3rd Semester

Course No.	Subject	L	T	P/D	Hours	Credit
BS-236	Differential Equations, Probability and Statistics	3	1	0	4	4
HU-232	Engineering Economics	4	0	0	4	4
CE-231	Strength of Material	3	1	0	4	4
CE-232	Fluid Mechanics	3	1	0	4	4
CE-233	Civil Engineering Materials and Building Construction	3	0	0	3	3
CE-232 (P)	Fluid Mechanics Lab	0	0	2	2	1
CE-233 (P)	Civil Engineering Material and Building Construction Lab	0	0	2	2	1
ECA-231	Extra Curricular Activity-I	0	0	2	2	1
	Total				**25**	**22**

BS - 236 DIFFERENTIAL EQUATIONS, PROBABILITY AND STATISTICS

L	T	P
3	1	0

1. **Linear differential equations**: linear differential equations with constant co-efficient, complimentary functions and particular integral, method of variation of parameters, equations reducible to linear equations with constant co-efficients (Cauchy's and Legendre's linear equations), Simultaneous linear equations with constant co-efficient, Applications of linear differential equations in simple harmonic motion, Oscillations of a spring, simple pendulum, Oscillatory electric circuits, Deflection of beams. Applications of simultaneous linear differential equations to projectiles with resistance and electric circuits.

2. **Partial differential equations**: Formation and solutions of partial differential equations, Lagrange's Linear equation of the first order, Non linear equations, Charpit's method, Homogeneous linear equations with constant co-efficients, Non-homogeneous linear equations, Non linear equations of the second order (Monge's method).

3. **Probability and statistics** : Probability, conditional probability, random variables, Expected Value, Specific discrete and continuous distributions, e.g. binomial, Poisson, geometric, Pascal, hyper geometric, Uniform, exponential and normal, Poission process, Multidimensional random variables, Multinomial and bivariate normal distributions, Moment generating function, Law of large numbers and central limit theorem, Sampling distributions, Point and interval estimation, Testing of hypothesis, goodness of fit and contingency tables, Linear regression.

Books:

1. Advanced Engineering Mathematics : Erwin Kreyszig
2. Advanced Engineering Mathematics : Crwylie and L.C. Barrett
3. Partial Differential Equations for engineers and scientists : J.N. Sharma and K Singh
4. Differential Equations : L. Shepley
5. Probability and Statistics with reliability and queuing and computer science application : K.S. Trivedi

HU - 232 **ENGINEERING ECONOMICS**

L	T	P
4	0	0

1. **Basic economic concepts:** Stock and Flow, Static and Dynamic economics, Micro economics and Macroeconomics, National Income concepts.

2. **Market demand** : Demand, meaning and types, Law of demand, exceptions to the law of demand, Elasticity of Demand, Methods of measuring elasticity of demand, Marginal utility Analysis.

3. **Production analysis**: Production functions, law of returns, least cost combination, cost and cost curves, choice of plant size in the long run.

4. **Supply:** Law of supply, elasticity of supply.

5. **Cost concepts and estimation**: Cost elements, economic vs. accounting concepts of costs and Revenues, Standard Cost, Actual Cost, Over head Cost, Cost control, Break-Even-Analysis.

6. **Economic appraisal techniques**: Long- Range and Short range Budgeting, Criteria for Project Appraisal, Social benefit-cost analysis, Depreciation: concepts and Techniques.

7. **Monetary System:** Money and its functions, Functions of the Commercial Bank and Central Bank, Monetary Policy.

8. **Inflation and business cycles**: Causes, effects and methods to Control Inflation, Concepts of Business Cycles.

9. **Accounting**: Book keeping single and double entry system, Journal and ledger, Trading account, Profit and loss account, Balance sheet.

Books:

1. A Text Book of Economic Theory : Stonier and Hauge.
2. Modern Economic Theory : K.K.Dewett
3. Engineering Economics : Degramo.
4. A Text Book of Economic Theory : Sammuelson.
5. International Economics : Bo Sodersten
6. Principles of Macroeconomics : Rangarajan and Dholakia.
7. Monetary Economics : Suraj B. Gupta
8. Cost Accounting : Jawahar Lal
9. Project Planning Analysis, Selection Implementation and Review : Prasanna Chandra

CE – 231 **STRENGTH OF MATERIAL**

L	T	P
3	1	0

1. **Introduction**: Elasticity, Plasticity, Ductility, Brittleness, Strength, etc.

2. **Simple stresses and strains**: Types of stresses and strains, stress strain diagram, Hookes law, Principle of superposition, bars of varying section of different materials, compound bars, temperature stresses etc.

3. **Elastic Constants**: Modulus of elasticity, Poison's Ratio, Modulus of Rigidity and bulk modulus, and their relationships.

4. **Principal Stresses**: Stresses induced due to uniaxial stress, stresses induced by state of simple shear, stresses induced due to biaxial stress, Mohr Circle, Ellipse of stress, principal stresses and principal planes, maximum shear stresses, Principal strains. Theory of Failures.

5. **Strains Energy, Resilience and Impact loading**: Load deflection diagram: Strain energy of prismatic bars with varying section, for non-prismatic bars with stresses under gradual, sudden and impact loadings, shear resilience, Relation between Elastic moduli and strain energy.

6. **Shear Force and Bending Moment**: Types of structures, loading, supporting conditions, structural actions, equation of equilibrium, SFD and BMD under different loads for determinate beams, frames and arches.

7. **Stresses of Beam**: Theory of simple bending, Distribution of bending stresses, distribution of shear stresses.

8. **Columns and Struts**: Concept of structural stability, analysis of long and short columns by Euler's, Rankine's and Secant formulae, analysis of eccentrically and laterally loaded columns.

Books:

1. Strength of materials : R.C. Hibbler
2. Strength of materials : B.C. Punmia, AK Jain
3. Strength of materials and Mechanism of structures : R.S. Lehri
4. Strength of materials : Timoshenko and Young.

CE - 232 **FLUID MECHANICS**

L	T	P
3	1	0

1. **Fluid statics**: Basic equations, pressure and its relationship with height, pressure diagram, hydrostatic forces on submerged bodies, buoyancy and floatation, liquids in relative equilibrium.

2. **Fluid kinematics**: Flow characteristics, continuity equation, acceleration of fluid particles, rotational and irrotational motion, circulation and vorticity, velocity potential and stream function, streamlines, equipotential lines, flow net - method, use and limitations.

3. **Fluid dynamics**: Euler's equation, energy equation and Bernoulli's equation, application of Bernoulli's equation-orifice meter, venture meter, pivot tube etc., flow through orifice, mouth piece, weir and notches, impulse momentum equation and its application, pipe junction, bends, stationary flat and curved vanes, moment of momentum equation.

4. **Flow through pipes**: Reynolds' experiment, laws of fluid friction, Darcy-Weisbach equation, energy losses, equivalent pipe, pipes in series and parallel, branched pipes, time of emptying a reservoir through pipe, pipe networks.

5. **Laminar flow**: Laminar flow through circular pipes, parallel plates, open channel, Porous media, couette flow, Stokes law, measurement of viscosity, transition from laminar to turbulent flow.

6. **Dimensional analysis and similitude**: Dimensional homogeneity, Non Diomensional parameter, ∏ theorem, dimensional analysis-chice of variables, Reyleigh methods, examples-Rise in capillary tube, head characteristics of a pump, drag on a ship, Fall velocity of a sphere, velocity in an open channel, pipe orifice, discharge over a sharpedge weir, celerity of a gravity wave. Model analysis-similitude, types of similarities, force ratios, similarity laws, model classification, scale effects.

7. **Boundary layer theory**: Types, boundary layer thickness and equations, momentum integral equation boundary layer on rough surfaces, total drag on flat plate due to laminar and turbulent boundary layer, boundary layer separation and its control.

8. **Turbulent flow:** Shear stresses, establishment of flow, types of boundaries, mixing length concept, velocity distribution, mean velocity and resistance to flow in smooth and rough pipes, friction in non-circular conduits.

9. **Flow measurement**: Measurement of pressure-static, dynamic and total pressure, Piezometric head, Measurement of velocity-Pitot tube and prandtll tube. Measure flow through orifice, mouth piece, weir and notches, measurement of discharge-orifice, mouthpiece weir and notches, orifice meter, Flow nozzle, Venturi flume.

10. **Flow through open channels**: Classification of flow, Uniform flow, Prismatic and non prismatic channel, Hydraulically efficient channel cross sections, specific energy, specific energy curves, critical flow in rectangular channels.

Books:

1. Fluid Mechanics and Fluid Power Engineering : Dr R.S.Kumar
2. Hydraulics and Fluid Mechanics : P.N.Modi and S.M.Seth
3. Fluid Mechanics : R.J.Garde and A.G.Mirajgaoker
4. Experimental Fluid Mechanics : G.L.Asawa

CE-233 CIVIL ENGINEERING MATERIALS AND BUILDING CONSTRUCTION

L	T	P
3	0	0

1. **Building materials**:

Stones: Classification, requirements of good materials, Querying of stones, common building stones.

Bricks: Classification of bricks-constituent of a good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks.

Tiles, Terra - cotta: Manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra cotta.

Lime: Classification, manufactures of lime, artificial hydraulic lime, pozzuolana, field-testing of lime.

Cements: Composition, manufactures of Portland cement, field-testing of cement, special types of cements, storage of cement.

Steel: Types of steel, marketable forms, stress- strain behaviour.

Cement concrete: Various constituents, preparation and properties of concrete in fresh state, factors affecting workability, durability and strength, characteristic strength, stress- strain behaviour, acceptance criteria, mix- design and physical tests.

Timber: Classification of timber, structure of timber, seasoning of timber, defects in timber, important Indian timbers.

Paints and varnishes: Constituents of paints, types of paints, types, constituents and characteristics of varnishes, miscellaneous.

Introduction to polymers: Polymetric materials, PVC, Polyester, HDPE, CDPE etc. Classification, properties and applications in civil engineering.

2. **Building Construction**:

Brick and stone masonry: Various terms used, types, tools used, bonds in brick work, dressing of stones, applications for lifting stones.

Partition and cavity walls: Types of non bearing partition- brick partitions, clay block partitions, timber partitions and glass partitions, construction of a masonry cavity walls.

Damp prevention: Sources of dampness, effects of dampness, prevention of dampness, materials used in damp proofing course.

Roofs: Types, terms used in sloping roof, king post truss, queen post truss, simple steel roof trusses.

Floors: Components of floor, brick floors, cement concrete floors, terrazzo flooring, mosaic floorings, tiled flooring.

Doors and Windows: Locations, sizes general types of door movement, various types of doors and windows.

Books:

a) Building materials:

1. Properties of concrete : A.M. Neville
2. Engineering Materials : Surinder Singh
3. Civil Engineering Materials : Kulkarni et.el.
4. Relevant I.S. Codes

b) Building construction:

1. Building Construction : B.C. Punmia
2. Building Construction : Sharma and Kaul
3. Building Drawing : Shah Kale and Patki

CE – 232(P) **FLUID MECHANICS LAB**

L	T	P
0	0	2

List of experiments:

1. To determine the metacentric height of a ship model
2. Verification of Bernoulli's theorem
3. To calibrate a venturimeter and to determine its coefficient of discharge
4. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number
5. To study the flow over v notch (weir) and to find the coefficient of discharge
6. To determine the hydraulic coefficient of discharge of a mouth piece.
7. To verify the momentum equation experimentally
8. To determine the coefficient of friction of pipes of different diameters.
9. To determine the form losses in a pipe line
10. To obtain the surface profile on the total heads distribution of a forced vortex
11. Viscous flow analogy (Hele-Shaw apparatus) for flow net.
12. Electrical analogy for flow net.
13. Study of flow measurement devices through rotameter apparatus

CE-233(P) CIVIL ENGINEERING MATERIALS AND BUILDING CONSTRUCTION LAB

L	T	P
0	0	2

List of experiments:

1. To determine the fineness of cement using (i) dry blank sieving (ii) blaine's air permeability method.

2. To determine the standard consistency, initial and final setting time of cement sample using Vicat's apparatus.

3. To determine the soundness of given sample of cement and lime by

   (i) Le-Chatelier test, (ii) autoclave test.

4. To determine the compressive strength of cement sample.

5. To determine the specific gravity and water absorption of coarse aggregate.

6. To determine the fineness modulus and particle size distribution of coarse, fine, and all in aggregates.

7. To determine the percentage bulking of a fine aggregate sample.

8. To determine the consistency of freshly mixed concrete of given proportion by slump test.

9. To determine the workability of freshly mixed concrete of given proportion by compaction factor test.

10. To determine the cube strength and cylinder strength of concrete of given proportion and given water cement ratio.

11. To determine the water absorption and porosity of given stone sample.

12. To determine the compressive strength of a stone sample.

13. To determine the water absorption of burnt clay bricks.

14. To assess the liability of blank burnt clay to efflorescence.

15. To determine the compressive strength of burnt clay bricks.

4th Semester

Course No.	Subject	L	T	P/D	Hours	Credit
TA-243	Numerical Analysis	3	1	0	4	4
CE-241	Theory of Structure	4	1	0	5	5
CE-242	Soil Mechanics	3	1	0	4	4
CE-243	Surveying	3	1	0	4	4
CE-244	Engineering Geology	3	0	0	3	3
CE-242 (P)	Soil Mechanics Lab	0	0	2	2	1
CE-243 (P)	Surveying Lab	0	0	3	3	2
ECA-242	Extra Curricular Activity-II	0	0	2	2	1
	Total				**27**	**24**

- Survey camp of 3 to 4 weeks duration after 4th Semester

TA - 243 **NUMERICAL ANALYSIS**

L	T	P
3	1	0

1. N**umerical computations and errors analysis** : Introduction, Numbers and their accuracy, Floating point arithmetic, errors in numbers, Computational methods for error estimation, General error formulae-approximation of a function, series approximations and error propagation in computation.

2. **Algebraic and transcendental equations:** Revision of some basic concepts on polynomial equations, Bisection method, iterative method, Regula-falsi method, Newton-Raphson method, Secant method, Generalized Newton's method for multiple roots, solution of non-linear simultaneous equations and finding complex roots by Newton-Raphson method.

3. **System of simultaneous algebraic equations**: Revision of basic properties of matrices and determinants, Matrix inversion and solution of transcendental and system of algebraic equations-Gauss elimination method, Jacobi's method and Gauss-Seidal method, Eigen values and eigen vectors-Power method, Jacobi's method and Householder method.

4. **Interpolation and function approximations**: Least square curve fit and trigonometric approximations, Approximations by trigonometric polynomials and quality of approximations, Finite differences and difference operators, Newtons interpolation formulae, Gauss forward and backward formulae, Sterling, Bessel's and Evertte's formulae, Interpolation with unevenly spaced data points-Lagrange's interpolation.

5. N**umerical differentiation and integration**: Numerical differentiation, errors in numerical differentiation, Maximum and minimum values of a tabulated function, Numerical integration-Trapezoidal, Simpson's 1/3 and 3/8 rules, Boole's and Weddle's rules, Romberg integration-recursive formulae, Evaluation of double integrals by Trapezoidal and Simpson's rules.

6. **Ordinary differential equations**: Taylor's series method, Picard's method, Euler's method, Modified Euler's method, Runge- Kutta methods of 2^{nd} and 4^{th} order, Adams- Moltan and Miline methods, Solution of simultaneous and higher order equations.

Books :

1. Numerical Methods for Engineers and Scientists : J.N. Sharma
2. Numerical Analysis : F. B. Hildbrand
3. Numerical Method for Engineers and Scientists : M. K. Jain, S.R.K. Lyngar and R. K. Jain
4. Introductory Methods of Numerical Analysis : S.S. Sastry

CE-241 **THEORY OF STRUCTURES**

L	T	P
4	1	0

1. **Introduction**: Classification of structures, equations of equilibrium, stability, static and kinematics indeterminacies, principle of superposition.

2. **Slopes and deflections in determinate beams and frames**: Double integration, Macaulay's moment area and conjugate beam methods, deflection from strain energy, Castigliano's theorem and its applications, unit load method, deflection of pin-jointed frames, Maxwell's reciprocal theorem.

3. **Moving loads and influence lines**: Analysis of statically determinate structures subjected to moving loads, calculation of maximum and absolute maximum B.M. and S.F., Influence line Diagram for reaction, S.F. and B.M. in beams trusses and 3-hinged arches.

4. **Analysis of indeterminate beams and frames**: Force and displacement approaches in analysis of indeterminate structures, Method of consistent deformation, principle of minimum strain energy, slope deflection method, moment distribution method, Muller-Breslau Principle and analysis of indeterminate pin jointed frames.

5. **Plastic analysis**: Introduction, plastic hinge concept, plastic modulus, shape factor, upper and lower hound theorems, collapse mechanisms, combined mechanism, plastic analysis of beams and portal frames by equilibrium and mechanism methods.

Books :

1.	Basic Structural Analysis	: C.S.Reddy
2.	Indeterminate Structural Analysis	: C.K.Wang
3.	Elementary structural analysis	: J.B.Willbur, C.H. Norris and Utku
4.	Plastic methods of Structural analysis	: B.G. Neal
5.	Theory of Structures	: B.C.Punmia, Ashok Jain, Arun Jain

CE-242 **SOIL MECHANICS**

L	T	P
3	1	0

1. **Introduction**: Definition of soil, rock, soil mechanics and foundation engineering, soil formation, soil structure, soil map of India.

2. **Soil properties**: Basic definitions, phase diagram, water content, specific gravity, void ratio, porosity, unit weight, weight volume relationships, index properties of soil and their determination, classification of soils, degree of saturation, density index.

3. **Permeability and seepage** : Darcy's law and its validity, seepage velocity, discharge velocity, constant and variable head permea-meter, pumping in and out tests, permeability of stratified soils, factors affecting permeability, Laplace's equation, flow potential flow net and its properties, different methods of drawing flownets, seepage pressure, quick sand, exit gradient, piping, design of filter, principle of total and effective stresses, capillarity conditions in soil, effective and pore pressures.

4. **Stresses in soils**: Need for finding stress distribution in soil, assumptions in elastic theories, Boussinesq's equation for point, line, circular and rectangular loads, Westergaad's formula for point load, comparison of Boussinesq's and Westergaard's equation, concept and use of pressure bulbs, principle and use of New mark's influence chart, contact pressure.

5. **Compaction:** Mechanism of compaction, objective of compaction, measurement of compaction, factors affecting compaction, optimum moisture content, Standarad Proctor test, Modified Proctor test, effect of moisture content and compactive effort on dry density, zero air void curve, compaction of cohesionless soils, field compaction, field control of compaction.

6. **Consolidation**: Mechanism of consolidation, e-log (p) curves, basic definitions, estimation of preconsolidation pressure, normally consolidation and over consolidation ratio, Terzaghi's theory of one dimensional consolidation, assumptions, governing equation, standard solution, laboratory determination of consolidation properties of soil, magnitude and rate of consolidation, settlements, secondary consolidation, compression characteristics of clays and settlement analysis.

7. **Shear strength** : Normal, shear and principal stresses, Columb's equation, Mohr's stress circle, Mohr-Columb failure criteria, laboratory determination of shear parameters of soil by direct shear tests, triaxial test, unconfined compression test, Vane shear test, Consolidated drained, consolidated undrained and unconsolidated undrained shear test, pore pressure parameters, Lambe's p-q diagram.

Books :

1. Geotechnical Engineering : S.K.Ghulati and Manoj Dutta
2. Geotechnical Engineering : C. Venkatramaiah

CE-243 **SURVEYING**

L	T	P
3	1	0

1. **Introduction to Chain and Compass Surveying**: Introduction, Definition of surveying, primary divisions of surveying, object and classification of surveying, principles of surveying, approximate methods of chine and tape surveying, unfolding and folding of a chain, instruments for chaining and taping, measurement by tape and chain, errors in tape measurements and their corrections, testing and adjusting of a chain, chaining on flat and sloping ground, obstacle in chaining, direct and indirect methods of ranging, methods of traversing, principle basic definitions, bearings and meridians, prismatic compass, surveyors compass, azimuthal and quadrantal bearing systems, true north and magnetic north, magnetic declination, local attraction and its correction.

2. **Leveling and contouring:** Definition of terms, principles of leveling, types of levels, leveling staffs, booking and reduction in field book, balancing of sights, errors curvature and refraction, distance of visible horizon, reciprocal leveling, and its merits, contour, contour interval, horizontal equivalent, contour gradient, factors affecting contour interval, characteristics of contours, direct and indirect methods of contouring, uses of contour maps.

3. **Theodolite**: Vernier and microscopic theodolite, construction, temporary and permanent adjustments, measurements of horizontal and vertical angles, methods of repetitions and reiteration, sources of errors, checks in traversing, omitted measurements.

4. **Plane table surveying:** Principles, merits and demerits, instruments and other accessories, methods used, radiation, traversing, resection, intersection and their uses, two and three point problem.

5. **Tacheometry:** General principles of stadia system, fixed and movable hair methods, inclined sights with staff vertical, inclined sight with staff normal to the line of sight, determination of tacheometric constants, analytic lens, field work and seconds, tangential system.

6. **Curves:** Types of curves, elements of curve, different methods of setting out-simple circular curves, compound curves, reverse curves, transition curves, types of transition curves, super-elevation, suitability of a circular curve, vertical curves.

7. **Introduction to Modern Survey Instruments.**

Books:

1. Surveying - I : K. R. Arora
2. Surveying Volume – I and II : B. C. Punmia
3. Advance Surveying : R. Agor

CE-244 **ENGINEERING GEOLOGY**

L	P	T
3	0	0

1. **General Geology**: Branches and scope of geology, Earth, its position in the solar systems, surface features and internal structure, work of natural agencies like lakes, oceans, atmosphere, wind, streams, sea, glacier, Earth movements. Types of weathering, mountains and mountain building.

2. **Mineralogy:** Definition of crystal and a mineral, the study of the physical properties and occurrence of quartz, Feldspar, Mica, kyanite, calcite, tale, corundum, gypsum, fluorite, biotite, mus, covite, graphite, realgar, magnetite, limonite, pyrite, galena, barite, dolomite, garnet, tourmaline, chal-copy-rite, opal, topaz, autite, hornblende, epidate, kaolinite, diamond.

3. **Petrology:** Formation and classification of rocks into three types, Igneous, sedimentary and metamorphic rocks, description of physical properties for constructional purposes of granite, pegmatite, dolerite, gabbzo, basalt, sandstone, conglomerate, breccia, limestone, shale, schist, marble, quartzite, khondalite, slate, gneiss, andesite, stratigraphy of India (a general idea), principles of correlation, fossils, their preservation and significance.

4. **Structural geology**: Strike and dip, out crops, volcanoes, overlaps, inliers and outliers, types classification of folds, faults, joints, unconformities.

5. **Engineering Geology**: Ground water, zones of ground water, water table and perched water table, water bearing properties of rocks, occurrence of ground water, springs, selection of a site for well sinking and ground water investigations.

6. **Earthquakes and landslides**: Classification, causes and effects of earthquakes and land slides, seismic curve, seismographs, seismograms, accelograms, seismic problems of India, seismic zones of India, remedial measures to prevent damage for engineering structures, case histories.

7. **Geological investigation:** Interpretation of geological maps, use of aerial maps in geological surveying, geophysical methods as applied to civil engineering for subsurface analysis (Electrical and Seismic methods).

8. **Geology of dams and reservoirs:** Types of dams, requirements of dam site, preliminary and detailed geological investigations for a dam site, important international and Indian examples of failures of dams and their causes, factors affecting the seepage and leakage of the reservoirs and the remedial measures, silting of reservoirs.

9. **Rock mechanics and tunneling:** Purposes of tunneling and geological problems connected with tunneling, geological considerations in road alignment, roads in complicated regions, problems after road construction, geology of bridge sites.

Books:

1.	Engineering Geology	: Parbin Singh
2.	Engineering Geology	: P.K. Mukherjee
3.	Mineralogy	: Dana
4.	Structural Geology	: H.P. Billings

CE-242(P) **SOIL MECHANICS LAB**

L	T	P
0	0	2

List of experiments:

1. Determination of water content by oven drying method
2. Determination of specific gravity by pycnometer
3. Determination of field density and dry unit weight by core cutter method
4. Determination of field density by sand replacement method
5. Determination of grain size distribution by sieve analysis
6. Determination of grain size distribution by hydrometer analysis
7. Determination of liquid limit of soil
8. Determination of plastic limit of soil
9. Determination of compaction properties of soil by standard proctor test
10. Determination of shear parameters of soil by direct shear method

CE-243(P) **SURVEYING LAB**

L	T	P
0	0	3

List of experiments:

1. Ranging and chaining of a line AB and taking offsets.
2. Traversing with compass and error adjustment to local attraction.
3. To determine the difference in elevation of two given points.
4. Profile levelling and cross sectioning of a given route.
5. To measure the horizontal angle by the method of reiteration and repetition.
6. Theodolite traversing.
7. To prepare the contour map of an area by the method of radial lines.
8. Plane tabling by the method of radiation and intersection.
9. To point problem in plane tabling.
10. Three point problem by mechanical method.
11. Setting out of simple circular curve by offsets from long chord
12. Setting out of simple circular curve by successive bisection.
13. Setting out of simple circular curve by radial and perpendicular offsets.
14. Setting out of simple circular curve by chord produced.
15. Setting out of simple circular curve by one theodolite method.
16. Setting out of simple circular curve by two theodolite method.
17. Setting out of compound curve.
18. Setting out of transition curve.
19. Techometric constant.
20. Use of total station.