stiffness of spring.
8. To conduct Hardness Test of the given specimen by Brinell's and Rockwell's method.
9. To conduct Hardness Test of the given specimen by Vicker's method.
10. To determine critical buckling loads for columns with support
11. To examine the Euler's theory of buckling.
12. To investigate the influence of different material parameters on buckling.

CE- 352
Building Materials and Construction Lab

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0 0 2

Note :- At least **ten** experiments are to be conducted from the following list.

I.   To study quality of water used in building materials and construction.

II.   Testing of various properties of following materials as per BIS specifications
   A. Cement (two turns)
      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-chatailer's apparatus.
      5.   Soundness of cement.
      6.   Tensile strength

   B. Coarse Aggregate (two turns)
      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.

   C. Fine Aggregate (one turn)
      1.   Sieve analysis of sand and calculation of Fineness Modulas
      2.   Silt content of sand
      3.   Bulking of sand

   D. Bricks (one turn)Tests for:
      1.   Water absorption
      2.   Dimension Tolerances
      3.   Compressive strength of bricks
      4.   Efflorescence
III.   Destructive and non destructive testing on concrete.
IV.   Physical and mechanical properties of reinforcing steel.
V.   To determine compressive strength of concrete.

CE - 353
Surveying Lab.

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Note :- At least **ten** experiments are to be conducted from the following list.

1. Measurement of distance and locating various objects by chain & cross staff surveying.
2. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
3. Measurement of horizontal and vertical angles with theodolite.
4. Determination of elevation of various points with dumpy level
5. Creation of L-Section and cross section of road.
6. Determination of elevation of point by trigonometric levelling.
7. Creation of Contour plan of given area.
8. Solution of two point problem by plane table.
9. Solution of three point problem by plane table.
10. To set out a simple circular curve by Rankine's method.

AS - 401
COMPUTER ORIENTED NUMERICAL TECHNIQUES

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Unit I 08

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. Rate of convergence of iterative methods.

Unit II 06

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.

Unit III 10

Interpolation and Extrapolation: Finite differences, Newton's forward and backward interpolation formula, Lagrange interpolation formula. Divided differences and Newton's formula.
Numerical differentiation. Numerical integration: Trapezoidal and Simpson's rules. Newton-Cotes integration formulas, Romberg integration, Gaussian quadrature.

Unit IV 08

Numerical solution of O.D.E.: Taylor series method, Euler's method, Runge Kutta method.
Multistep method: Milne,s method, Adams method, accuracy, convergence criteria, stiffness.

Unit V 08

Boundary Value problems: Finte difference method, solving eigenvalue problems, polynomial method and power method.
Numerical solution of Partial Differential equations. Elliptic, Parabolic and hyperbolic PDEs.

Text Books :
1. Jain, Iyengar and Jain, Numerical Methods for Scientific and Engineering Computation (2003), New Age International, New Delhi.
2. Grewal B.S., Numerical Methods in Engineering and Science, Khanna Publishers, Delhi.
3. E.Balagurusamy, Numerical Methods, Tata Mc Graw 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 Method, S Chand & Company Ltd., New Delhi (1999)
4. Balaguruswanmy, E. Numerical Methods. Tata Mc Graw Hilll Publishing Co. Limited, New Delhi (2001)

CE – 401
Hydraulics and Hydraulic Machines

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Unit - I   08
Introduction: Difference between open channel flow and pipe flow, channel geometry, hydraulic parameters of various shapes of channels, types of open channel flow, velocity and pressure distribution, mass, energy and momentum conservation principles for prismatic and non-prismatic channels, continuity equation for steady and unsteady flow.
Energy-Depth Relations: Concept of specific energy, specific force, critical flow and its computation, flow in vertical and horizontal channel transitions.

Unit – II   08
Uniform Flow: Characteristics of uniform flow, Manning's and Chezy's formula, normal depth, normal, critical and limit slopes, equivalent roughness coefficient, flow in compound sections, hydraulically efficient channel sections, flow in circular channels.

Unit – III   08
Gradually Varied Flow: Dynamic equation of gradually varied flow and its limitations, classification and analysis of flow profiles, control sections, transitional depth.
Computation of GVF Profile: Integration of varied flow equation by analytical, graphical and advanced numerical methods, flow profiles in dividing and combining channels, role of end conditions.
Spatially Varied Flow: Differential SVF equations for increasing and decreasing discharge conditions.

Unit – IV   08
Rapidly Varied Flow: Types of RVFs, hydraulic jump, types of jump, characteristics of jump in rectangular and non-rectangular channels on horizontal and sloping beds, length and location of jump, jump as an energy dissipator.
RVF Measurement: Flow in sharp crested, narrow crested and broad crested weirs, critical depth flumes, sluice gates, end depth in a free overfall.
Centrifugal Pumps: Difference between centrifugal and reciprocating pumps, classification of centrifugal pumps on the basis of various parameters, priming of a centrifugal pump, fundamental equation of a centrifugal pump, types of heads and efficiencies, cavitation in pumps, characteristic curves.

Unit – V   08
Turbines: Layout of a hydroelectric plant, classification of turbines on the basis of various parameters, important terms used, Surge Tanks.
Power produced by an impulse turbine and efficiencies.
Velocity triangle and work done for pelton wheel.
Reaction turbines classification and expression for work done.
Propeller and Kaplan turbines.

Performance of turbines, similarity laws and specific speed, characteristic curves,

Rapidly Varied Unsteady Flow: Celerity of wave, types of surges, analysis of positive and negative surges in a rectangular channel.

Text Books :
1. Subramanya,K, 'Flow through Open Channels', Tata McGraw Hill.
2. Ojha, C.S.P., Berndtsson, R., Chandramouli, P.N. 'Fluid Mechanics and Machinery', Oxford University Press.
3. RangaRaju, K.G., Flow through open channels, T.M.H.

Reference Books :
4. Srivastava, R , 'Flow through Open Channels' , Oxford University Press.
5. V.T. Chow: "Open-channel hydraulics." McGraw Hill .Publications
6. H. Chaudhury: "Open channel flow".
7. Henderson, "Open channel flow".

CE-402
ENGINEERING GEOLOGY

L T P
3 0 0

UNIT – 1 08

Introduction, Importance of Geology in Civil Engineering.

Minerals: Their physical properties and detailed study of certain rock forming & common economic minerals.

Rocks: Their origin, structure, texture and classification & properties of igneous, sedimentary and metamorphic rocks and their suitability as Engineering Materials.

Stratification, Lamination and bedding. Outcrop-its relation to topography, dip and strike of bed, overlap, outlier and inlier, profile.

Engineering classification of Rocks: Deere & miller classification, Rock mass, Rock quality designation, Rock mass rating, Rock mass quality & applications in Civil engineering projects. Hock & Brown criterion

UNIT – 2 10

Rock deformation: Folds, Faults, joints, unconformity and their classification, causes and relation to Civil engineering. Behavior of rock masses & effects on outcrop.

Plate Tectonics & Continental drift. Earthquake, its causes, classification, Intensity & Magnitude.

seismic zones of India, Geological consideration for construction of building and projects in seismic areas.

UNIT – 3 07

Landslides, its causes, classification and preventive measures. Settlement & subsidence.

Underground water, sources, Aquifers, Aquiclude, Artesian Wells, Underground water provinces of India and its role as geological hazard.

Building Stones, Engineering. properties of rocks, Alkali aggregate reaction, Grouting, Puzzolonic materials, Fly ash.

UNIT – 4 08

Geological investigations for site selection of Dams and reservoirs, tunnels, bridges and roads in hilly areas.

Principles of Geophysical explorations methods for subsurface Investigation.

UNIT – 5 07

Brief description of Physiographic & stratigraphic subdivision of India. Archaean group, Cuddapah system, Vindhyan system, Gondwana system, Deccantraps, Siwalik hills.

Text Books:
1. Prabin Singh: Engineering And General Geology, Katson Publishing House, Ludhiana
2. D.S. Arora: Geology for Engineers, Mohindra Capital Publishers, Chandigarh.
3. P. K. Mukerjee: A Text Book of Geology, The World Press pvt. Ltd., Calcutta.

Reference Books:
4. Krynine and Judd: Principles of Engineering Geology, McGraw Hill book Co., New York.
5. S. K. Garg: Physical & Engineering Geology, Khanna Pub., Delhi.
6. K V G K Gokhale: Text Book of Engineering Geology, B.S. Publication.
7. Blyth F.G.M.: A Geology for Engineers, Edward Arnold, Great Britain
8. F. G. Bell: Fundamentals of Engineering Geology, Butterwoths Pub., London.
9. Legget, R.F.: Geology and Engineering, McGraw Hill, New York
10. B.S. Sathya Narayanaswami, "Engineering Geology", Dhanpat Rai & Co.

CE - 403
GEO-INFORMATICS

L T P
3 0 0

UNIT-I 09
Photogrammetric Survey, basic principles, elevation of a point, determination of focal length of lens, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, scale of a tilted photograph, tilt distortion, relief displacement of a tilted photograph, combined effects of tilt and relief, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope parallax, parallax in aerial stereoscopic views, parallax equations. Photogrammetry – analog, analytical and digital photogrammetry.

UNIT-II 08
Remote Sensing, Introduction, concepts and physical basis of Remote Sensing, Electromagnetic spectrum, radiation laws, atmospheric effects, image characteristics. Remote sensing systems; sources of remote sensing information, spectral quantities spectral signatures and characteristics spectral reflectance curves for rocks, soil, vegetation and water. Introduction to Aerial and space borne platforms. Optical, thermal and microwave sensors and their resolution, salient features of some of operating Remote Sensing satellites.

UNIT-III 08
Digital image processing: introduction, image rectification and restoration, image enhancement, image transformation, manipulation, image classification, fusion. Applications of remote sensing to civil engineering.

UNIT-IV 08
GIS system: Definition terminology and data types, basic components of GIS software, data models, data acquisition, both raster based and vector based data input and data processing and management including topology, overlaying and integration and finally data product and report generation. GIS applications in civil engineering.

UNIT-V 07
Global Navigation Satellite System (GNSS), GLONASS, GALILEO and GPS : Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications.

Text Books:
1. Sateesh Gopi, R Sath Kumar & N Madhu "Advance Surveying GIS & Remote Sensing" Pearson Education.
2. BC Punamia: Higher Surveying Laxmi Publication
3. B. Bhatta: Remote Sensing & GIS TMH.
4. G.S. Srivastava "An Introduction to Geo informatics" TMH.

References Books:
5. Kang Tshung Chang "Introduction of Geographic Information Systems" TMH.
6. Campbell, "Introduction to Remote Sensing" 3/e, CRC Press Taylor & Francis Group.
7. Chen, "Signal and Image Processing for Remote Sensing" CRC Press Taylor & Francis Group.

8. AM Chandra: Higher Surveying Narosa Pub.
9. TM Lillesand et al: Remote Sensing and Image Interpretation
10. R. Agor, " Advanced Surveying" Khanna Publishers.
11. M Anjireddy: Remote Sensing & GIS, BS Publications
12. Narayan Panigrahi "Geographical Information Science" Universities Press.
13. N.K. Agarwal: Essentials of GPS, Spatial Networks: Hyderabad
14. George Joseph " Fundamental of Remote Sensing" Universities Press.
15. Ahmed EI Rabbany, "Introduction to GPS the Global Positioning System" Artech House, Boston.
16. Chor Pang Lo, "Concepts & Techniques of Geographic Information Systems"2/e Pearson Education.

CE - 404
STRUCTURAL ANALYSIS - I

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UNIT-I   08

Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom, Static and Kinematic Indeterminacy for beams, trusses and building frames. Analysis of cables with concentrated and continuous loadings, Effect of Temperature upon length of cable.

UNIT-II   08

Classification of Pin Jointed determinate trusses, Analysis of determinate plane trusses (compound and complex). Method of Substitution, Method of tension coefficient for analysis of plane trusses.

UNIT-III   08

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's theorems, Calculations of deflections: Strain Energy Method, Unit load method & for statically determinate beams, frames and trusses. Deflection of determinate beams by Conjugate beam method.

UNIT-IV   09

Rolling loads and influence line diagrams for determinate beams and trusses, Absolute maximum bending moment and shear force. Muller-Breslau's principal & its applications for determinate structures.

UNIT-V   07

Arches, Types of Arches, Analysis of three hinged parabolic and circular Arches. Linear arch, Eddy's theorem, spandrel braced arch, moving load & influence lines for three hinged parabolic arch.

Text Books:
1. T S Thandavmorthy, "Analysis of Structures", Oxford University Press 5. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
2. Reddy, CS, "Basic Structural Analysis", Tata McGraw Hill.
3. Jain, OP and Jain, BK, " Theory & Analysis of Structures", Khanna Publishers
4. S Ramamurtham "Theory of Structure" Dhanpat Rai

References Books:
5. Hibbler, "Structural Analysis" , Pearson Education
6. Mau, "Introduction to Structural Analysis" CRC Press Taylor & Francis Group.
7. Ghali, "Structural Analysis: A Unified Classical and Matrix Approach" 5/e, CRC Press Taylor & Francis Group.
8. Temoshenko & Young "Theory of Structure" Tata McGraw Hill.
9. Vazirani & Ratwani et al, "Theory & Analysis of Structures", Khanna Publishers
10. Coates, RC, Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980
11. SP Gupta & Gupta "Theory of Structure Vol.1 &2" TMH
12. DS Prakash Rao "Structural Analysis: A Unified Approach" Universities Press
13. Devdas Menon Ädvance Structural Analysis", Narosa
14. Wang, CK, "Intermediate Structural Analysis", Tata McGraw Hill.
15. Hsieh, "Elementary Theory of Structures" 4/e Pearson Education, Noida.
16. Mckenzie, " Examples in Structural Analysis" 2/e CRC Press Taylor & Francis Group.

CE – 451
Hydraulics and Hydraulic Machines Lab.

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Note :- At least **ten** experiments are to be conducted from the following list.

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine 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.
6. To study the flow over an abrupt drop and to determine the end (brink) depth for a free over fall in an open channel
7. To study the characteristics of free hydraulic jump.
8. To study rotodynamic pumps and their characteristics
9. To study characteristics of Francis turbine.
10. To study characteristics of Kaplan turbine.
11. To study characteristics of Pelton turbine.

CE - 452
STRUCTURAL ANALYSIS LAB - I

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1. To determine Flexural Rigidity (EI) of a given beam

2. To verify Maxwell's Reciprocal theorem.

3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust and Bending moment.

4. To find horizontal thrust in a arch and to draw influence line diagrams for horizontal Thrust and bending moment.

5. To find deflection of curved members.

6. To find bar forces in a three members structural frames with pin jointed bar.

7. To find Critical load in Struts with different End conditions.

8. To find deflection in Beam having unsymmetrical bending.

CE - 453
GEO-INFORMATICS LAB

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1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.

2. Measurement of area of a land parcel using Total Station.

3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.

4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.

5. Visual Interpretation of standard FCC (False colour composite).

6. Digitization of physical features on a map/image using GIS software.

7. Coordinates measurement using GPS.

CE - 454
NUMERICAL TECHNIQUES LAB

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Note: At least 10 programs need to be conducted from section B.

Section A: Introduction to MATLAB (3 slots): Data types and variables, Operators, Flow control, Functions, Input /Output, Vectors and Matrices, M-File.

Section B:

1. WAP to print sum of even and odd numbers from 1 to N numbers.
2. Solution of linear equations for under damped and over damped.
3. Study of basic matrix operations and verify it manually.
4. Determination of Eigen values and eigenvectors of a square matrix.
5. Determination of roots of a polynomial.
6. Determination of polynomial using method of least square curve fitting.
7. Solution of differential equations using 4th order Runga - Kutta method.
8. Solution of differential equation using revised Euler method.
9. Solution of differential equations.
10. To solve a Strength of Materials problem using MATLAB.
11. To solve a Fluid Mechanics problem using MATLAB.
12. To solve a Structural Analysis problem using MATLAB.