Mohan Lal Sukhadia University
Udaipur

B. Tech. Program
(Effective from session 2021-2022)

Civil Engineering

Semesters III

Syllabus

BT3CE01-CT01: ADVANCE ENGINEERING MATHEMATICS-I

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hrs.
1	**Numerical Methods – 1:** Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	8
2	**Numerical Methods – 2:** Numerical solution of ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method.	8
3	**Laplace Transform:** Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method.	8
4	**Fourier Transform:** Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem, application of Fourier transforms to partial ordinary differential equation (One dimensional heat and wave equations only).	8
5	**Z-Transform:** Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation.	8
	Total	40

BT3CE02-CT02: TECHNICAL COMMUNICATION

Credit: 2 **Max. Marks: 100 (IA: 20, ETE: 80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hours
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	5
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	5
3	**Technical Writing, -** Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking,	5
4	**Grammar and Editing** Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	5
5	**Advanced Technical Writing-**Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	5
	Total	**25**

BT3CE03-CT03: ENGINEERING MECHANICS

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENT	Hrs.
1	**Introduction: objective, scope and outcome of the course.** **Statics of particles and rigid bodies:** Fundamental laws of mechanics, Principle of transmissibility, System of forces (conservative and non- conservative), Resultant force, Resolution of force, Moment and Couples, Resolution of a force into a force and a couple, Free body diagram, Equilibrium, Conditions for equilibrium, Lami's theorem.	6
2	**Plane trusses:** Types of structures, Trusses, Support Conditions, Types of Loadings, Classification of trusses, Determinacy of trusses, Basic assumptions of truss analysis (zero force member, tension or compression member), Method of joints, Method of sections. **Simple Stresses and Strains:** Concept of stress and strain in three dimensions and generalized Hooke's law; Young's modulus, Shear stress, Shear strain, Modulus of rigidity, Complementary shear stress; Poisson's ratio, Volumetric strain, Bulk modulus, relation between elastic constants, Stress and strain thin cylinder and spherical cell under internal pressure.	6
3	**Friction:** Types of Friction, Laws of friction, Angle of friction, Angle of repose, Ladder, Wedge, Belt Friction. **Springs**: Stiffness of springs, springs in series and parallel, Introduction to laminated plate springs, leaf spring, close coiled helical springs, open coiled springs.	6
4	**Centroid & Moment of inertia (M.I.):** Location of centroid, Moment of inertia (mass and area), Parallel axis and perpendicular axis theorems, M.I of composite section, M.I. of solid bodies, Polar moment of inertia, principle axis and principle moment of inertia.	6
5	**Virtual work:** Principle of Virtual Work, Active forces and active force diagram, Stability of equilibrium. **Work, Energy and Power:** Work of a force, weight and couple, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy, Conservation of energy.	6
	TOTAL	30

BT3CE04-CT04: SURVEYING

Credit: 3 **Max. Marks: 150 (IA: 30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hrs.
1	**LINEAR AND ANGULAR MEASUREMENTS** Method of linear measurements, Correction to length measured with a chain/tape, Ranging a survey line; direct and indirect Angular measurement by compass, Designation of bearing, Traversing with tape and compass, Correction to measured bearing, Angular measurement by theodolite; Temporary adjustments, Method of horizontal angle measurement and vertical angle, Traverse computation, plotting of traverse and determining the closing error, Balancing traverse.	**8**
2	**LEVELLING** Measurements of elevations methods of levelling; direct/differential, Indirect/Trigonometrical, and Profile/Cross sectional levelling. Digital and Auto level, Errors in levelling, contours and contour lines; methods of contouring; direct and indirect, characteristics, uses, area and vol. measurements.	**8**
3	**CURVE SURVEYING** Elements of simple and compound curves, Types of curves, Elements of circular, reverse, and transition curves. Method of setting out simple, circular, transition and reverse curves, Types of vertical curves, length of vertical curves, setting out vertical curves. Tangent corrections.	**8**
4	**TACHEOMETRY AND PHOTOGRAMMETRY SURVEYING** Advantages of tacheometric surveying, different systems of tacheometric measurements, Stadia system of tacheometry, distance elevation formulae for horizontal sights. Determination of tacheometric constants, distance and elevation formulae for inclined sights with staff vertical. Introduction to basic concepts perspective geometry of aerial photographs, relief and tilt displacements, Terrestrial Photogrammetry, flight planning	**8**
5	**SETTING OUT WORKS & MODERN FIELD SURVEY SYSTEMS** Instruments and methods for laying out buildings, setting out culverts, setting out sewer lines. Principle of E.D.M. (Electronic Distance Measurements), Modulation, Type of E.D.M., Distomat, Total station, parts of total station, advantages and application.	**8**
	TOTAL	**40**

BT3CE05-CT05: FLUID MECHANICS

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hrs.
1	**Introduction to objective, scope and outcome of the course.** **Fluids**: Definition, Type of fluids, Ideal fluids, real fluids, Newtonian and non-Newtonian fluids. **Properties of Fluids:** Units of measurement, Mass density, Specific weight, Specific volume, Specific Gravity, Viscosity, Surface tension and Capillarity, Compressibility and Elasticity.	6
2	**Principles of Fluid Statics**: Basic equations, Pascal Law, Type of pressure:- atmospheric pressure, Gauge pressure, vacuum pressure, absolute pressure, manometers, Bourdon pressure gauge. **Fluid Dynamics**: Control volume approach, Euler's equation, Bernoulli's equation and its applications, venture-meter, orificemeter, orifices & mouthpieces, time of emptying of tanks by orifices, momentum and angular momentum equations and their applications, pressure on flat plates and nozzles.	6
3	**Buoyancy**; Forces acting on immersed plane surface. Centre of pressure, forces on curved surfaces. Conditions of equilibrium for floating bodies, meta-centre and analytical determination of meta centric height.	6
4	**Kinematics of Flow**: Visualisation of flow, Types of flow: Steady and unsteady, uniform and non-uniform, rotational and irrotaional flow, Laminar and turbulent flow, streamline, path line, streak line, principle of conservation of mass, equation of continuity, acceleration of fluid particles local and convective, velocity, acceleration, velocity potential and stream function, elementary treatment of flow net, vorticity, circulation, free and forced vortex. Fluid mass subject to horizontal and vertical acceleration and uniform rotation	6
5	**Laminar Flow through Pipes**: Laminar flow through pipes, Relation between shear & pressure gradient. Flow between plates & pipes. Hagen- Poiseuille equation, Equations for velocity distribution, pressure difference velocity distribution over a flat plate and in a pipe section, Darcy-Weisbach equation, friction factor , minor losses, pipe networks.	6
	TOTAL	**30**

BT3CE06-CT06: BUILDING MATERIALS AND CONSTRUCTION

Credit: 3 **Max. Marks: 150 (IA: 30, ETE: 120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hrs.
1	**Introduction to objective, scope and outcome of the course.**	8
	Basic Civil Engineering Materials (Properties, Types and Uses): Stone: Compressive strength, Water absorption, Durability, Impact value, Tensile strength; Bricks: Water absorption, Compressive strength, Effloresces, Dimension and Tolerance; Tiles: Water absorption, Tolerance, Impact value and Glazing; Light weight concrete blocks. **Lime**: classification as per IS, properties, standard tests and uses in construction. **Fly-ash:** Properties and Use in manufacturing of bricks & cement; **Miscellaneous**: Gypsum, Plaster of Paris, PVC materials, Paints, Varnish and Distemper.	
2	**Timber & Steel:** Timber: Definitions of related terms, Classifications and Properties, Defects in Conversion of wood, Seasoning wood, Preservation, Fire proofing, Ply woods, Fibre boards; Steel: Mild steel and HYSD steel, Properties and their use, common tests on steel	8
	Mortarand Plaster: Mortar preparation methods**:** Functions and tests & their uses in various types of pointing & plastering	
	Brick and Stone Masonry: Basic principle of masonry work, different types of bonds, relative merits and demerits of English, Single Flemish and Double Flemish bond. Comparison between stone and brick masonry. General principles, classification of stone masonry and their relative merits and demerits.	
3	**Building Requirements & Construction System:** Building components, their functions and requirements. Types of construction: load bearing and framed structure construction, RCC beam, column and slab construction, Precast and In-situ construction, Relative merits and demerits. Fire resistance construction, FRC. **Ground & Upper floors:** Floor components and their functions, Floor types and Selection of flooring, construction details of ground and upper floors, merits and demerits.	7
4	**Foundation & Site Preparation:** Purpose, types of foundation: like shallow, deep, pile, raft, grillage foundation and their suitability. Depth of foundation, Sequence of construction activity and co-ordination, site clearance, layout of foundation plan.	8

	Temporary structures: Types & methods of shoring, underpinning and scaffolding.	
	Damp Proofing: Causes and Effects of dampness, Methods and materials for damp proofing, Methods and materials for anti-termite treatment. **Construction and Expansion Joints:** Requirements, Types material used, Construction details.	
5	**Arches and Lintels:** Terms used, types of arches and their construction detail, types of lintels and constructions. **Partition Wall:** Types, purpose and use of partition wall.	**8**
	Stairs: Terms used, requirements of good staircase, classification, construction details and suitability of different types of stairs, Lifts and Ramps.	
	Roof and Roof Covering: Purposes, classification of roofs, terms used. Introduction to Solid slab, Flat slab, Shell Roofs and Pitched roofs, and their constructional features. Types of pitched roofs and Trusses, typical constructional details; Roof covering materials, types and typical constructional details.	
	Total	**40**

BT3CE07-CT07: ENGINEERING GEOLOGY

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	Contents	Hrs.
1	**Introduction to objective, scope and outcome of the course.** **General Geology**: Branches and Scope of Geology, Types of Weathering & Geological work of natural agencies like River & Wind. Geological Time Scale. Physical Properties of Minerals.	6
2	**Petrology:** Formation, Texture, Structure and Classification of Igneous, Sedimentary and Metamorphic Rocks. Engineering Properties of Rocks for Building & Road Material. Laboratory and Field & in-situ Test for Site Construction.	6
3	**Structural Geology:** Causes, Terminology, Classification, Recognition, Effects and Engineering consideration of Fold, Fault, Joints and Unconformities.	6
4	**Engineering Geology:** Geophysical methods as applied to Civil Engineering for Subsurface Analysis (Electrical and Seismic methods). Terminology, Types and Geological consideration for site selection of Dam & Tunnel.	6
5	**Remote Sensing & GIS:** Application of Remote Sensing and GIS in Various fields of Civil Engineering.	6
	TOTAL	30

BT3CE08-CP01: SURVEYING LAB

Credit: 2 **Max. Marks: 100 (IA:4, ETE:60)**
0L+0T+4P

List of Experiments

1. Linear Measurement by Tape:
   a. Ranging and Fixing of Survey Station.
   b. Plotting Building Block by offset with the help of cross staff.
2. Compass Survey: Using Surveyor's and Prismatic compass
   a. Measurement of bearing of lines
   b. Adjustment of included angles of compass traverse.
3. Levelling: Using Tilting/ Dumpy/ Automatic Level
   a. To determine the reduced levels in closed circuit.
   b. To carry out profile levelling and plot longitudinal and cross sections for road.
4. Theodolite Survey: Using Vernier Theodolite
   a. To carryout temporary adjustment of Theodolite & Measurement of horizontal and vertical angle: by method of repetition and method of Reiteration.
   b. To measure and adjust the angles of a braced quadrilateral.
5. Trigonometric Levelling: To determine the Height of an object by trigonometric levelling:
   a. By using Instruments in same vertical plane.
   b. By using Instruments in different vertical planes.
6. Tacheometry Survey:
   a. To determine the tachometric constant.
   b. To determine the horizontal and vertical distance by tachometric survey.
7. To study the various electronic surveying instruments like EDM, Total Station etc.

One-week Survey Camp for topographic/ project survey/Contouring be arranged before or after Term End Exam.

BT3CE09-CP02: FLUID MECHANICS LAB

Credit: 01 **Max. Marks: 50 (IA: 20, ETE:30)**
0L+0T+2P

List of Experiments

1. To study the various pressure measuring devices
2. To verify the Bernoulli's theorem.
3. To calibrate the Venturi-meter.
4. To calibrate the Orifice-meter.
5. To determine Metacentric Height.
6. To determine C_c, C_v, C_d of an orifice.
7. To determine C_d of a mouthpiece.
8. To determine C_d of a V-notch.
9. To determine viscosity of a given fluid.
10. To study the velocity distribution in pipes.

BT3CE10-CP03: COMPUTER AIDED CIVIL ENGINEERING DRAWING

Credit: 2 **Max. Marks: 100 (IA:40, ETE:60)**
0L+0T+4P

List of Assignments

To study and draw the labelled sketch of different Building Components on sheets with exposure to CAD:

1. Drawing of walls
    a. Brick and Stone masonry
    b. Cross section of external wall from foundation to parapet
    c. Partition wall, cavity wall and
2. Pointing, Arches, Lintels and Floors
3. Doors and Windows
4. Stairs, Cross section of Dog legged stairs
5. Roofs: Flat and Pitched roof (Steel truss)
6. Development of Front Elevation and Sectional Elevation from a given plan
7. Development of Plan, Front Elevation and Sectional Elevation from line diagram

BT3CE11-CP04: CIVIL ENGINEERING MATERIALS LAB

Credit: 01 **Max. Marks: 50 (IA:20, ETE:30)**
0L+0T+2P

List of Experiments

1. To determine properties of following materials:

   A. STONE:
      a. Compressive strength,
      b. Water absorption,
      c. Impact value,
      d. Tensile strength;
   B. Bricks:
      a. Water absorption,
      b. Compressive strength,
      c. Dimension and Tolerance;
   C. Tiles:
      a. Water absorption,
      b. Tolerance,
      c. Impact value
   D. Timber: Compressive and Tensile Strength of Timber across and along the Grain

2. To Study the Properties & Utilization of Fly Ash in Construction
3. To Study the Different Aluminum and Steel Sections
4. To Study the Manufacturing and Use of Concrete Hollow Blocks
5. To Study the Properties and Uses of Kota Stone and its Slurry

BT3CE12-CP05: GEOLOGY LAB

Credit: 01 **Max. Marks: 50 (IA:20, ETE:30)**
0L+0T+2P

List of Experiments

1. Physical Properties of Minerals
2. Physical Properties of Rocks
3. Identification of Minerals in Hand Specimen
4. Identification of Rocks in Hand Specimen
5. Identification of Geological features through wooden Models
    a. Structural Geological Diagrams
    b. Petrological Diagrams
    c. Engineering Geological Diagrams
6. Interpretation of Geological Map (10 Nos.)
7. Dip & Strike Problems (8 Nos.)

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Civil Engineering

Semesters IV

Syllabus

BT4CE01-CT01: ADVANCE ENGINEERING MATHEMATICS-II

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	Fourier Series: Fourier series, even and odd functions; Half range series; Change of interval; Exponential form of Fourier series; Harmonic analysis.	6
2	Roots of Nonlinear (Algebraic and Transcendental) Equations: Bisection method, False position method, Newton Raphson method; Convergence of False position and Newton Raphson method. Complex roots of polynomials by Bairstow‟s method.	6
3	Partial Differential Equations: Classifications of partial differential equations; Method of separation of variables to solve Heat equation, Wave equation and Laplace‟s equations.	6
4	Statistics: Correlation and regression; Principle of least square method and curve fitting.	6
5	Probability Distribution Functions: Random variable; Mathematical expectations; Moment generating functions; Discrete and continuous distribution functions; Binomial, Poisson and Normal distributions.	6
	TOTAL	30

BT4CE02-CT02: MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

Credit-2 **Max. Marks : 100 (IA:20,ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN		Hours
1	**Basic economic concepts-** Meaning, nature and scope of economics, deductive v/s inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	5
2	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
3	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunkcosts, cost function, cost curves, cost and output decisions, cost estimation.	5
4	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	5
5	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement andrelated concepts, financial ratioanalysis, cash-flow analysis, funds- flow analysis, comparative financial statement, analysisand interpretation of financial statements, capital budgeting techniques.	5
	TOTAL	25

BT4CE03-CT03: BASIC ELECTRONICS FOR CIVIL ENGINEERING APPLICATIONS

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to objective, scope and outcome of the subject.	6
	Basic Electronics: Number systems & Their conversion used in digital electronics, Demorgan's theorem, Logic Gates, half and full adder circuits, R-S flip flop, J-K flip flop.	
	Introduction to Semiconductors, Diodes, V-I characteristics, Bipolar junction transistors (BJT) and their working, introduction to CC, CB & CE transistor configurations.	
2	**Instrumentation**: mechanical, electrical, electronic system and their calibration, Use of automatic and digital levels, electronic theodolites, total stations; Control surveys using GNSS, Total station and traversing methods (adjustment and computations of coordinates).	6
	Measurement errors: Gross error and systematic errors, absolute and relative errors, accuracy, precision, resolution and significant figures. Full-field measurements;	
3	**Data acquisition system and data processing**: analog systems, digital systems using personal computers, dynamic measurement, numerical and graphical data processing and archiving.	6
4	**Sensors & Transducers**: various types of sensors for displacement, velocity, acceleration, pressure, loads, strains, Displacement sensors, Mass &Piezoeletric, strain gauges, Temperature sensors thermocouple, flow sensors : Ultrasonic, electromagnetic, laser and thermal	6
	Sensor types characteristics: types of resolution, FOV, IFOV, PSF; Geometric and radiometric distortions, Geo-referencing, re-sampling methods; Atmospheric errors and removal; Satellite orbits and characteristics; Applications of optical and microwave remote sensing techniques in Civil Engineering.	
5	**Digital Image Processing**: Digital image, introduction to digital image processing, pre-processing, enhancement, classification, accuracy assessment.	6

	TOTAL	**30**

BT4CE04-CT04: STRENGTH OF MATERIALS

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to objective, scope and outcome of the subject **Simple Stresses and Strains in different members:** Stresses in prismatic & non prismatic members and in composite members; Thermal stresses; Stresses in composite members, Compatibility condition.	**8**
2	**Compound Stress:** Two dimensional stress system: stress resultant, principal planes and principal stresses, state of pure shear maximum shear stress, Mohr's circle &its application. Introduction to theories of failures.	**8**
3	**Bending of Beams:** Bending moment, Shear force and Axial thrust diagrams for statically determinate beams subjected to various types of loads and moments, Point of Contra-flexure, relation between load, SF and BM. **Theory of simple bending**: Distribution of bending and shear stresses for simple and composite sections, Combined direct and bending stress,	**8**
4	**Torsion:** Elementary concepts of torsion, shear stress in solid and hollow circular shafts, angle of twist, power transmitted by a shaft, combined bending and torsion; **Columns:** Short and long columns, slenderness ratio, crushing and buckling of column, short column subjected to axial and eccentric loads; Euler's theory and its limitation, concept of effective length of columns; Rankine & Secant formulae, middle third rule, core of a section.	**8**
5	**Deflection of Beams:** Differential relation between load, shear force, bending moment, slope deflection. Slope & deflection in determinate beams using double integration method, Macaulay's method, area moment method and conjugate beam method and their application to statically determinate prismatic beams.	**8**
	TOTAL	**40**

BT4CE05-CT05: HYDRAULICS ENGINEERING

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to scope, objective and outcome of subject	8
	Dimensional Analysis & Models: Dynamical Similarity and Dimensional Homogeneity Model experiment, geometric, Kinematic and Dynamic similarity. Reynold's, froudes, Weber's, Euler and Mach numbers. Distorted river models and undistorted models, proper choice of scale ratios. Scale effect. Principle of dimensional analysis Rayleigh method, Buckingham theorem.	
2	**Turbulent flow**, Reynolds equations, Prandtl's mixing length theory, Equations of velocity distribution and friction coefficient **Boundary Layer Theory**: Concept of boundary layer, laminar and turbulent boundary layers, boundary layer thickness, von Karman integral equation, laminar sub-layer, hydro-dynamically smooth and rough boundaries, separation of flow and its control, cavitation.	8
3	**Open channel Flow** Uniform, Non-Uniform and variable flow. Resistance equations of Chezy and Manning. Section factor for uniform flow. Most Efficient rectangular, triangular and trapezoidal sections. Velocity distribution in open channels.	8
	Gradually varied flow in Prismatic channels. Specific energy of flow. Critical depth in prismatic channels. Alternate depths. Rapid, critical and sub critical Flow Mild, steep and Critical Slopes. Classification of surface curves in prismatic channels and elementary computation	
4	**Rapidly varied flow**: Hydraulic jump or standing wave in rectangular channels. Conjugate or sequent depths Losses in jump, location of jump. velocity distribution in open channels. Energy correction factor. Moment correction factor	8
	Impact of free Jets: Impact of a jet on a flat or a curved vane, moving and stationary vane. **Introduction of Hydraulic machine –** Type of pumps and turbine and its brief description. Draft tube and its principle	
	Hydrology: Definition, Hydrologic cycle, Application to Engineering problems, measurement of rain fall, rain gauge, peak flow, flood frequency method, catchment area formulae, Flood hydrograph, Rainfall analysis, Infiltration, Run off, Unit hydrograph and its determination, Estimation of run off.	8
	Ground Water: Aquifers and its types, Confined and unconfined aquifer, Darcy's Law, hydraulic conductivity, transmissivity, well hydraulics.	

5	**Canal Hydraulics:** Types of canals, parts of canal irrigation system, channel alignment, assessment of water requirements, estimation of channel losses, design of channels, regime and semi theoretical approaches (Kennedy's Theory, Lacey's Theory), cross section of channels, silt control in canals.	
	TOTAL	**40**

BT4CE06-CT06: BUILDING PLANNING

Credits: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to scope, objective and outcome of subject	6
	Introduction: Types of buildings, criteria for location and site selection, site plan and its detail.	
	Sun Consideration : Different methods of drawing sun chart, sun shading devices, design of louvers.	
2	**Climatic and comfort Consideration**: Elements of climate, global climate, climatic zones of India, thermal comfort, biclimatic chart,	6
	Orientation: Meaning, factors affecting orientation, orientation criteria for tropical climate.	
3	**Building Bye Laws and NBC Regulations:** Objective of by-laws, regulation regarding; means of access, lines of building frontages, covered area, floor area ratio, open spaces around buildings, height & sizes of rooms, plinth regulation.	6
	Principles of Planning: Different factors affecting planning viz-aspect, prospect, furniture requirement, roominess, grouping, circulation, elegance, privacy etc.	
4	**Vastu Shastra In Modern Building planning:** Factors considered in Vastu, site selection, orientation, planning and design of residential buildings, school/hospital	6
	Functional Design And Accommodation Requirements Of Non Residential Buildings: viz-school buildings, rest house, primary health centers, post office etc.	
5	**Services in Buildings** (A) Lighting and ventilation, doors and windows, lifts. (B) Acoustics, sound insulation and noise control. (C) Fire fighting provisions	6
	TOTAL	**30**

BT4CE07-CT07: CONCRETE TECHNOLOGY

Credit: 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hrs.
1	**Introduction:** to objective, scope and outcome of the subject	8
	Ingredients of concrete: Cement: hydration of cement and its basic compounds, structure of hydrated cement, C-S-H gel, heat of hydration, gel-space ratio etc.	
	Aggregates: types, physical properties and standard methods for their determination, including Grading of aggregates as per IS. Manufactured sand- properties and IS Specifications for use in concrete.	
2	**Concrete:** Grade of concrete, proportioning of ingredients, water content and its quality, water/cement ratio and its role, Properties of fresh concrete including workability, air content, Flow ability, Segregation, Bleeding and Viscosity etc. Factors affecting, methods of determination.	8
	Properties of hardened concrete such as strengths, permeability, creep, shrinkage, factors influencing, Standard tests on fresh and hardened concrete as per IS code. Aggregate-cement interface, its effect on properties of concrete.	
	NDT: Introduction and their importance. Application & use of Rebound Hammer, Ultra-sonic pulse velocity meter, Rebar & Cover meter, half-cell potential meter, corrosion resistivity meter, core sampling. Interpretation of their results,	
3	**Concrete Handling in Field:** Batching, mixing, placing and transportation of concrete, equipments for material handling, various methods their suitability and precautions. Compaction of concrete: methods &equipments. Curing of concrete: various methods their suitability.	8
	Durability of concrete. Causes of deterioration, Carbonation, Tests for durability assessment	
	Admixture in concrete: Chemical and mineral admixtures, their types and uses: accelerator, retarders, water-proofing, plasticisers, super plasticizers-types, their suitability. Fly ash-properties for use in concrete, specifications of flyash as per IS 3812, and effect on properties of concrete. GGBFS, Microsilica and metakaolin- propertie, specifications and utility in concrete.	
4	Concrete mix deign (IS method)- with and without water reducing admixtures	8

	Form work: Requirements, their types. Typical formworks and shuttering/centering for Columns, beams, slabs, walls, etc. Slip and moving formwork.	
5	**Special types of concrete:** Sulphate resisting concrete, under water concreting, pumpable concrete: methods and issues in making, salient properties and applications.	**8**
	Concretes with tailored properties- including high performance concrete, with specific properties in fresh and hardened states, self-compacting concrete-materials, mix proportioning, test methods, use and applications with case studies.	
	TOTAL	**40**

BT4CE08-CP01: MATERIAL TESTING LAB

Credit: 01 **Max. Marks: 50 (IA:20, ETE:30)**

0L+0T+2P

1. Tests on Mild steel and HYSD Bar –To determine compressive and tensile strength, yield strength, percentage elongation etc.
2. Tests on Cement and concrete cubes/ core to establish their strength
3. Hardness Test – Rockwell Hardness and Brinell Hardness
4. Impact Test – Izod and Charpy
5. Modulus of Rupture of Wooden Beam
6. Fatigue Test
7. Spring Test
8. Torsion Test

BT4CE09-CP02: HYDRAULICS ENGINEERING LAB

Credit: 01 **Max. Marks: 50 (IA:20, ETE:30)**

0L+0T+2P

1. To determine the minor losses.
2. To determine the friction factor.
3. To determine Cd of Broad crested weir.
4. To verify the momentum equation.
5. To determine the discharge of venturimeter.
6. To determine Manning’s & Chezy's coefficient of roughness for the bed of a given Channel.
7. To study and plot characteristics curve of hydraulic jump.
8. To study velocity distribution in open channel flow.

BT4CE10-CP03: BUILDING DRAWING

Credit: 2 **Max. Marks: 100 (IA:40, ETE: 60)**

0L+0T+3P

1- To plan and draw working drawing of a Residential building with following detail.

(a) Site plan

(b) Foundation plan

(c) Plan

(d) Two sectional elevations

(e) Front elevation

(f) Furniture plan

(g) Water supply and sanitary plan

(h) Electric fitting plan

2- To design and draw a Primary Health Center

3- To design and draw a Primary School

4- To design and draw a Rest House

5- To design and draw a Post Office

6- To design and draw a Bank

7- To design and draw a College Library

8- To design and draw a Cinema Theatre

BT4CE11-CP04: ADVANCED SURVEYING LAB

Credit: 01 **Max. Marks: 50 (IA:20, ETE:30)**

0L+0T+2P

1. To measure the horizontal and vertical angles by Theodolite.
2. To determine the Height of an object by trigonometric leveling (Instruments in same vertical plane).
3. To determine the Height of an object by trigonometric leveling (Instruments in different vertical planes).
4. Measurement of angles, length of survey line using Total Station, finding the coordinate of station
5. To measure and adjust the angles of a braced quadrilateral.
6. To prepare the map of given area by plane tabling.
7. Measurement of area of a traverse by Total Station

BT4CE12-CP05: CONCRETE LAB

Credit: 2 **Max. Marks: 100 (IA: 40, ETE: 60)**

0L+0T+3P

1. To determine the fineness of Cement by Blaine's air permeability test.
2. To determine the flexural strength of Concrete.
3. To determine Soundness of cement by Le-chatelier apparatus.
4. To determine the specific gravity of fine aggregate (sand) by Pycnometer.
5. To determine the bulking of fine aggregate and to draw curve between water content and bulking.
6. Sieve analysis of coarse aggregates and fine aggregates.
7. To determine the workability of given concrete mix by slump test.
8. To determine the optimum dose of super plastsizers by Flow table test.
9. To design concrete mix of M-20 grade in accordance with I S 10262.
10. To design concrete mix of M-40 grade with super plasticizer in accordance with I S 10262.
11. To determine the Permeability of Concrete.
12. Study of Core cutter, UPV & Rebound Hammer equipment.

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Civil Engineering

Semesters V

Syllabus

BT5CE01-CT01: CONSTRUCTION TECHNOLOGY AND EQUIPMENT

Credit:2 **Max.Marks:100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	
	Engineering Economy Principle of Engineering Economy, Minimum cost point analysis, Breakeven point analysis, Depreciation anddepletion	6
2	**Safety in construction** Causes, classification, cost and measurement of an accident, safety programme for construction, protective equipment, accident report, safetymeasure:(a)Forstorageandhandlingofbuildingmaterials. (b) Construction of elements of a building (c) In demolition ofbuildings; Safety lacuna in Indian scenario. Fire safety provisions as per NBC.	6
3	**Construction Planning** Need of construction planning, Constructional Resources, construction team, stages in construction, preparation of construction schedule, Job layout, inspection and quality control	6
4	**Materials Management:** Objective and functions ofmaterialmanagement	6
5	**Construction Equipment andManagement** Earth Moving Equipment-Bull dozers tractor pulled scrapers Power shovels Draglines clamshells; cranes; Hoes, trenching machine types Hauling Equipment; Drilling, Blasting and Tunnelling Equipment; Pile Driving Equipment	6
	TOTAL	30

BT5CE02-CT02: STRUCTURE ANALYSIS-I

Credit:2 **Max.Marks:100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course. Introduction to Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Releases in structures, Maxwell's reciprocal theorem and Betti's theorem.	6
2	Analysis of prop cantilever structures, Analysis of Indeterminate Structure (fixed and continues beams) using Area moment method, Conjugate beam method, Three moments Theorem.	6
3	Analysis of Statically Indeterminate Structures using Slope-deflection method and Moment-distribution method applied to continuous beams and portal frames with and without inclined members	6
4	**Vibrations:** Elementary concepts of structural vibration, Mathematical models, basic elements of vibratory system. Degree of freedom. Equivalent Spring stiffness of springs in parallel and in series.	6
5	**Simple Harmonic Motion**: vector representation, characteristic, addition of harmonic motions, Angular oscillation. **Undamped free vibration of SDOF system**: Newton's law of motion, D Almbert's principle, deriving equation of motions, solution of differential equation of motion, frequency & period of vibration, amplitude of motion; Introduction to damped and forced vibration.	6
	TOTAL	**30**

BT5CE03-CT03: DESIGN OF CONCRETE STRUCTURES

Credit:3 **Max. Marks: 150(IA:30,ETE:120)**

3L+0T+0P **End Term Exam: 3Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
	Fundamental concepts of design of RC members, assumptions. Types and function of reinforcement. Introduction to various related IS codes, Characteristic load and characteristic strength. **Working Stress Method:** Working stressdesign philosophy. Analysis and Design of singly reinforced rectangular beam section for flexure.	8
2	**Limit State Design:** Limit state design philosophy. Assumptions, Analysis and design of singly reinforced, doubly reinforced rectangular beams and flanged beams for flexure using codal provisions for simply supported, cantilever, fixed and continuous beams.	8
3	**Limit state of serviceability for deflection**: control of deflection as per codal provisions of empirical coefficients. **Limit state of collapse in shear**: Types of shear reinforcement and its detailing, analysis and design of shear reinforcement for prismatic sections. **Limit state of collapse in bond**: concept of bond stress, anchorage length and development length. Detailing and curtailment of reinforcement as per codal provisions.	8
4	**Slabs:** Analysis and design of one way and two way slabs using LSM, Detailing of reinforcement. Check for shear and deflection. **Torsion:** Analysis and Design of beams for torsion as per codal method.	8
5	**Columns:** Short and long columns, their structural behaviour. Analysis and design of axially loaded short columns, using LSM. Analysis of eccentrically loaded short columns. Introduction to Pu- Mu interaction curves and their use for eccentrically loaded columns. **Footings:** Analysis and design of Isolated column footing for axial load. Introduction to combined footing for two columns (withoutcentral beam) for axial loads using LSM.	8
	TOTAL	40

BT5CE04-CT04: GEOTECHNICAL ENGINEERING

Credit:3 **Max. Marks: 150(IA:30,ETE:120)**

3L+0T+0P **End Term Exam: 3Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course. Soil and soil-mass constituents, water content, specific gravity, void ratio, porosity, degree of saturation, air void and air content, unit weights, density index etc. Inter-relationships of the above. Determination of index properties of soil: water content, specific gravity, particle size distribution, sieve and sedimentation analysis, consistency limits, void ratio and density index. Mineral structures, structures of Illite Montmorillonites and kaolinite and their characteristics. Darcy's law of permeability of soil and its determination in laboratory. Stresses in soil mass: total, effective and neutral pressure, calculation of stresses, influence of water table on effective stress, quicksand phenomenon. Classification of soil for general engineering purposes : particle size and I.S. Classification systems.	8
2	Mohr's circle of stress, shearing strength of soil, parameters of shear strength, Coulomb's failure envelope, determination of shear parameters by Direct Shear Box. Tri-axial and unconfined compression test apparatuses. Principles of soil compaction, laboratory compaction tests; Proctor's test, Stresses in Soil under surface loading: Bossinesq's and Westergaard's analysis for vertical pressure and its distribution in a soil mass. Vertical stresses due to concentrated loads, Isobar diagram, Vertical stress distribution on a horizontal plane. Influence diagram, Vertical stresses at a point under circular and rectangular loaded area. Approximate methods of obtaining vertical pressure due to surface loading. Newmark's chart,	8

3	Compressibility and Consolidation: Introduction to consolidation, comparison of compaction and consolidation, Spring Analogy Terzaghis one dimensional consolidation theory, Degree of consolidation, consolidation test, Compressibility parameters, co- efficient of consolidation. Pre-consolidation pressure and its determination. Normally, over and under consolidated soils. Methods of predicting Settlement and its rate. Total and differential Settlement.	**8**
4	Stability of Slopes: Classifications of slopes, Stability analysis of infinite slopes. Stability of finite slopes by Swedish and Friction circle method. Stability analysis by Taylor's stability number , Taylor's stability number curves. . Bishop's method of stability analysis. Earth Pressure: Active, passive and earth pressure at rest. Rankine's and Coulomb's theories. Rebhann's and Culman's graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesion less back fill.	**8**
5	Bearing Capacity of Soils: Terminology related to bearing capacity, Common types of foundations. Terzaghi and Meyehoff's theory for bearing capacity. Rankine's method for minimum depth of foundation. Skempton's method. Effect of eccentricity and water table on bearing capacity. IS code method, Plate load and penetration tests for determining bearing capacity. Introduction to pile, Site Investigations: Methods of explorations. Planning of Investigations, Depth of exploration, Number of boreholes, Undisturbed and Disturbed samples. Types of samplers. Brief description of procedures of sampling, Transportation and Storage of samples.	**8**
	TOTAL	**40**

BT5CE05-CT05: WATER RESOURCE ENGINEERING

Credit:2 **Max.Marks:100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course. **Introduction**: Definitions, functions and advantages of irrigation, present status of irrigation in India, classification for agriculture, soil moisture and crop water relations, Irrigation water quality. Consumptive use of water, principal Indian crop seasons and water requirements.	6
2	**Canal Irrigation:** Types of canals, design of channels, regime and semi theoretical approaches (Kennedy's Theory, Lacey's Theory) **Diversion Headworks:** Design for surface and subsurface flows, Bligh's and Khosla's methods.	6
3	**Embankment Dams:** Suitable sites, causes of failures, stability and seepage analysis, flow net, principles of design of earth dams. **Gravity Dams:** Force acting on a gravity dam, stability requirements.	6
4	**Well Irrigation:** Open wells and tube wells, types of tube wells, duty of tube well water. **Cross-Drainage Structure**: Necessity of Cross- drainage structures, their types and selection, comparative merits and demerits.	6
5	**Hydrology:** Definition, Hydrologic cycle, measurement of rainfall, Floodhydrograph,Rainfallanalysis,Infiltration,Runoff,Unithydrograph and its determination.	6
		30

BT5CE06-CT06 (A) : AIR & NOISE POLLUTION AND CONTROL

Credit:2 **Max.Marks:100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course. *Air Pollution:* Air pollutants, Sources, classification, Combustion Processes and pollutant emission, Effects on Health, vegetation, materials and atmosphere, Reactions of pollutants in the atmosphere and their effects- Smoke, smog and ozone layer disturbance, Greenhouse effect.	6
2	Air sampling and pollution measurement methods, principles and instruments, Ambient air quality and emission standards, Air pollution indices, Air Act, legislation and regulations, control principles.	6
3	Removal of gaseous pollutants by adsorption, absorption, reaction and other methods. Particulate emission control, settling chambers, cyclone separation, Wet collectors, fabric filters, electrostatic precipitators and other removal methods like absorption, adsorption, precipitation etc. Biological air pollution control technologies, Indoor air quality.	6
4	*Noise pollution:* Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psychoacoustics and noise criteria.	6
5	Effects of noise on health, annoyance rating schemes; special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Noise control methods.	6
	TOTAL	**30**

BT5CE06-CT06 (B): DISASTER MANAGEMENT

Credit:2 **Max.Marks:100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**6**
	Introduction: Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Natural and Manmade Disasters, Disaster and Development, and Climate Change.	
2	**Types of Disasters, their occurrence/ causes, impact and preventive measures:** **Geological Disasters**: earthquakes, landslides, tsunami, mining;	**6**
	Hydro-Meteorological Disasters: floods, cyclones, lightning, thunder-storms, hailstorms, avalanches, droughts, cold and heat waves.	
	Biological Disasters: epidemics, pest attacks, forest fire.;	
3	**Technological Disasters**: chemical, industrial, radiological, nuclear.	**6**
	Manmade Disasters: building collapse, rural and urban fire, road and rail accidents.	
	Disaster profile of Indian continent, Mega Disasters of India and Lessons Learnt. Risk mapping.	
4	**Disaster Management Cycle**: Disaster Management Cycle and its components: Pre disaster and post disaster, Paradigm Shift in Disaster Management. Safety tips for various types of disasters.	**6**
5	**Disaster management system in India:** Disaster Management Act 2005, National Guidelines and Plans on Disaster Management; Role of Government(local, state and national),Non-Government and Inter-Governmental Agencies.	**6**
	TOTAL	**30**

BT5CE06-CT06 (C): TOWN PLANNING

Credit:2 **Max.Marks:100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	6
	Introduction: Definition of town planning, Evolution of towns, Objects of town planning, Economic Justification for town planning, Principles of town planning, Necessity of town planning, Origin, Growth and patterns of town development, distribution of land-use, site for ideal town, powers required to enforce T.P. scheme	
2	Civic Surveys: Definition, Necessity, collection of data, Types of surveys, methods adopted to collect data, Drawings, reports.	6
	Zoning: Definition, Use of land, Objects of zoning, Principles of zoning, Aspects, Advantages & Importance zoning, Transition zone, Zoning powers, Maps for zoning	
3	Importance and Demand of housing, Classification, requirements and design of residential building, Housing agencies, Housing problems in India.	6
	Slums: Causes, characteristics and effects of slums, Slum clearance.	
4	Industries: Classification of industry, Concentration of industry, requirements of the industry, Industrial townships.	6
	Public Buildings: Location, classification principle of design, town center, grouping of public buildings. Town Planning, CL-SPP/CL-DDU/Nadiad, Gujarat, INDIA 4	
5	Re-planning of existing towns: Objects of re-planning, defects of existing town, data required for re- planning, Urban Renewal projects, De-centralization and Re-centralized, Garden city concept overview.	6
	TOTAL	**30**

BT5CE07-CT07 (A): REPAIR AND REHABILITATION OFSTRUCTURES

Credit:2 **Max.Marks:100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	**6**
	Deterioration of Concrete Structures: Penetrability of concrete- permeability, sorptivity, diffusion. Physical processes-abrasion, erosion. Chemical-carbonation, chloride and sulfate attack. Alkali – Aggregate Reaction. Corrosion-mechanism. **Factors affecting and Preventive measures**: for all the above, including water – proofing techniques for various conditions, sacrificialanode,corrosionresistantsteel,corrosioninhibitors,protective coatings etc.	
2	**Cracks in Concrete and Masonry Structures-** Types, patterns, measurement and preventive measures.	**6**
3	**Assessment of Risk/Damage-in Structures:** *Preliminary investigation-* visual, history collection etc. *Detailed Investigation:* core cutting, rebar locator, corrosion meter, penetration resistance, pull out tests, half–cell potential, concrete resistivity etc. Interpretation of non-destructive test data from all the above tests as well as rebound hammer number and ultrasonic pulse velocity. Destructive and chemical tests- on material samples from site.	**6**
4	**Materials for Repair:** polymers and resins, self-curing compounds, FRP, ferro-cement- properties, selection criterion, cement based and polymer modified mortars, etc.	**6**
5	**Repair Techniques:** Grouting, Jacketing, External bonded plates- processes, limitations, design computations etc. including numerical problems. **Under Water Repair:** Processes.	**6**
	Case Studies: related to rehabilitation of bridge piers, heritage structures, masonry structures etc.	
	TOTAL	**30**

BT5CE07-CT07 (B): GROUND IMPROVEMENT TECHNIQUES

Credit:2 **Max.Marks:100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course. **Introduction**: Formation of soil- Mechanical Weathering, Chemical weathering, types of soil-Residual soil, Transported soil, regional soil Deposit in India, Difficult soils- Expansive soil, Collapsible soil,organic soil etc. Purpose and Principles of Ground Improvements.	**6**
2	**Densification by Compaction Near Surface**: Theory of compaction, Laboratory compaction tests; compactionin-field, effect of compaction on different soil properties, Factor affecting compactionin field, Measurement of density in field. **Densification by Deep Compaction:** (a) Vibration methods- Vibro compaction, Vibro floatation, Vibratory probes method, Blasting. (b) Displacement methods- Sand compaction piles; Dynamic Compaction.	**6**
3	**Modification Using Stone Columns:** **Introduction**-Failure mechanism, load carrying capacity, settlement analysis, installation technique, Geo-synthetic -encased stone columns, Mechanism of encasement, field control of stone columns. **Pre-Compression and Vertical Drain**: Applicability and types of pre compression. Purpose and mechanism of pre-compression by pre loading. Design procedure of pre-compression by preloading. **Pre-compression by preloading with vertical drains**- Principles, Advantages, and disadvantages of Vertical drains, Type of Vertical drains, Installation, Monitoring and Instrumentation of Vertical drains.	**6**

4	**Modification by Grouting**: Purpose, principles and classification of grouts and their properties. Desirable characteristics of grout,Grouting methods, Planning and operation of grouting, control of grouting operations and monitoring.	**6**
	Modification by Soil Reinforcement: Purpose of reinforced earth, Mechanism of reinforced soil, Failure mechanism of reinforced earth, Advantages of reinforced earth. Application ofReinforced Earth, Design methods of reinforced earthwall- Check for External stability and Check for Internal stability.	
5	**Miscellaneous Methods of Soil stabilization:** Lime stabilization, cement stabilization, bituminous stabilization, chemical stabilization.	**6**
	TOTAL	**30**

BT5CE07-CT07 (C): ENERGY SCIENCE ANDENGINEERING

Credit:2 **Max.Marks:100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course. Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the Environment.	6
2	Energy Sources: Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil- bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear,wave,tidalandhydrogen;Sustainabilityandenvironmentaltrade-offs of different energy systems	6
3	Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and Sustainability	6
4	Civil Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.	6
5	Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts; LEED ratings; Identification of energy related enterprises	6
	TOTAL	**30**

BT5CE08-CP01: CONCRETE STRUCTURES DESIGN

Credit:2 **Max. Marks: 100 (IA:60,ETE:40)**
0L+0T+3P **End Term Exam: 3Hours**

1 Revision of Typical problems of BMD and SFD
2 Analysis and Design of singly reinforced rectangular beam section for flexure, based on Working stress design philosophy.
3 Analysis and Design of singly reinforced rectangular beam section for flexure, based on Limit State design philosophy
4 Analysis and Design of doubly reinforced rectangular beam section for flexure, based on Limit State design philosophy
5 Analysis and Design off langed beam section for flexure, based on Limit State design philosophy
6 Problems on Limit state of serviceability for deflection as per codal provisions of empirical coefficients.
7 Analysis and design of prismatic sections for shear using LSD
8 Problems on limit state of collapse in bond
9 Analysis and design of one way slabs using LSM,
10 Analysis and design of two way slabs using LSM,
11 Analysis and design of short axially loaded columns
12 Analysis and design of footing
13 Analysis and Design of beams for torsion as per codal method.

BT5CE09-CP02: GEOTECHNICAL ENGINEERDINGLAB

Credit:2 **Max. Marks: 100 (IA:60,ETE:40)**

0L+0T+3P **End Term Exam: 3Hours**

1 Grain size distribution by sieve Analysis and Hydrometer

2 Determination of specific Gravity byPycnometer.

3 Determination of liquid limit by Casagrande's apparatus and cone penetrometer.

4 Determination of plastic limit and shrinkage limit

5 Determination of field density by core-cutter and sand replacement method

6 Determination of compaction properties by standard Proctor Test Apparatus

7 Determination of C-Ø values by unconfined compression Test Apparatus, Direct Shear Test Apparatus and Triaxial Test.

8 To determine the differential free swell index of soil and swelling pressure of soil.

9 To determine the CBR of soil.

10 To determine the compressibility parameters of soil by consolidation test.

11 To determine the permeability of soil by constant and falling head methods. Design as per syllabus of theory.

BT5CE10-CP03: WATER RESOURCES ENGINEERING DESIGN LAB

Credit:1 **Max.Marks:50(IA:30,ETE:20)**

0L+0T+2P **End Term Exam: 2Hours**

Design as per syllabus oftheory.

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Semesters VI

Syllabus

BT6CE01-CT01: WIND AND SEISMIC ANALYSIS

Credit:2 **Max. Marks: 100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course. **Structural Systems:** Types of structures and Structure's forms, Symmetry and Asymmetry in building forms, Vertical and lateral load resting elements, shear walls, framed tubes and various multi- storey configurations.	6
2	**Design Loads:** various types of load sand relevant codes. Design loads for different types of buildings. (IS-875 part 1 & 2) & Load Flow Concept	6
3	**Wind Loads Analysis:** Wind loads & calculation of wind load on flat roof, pitched roof and single sloped roof buildings (IS: 875-Part 3).	6
4	**Earthquake Load Analysis:** Earthquake loads & calculations of earthquake loads on framed structures. (IS: 1893 – Part 1).	6
5	**Earthquake Resistant Construction:** Typical seismic failure of masonry and RCC structures. Earthquake resistant construction of buildings, and various provisions as per IS codes; IS-4326,IS-13827, IS-13828, IS-13920, IS-13935.	6
	TOTAL	**30**

BT6CE02-CT02: STRUCTURAL ANALYSIS-II

Credit:3 **Max. Marks: 150(IA:30,ETE:120)**

3L+0T+0P **End Term Exam: 3Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course. Unit load method & their applications: deflection of determinate beams and frames, analysis of determinate and redundant frames up to two degree of redundancy, lack of fit in redundant frames. Introduction to Energy Methods: Strain energy for gradually applied, suddenly applied and impact loads, Strain energy due to axial loads, bending, shear and torsion;. Castiglione's theorems & their applications in analysis of determinate and redundant frames up to two degree of redundancy and trussed beams; Stresses due to temperature & lack off it in redundant frames; deflection of determinate beams, frames using energy methods	**8**
2	**Influence line diagram & Rolling load:** ILD for beams & frames, Muller-Breslau principle and its application for drawing ILD, Rolling load, maximum stress resultants in a member/section, absolute maximum stress resultant in a structure.	**8**
3	**Arches:** analysis of three hinged two hinged and fixed type parabolic arches with supports at the same level and at different levels.	**8**
4	**Unsymmetrical bending:** Definition, location of NA, computation of stresses and deflection, shear centre and its location,	**8**
5	**Approximate methods for lateral loads:** Analysis of multistory frames by portal method, cantilever method & factor method. Analysis of determinate space trusses by tension coefficient method.	**8**
	TOTAL	**40**

BT6CE03-CT03: ENVIRONMENTAL ENGINEERING

Credit:3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course. *Water:* -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices. Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes.	**8**
2	*Sewage*- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water. Sewage characteristics: Quality parameters: BOD, COD, TOC, Solids, DO, Nitrogen, Phosphorus, Standards of disposal into natural watercourses and on land, Indian standards.	**8**
3	Sewage and Sullage, Pollution due to improper disposal of sewage, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes. Wastewater Disposal and Refuse: Disposal of sewage by dilution, self-purification of streams, sewage disposal by irrigation sewage farming, waste water reuse.	**8**
4	*Air* - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air quality standards, Control measures for Air pollution	**8**
5	*Noise*- Basic concept, measurement and various control methods.	**8**
	Total	**40**

BT6CE04-CT04: DESIGN OF STEEL STRUCTURES

Credit:3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	8
	Types of Steels and their broad specifications. Structural steel forms- hot rolled, tubular, light gauge etc and their applicability. Classification of cross sections as per IS 800-2007- Plastic, compact, semi compact and slender-characteristics	
	Plastic analysis of steel structures, fundamentals, shape factor, static and mechanism method of analysis, bending of beams of uniform cross sections	
2	Connections: Types of bolts, load transfer mechanism, prying action. Design of bolted and welded connections under axial and eccentric loadings with IS provisions.	8
	Tension Members: Design strength in gross section yielding, net section rupture and block shear. Design of axially loaded members.	
	Compression Members: Types of buckling, Imperfection factor, Buckling curves for different cross sections as per IS. Design of compression members: Axially loaded members including made up of angle section: single and in pair; built up columns including design of lacings and battens as per IS.	
3	Beams: Design of beams: simple and compound sections. Design of laterally supported and unsupported beams including for web buckling, web crippling, lateral torsional buckling.	8
	Member design under combined forces: Compressive load and uniaxial moment. tension and uniaxial moment	
	Column Bases: Design of column bases for axial and eccentric compressive loads: Slab and gusseted base.	

4	Design of plate girder: Design of welded and bolted sections including web and flange splicing, horizontal, intermediate and bearing stiffeners. Shear strength determination by post critical and tension field action methods. End panel design options and procedure as per IS 800. Curtailment of flange plates. Connections for flange plate to flange angles and flange angles to web, etc. Design of welded connections	**8**
	Design of gantry girder	
	Design of roof trusses members for combined forces, wind loading etc. Purlin design	
5	Introduction to Pre Engineered Buildings , characteristics and their applications.	**8**
	Introduction of truss girder bridges-its members including portal and sway bracings etc. Design aspects of foot over bridges.	
	TOTAL	**40**

BT6CE05-CT05: ESTIMATING AND COSTING

Credit:2 **Max. Marks: 100 (IA:20, ETE:80)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	Introduction: Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.	**6**
2	Rate Analysis: Task for average artisan, various factors involved in the rate of an item, material and labor requirement for various trades; preparation for rates of important items of work. Current schedule of rates. (C.S.R.)	**6**
3	Estimates: Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts Services for building such as water supply, drainage and electrification.	**6**
4	Cost of Works: Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building.	**6**
5	Valuation: Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.	**6**
	TOTAL	**30**

BT6CE06-CT06 (A) : PRE-STRESSED CONCRETE

Credit:2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	
	Introduction: Basic concepts of Pre-stressing and its advantages. Materials for pre-stressed concrete. Tensioning devices. Pre-tensioning and post tensioning systems.	**6**
2	**Analysis of Pre-stress and Bending Stresses:** Assumptions, Flexural analysis of pre-stressed rectangular and unsymmetrical T section. Concept of load balancing.	**6**
3	**Losses of Pre-stress:** Losses due to - elastic deformation of concrete, successive tensioning of curved cable, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip.	**6**
4	**Deflection of Pre-stressed Concrete Members:** Effect of tendon profile and associated factors in continuous members. Computation of deflection in pre-stressed concrete members.	**6**
5	**Design of Pre-stressed Concrete Sections:** Flexural Shear and Torsional strength using simplified code procedure (IS-1343-2012).Design of simply supported Pre-stressed Concrete Sections for flexure.	**6**
	TOTAL	**30**

BT6CE06-CT06 (B): SOLID AND HAZARDOUS WASTE MANAGEMENT

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	
	Introduction to SWM: Definition of waste and solid waste, classification solid waste, sources of solid waste, its composition, factors affecting waste generation, traditional methods of waste collection and disposal	**6**
2	**Waste Collection:** Components of waste collection, waste collection containers, their characteristics, types, waste collection vehicles, collection frequency, collection route, transfer stations	**6**
3	**Solid Waste Characterization:** Physical characteristics, chemical characteristics and biological characteristics of solid wastes **Waste Processing**: Size reduction, factors affecting size reduction, size reducing equipment, volume reduction, equipment for volume reduction, waste minimization, waste hierarchy, 3 R principle	**6**
4	**Hazardous Waste:** Definition, sources, classification, collection, segregation, treatment and disposal methods **Radioactive Waste, E-Waste, Biomedical Waste:** Definition, sources, classification, segregation, management and disposal methods	**6**
5	**Treatment and Disposal of Solid Waste:** Composting, vermin composting, biogas production, thermal treatment, incineration, pyrolysis, gasification, biological treatment, Sanitary land filling, land fill leachate and gas management **Latest Advances and Rules** related to SWM, Hazardous Waste, Plastic Waste and E-Waste Management	**6**
	TOTAL	**30**

BT6CE06-CT06 (C): TRAFFIC ENGINEERING AND MANAGEMENT

Credit: 2 **Max. Marks: 100 (IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course. **Traffic Planning and Characteristics:** Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow .	**6**
2	**Traffic Surveys**: Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including non motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation –Level of service – Concept, applications and significance.	**6**
3	**Traffic Design and Visual Aids:** Intersection Design – channelization, Rotary intersection design – Signal design – Coordination of signals — Grade separation – Traffic signs including VMS and road markings–Significant roles of traffic control personnel – Networking pedestrian facilities & cycle tracks.	**6**
4	**Traffic Safety and Environment**: Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards–	**6**
5	**Traffic Management:** Area Traffic Management System – Traffic System Management (TSM) with IRC standards –- Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods – Congestion and parking pricing – All segregation methods- Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.	**6**
	TOTAL	**30**

BT6CE07-CT07 (A): BRIDGE ENGINEERING

Credit:2 **Max. Marks: 100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**6**
	Introduction: Type of bridges & classification of road & railways bridges. IRC & Railway loadings for bridges, wind load & Earthquake forces. : Expansion joints.	
2	**Steel bridges**: Introduction to Design of through type &deck type steel bridges for IRC loading. Design of through type truss bridges for railway loadings.	**6**
3	**Bridges** T-beam bridges-courbons & Hendry-Jaegar methods.	**6**
4	**Reinforced concrete culverts:** Reinforced concrete slab culvert	**6**
5	**Bearings**: Bearings for slab bridges and girder bridges. Elastomeric bearings, design concepts as per IRC 83 (Part II).	**6**
	TOTAL	**30**

BT6CE07-CT07 (B): ROCK ENGINEERING

Credit:2 **Max. Marks: 100(IA:20, ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	
	Engineering Classification of Rocks: Objectives, Intact rock classification, Rock mass Classification. Terzaghi's, Rock load classification, Austrian classification, Deere's rock quality classification, rock structure rating concept, RMR classification, Q classification. Inter relation between Q and RMR.	**6**
2	**Engineering Properties and Laboratory Tests on Rocks:** Porosity, Density, Moisture content, Degree of saturation, Co-efficient of permeability, Durability, Compressive strength, Tensile strength, Shear strength, elasticity, Plasticity Deformability. Sampling and Samples Preparations, Uniaxial Compressive strength, Tensile Strength–Brazilian test, Shear strength test–Direct Shear test and Punch shear test, Triaxial Test, Flexural strength.	**6**
3	**In-situ Tests on Rocks**: Necessity of In-situ test, Plate load test for deformability, Field Shear test.	**6**
4	**Jointed Rocks:** Rocks Joint properties, Joint properties, Joint Roughness Co-efficient, Scale effects, Dilation, Orientation of Joints, Gouge, Joint Intensity, Uniaxial Compressive strength of Jointed Rocks.	**6**
5	**Strength of Rocks in Unconfined Condition**: Ramamurthy Strength Criteria, Singh and Rao Strength Criteria, Kulatilake Methodology, Barton Methodology. **Strength of Rocks in Confined Condition:** History of Hoek and Brown Failure Criterions, Parabolic Strength Criteria. **Bearing Capacity of Rocks:** Bearing capacity of intact rocks, jointed rocks, IS Code methodology, Singh and Rao Method and latest methodologies.	**6**
	TOTAL	**30**

BT6CE07-CT07 (C): GEOGRAPHIC INFORMATION SYSTEM & REMOTE SENSING

Credit:2 **Max. Marks: 100(IA:20,ETE:80)**

2L+0T+0P **End Term Exam: 2Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	6
	Photogrammetry: Definition of Photogrammetric Terms, Geometry of aerial and terrestrial photographs, Aerial camera and photo- theodolite, Scale of a Photograph, Tilt and Height displacements, Stereoscopic vision and stereoscopes, Height determination from parallax measurements, Flight planning, Maps and Map substitutes and their uses.	
2	**Remote Sensing:** Introduction and definition of remote sensing terms, Remote Sensing System, Electromagnetic radiation and spectrum, Spectral signature, Atmospheric windows.	6
3	Different types of platforms, sensors and their characteristics, Orbital parameters of a satellite, Multiconcept in Remote Sensing.	6
4	**Image Interpretation:** Principles of interpretation of aerial and satellite images, equipments and aids required for interpretation, ground truth – collection and verification, advantages of multidate and multiband images. Digital Image Processing concept.	6
5	**Geographic Information System(GIS):**Introduction & applications of GIS in map revision, Land use, Agriculture, Forestry, Archaeology, Municipal, Geology, water resources, Soil Erosion, Land suitability analysis, change detection.	6
	TOTAL	30

BT6CE08-CP01: Environmental Engineering Design and Lab

Credit:2 **Max. Marks: 100 (IA:40, ETE:60)**
0L+0T+3P **End Term Exam: 3Hours**

Design

1. Population forecasting and water demand
2. Water Quality parameters
3. Design of Sedimentation tanks, coagulation and flocculation tanks
4. Design of rapid and slow sand filters
5. Design of disinfection units and transmission systems
6. Design of Sewer lines and storm water systems
7. Design of aerobic and anaerobic treatment units
8. Design of suspended and attached growth systems

Lab.

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile, inorganic etc.
3. Alkalinity and acidity, Hardness: total hardness, calcium and magnesium hardness
4. Optimum coagulant dose
5. Chemical Oxygen Demand(COD)
6. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand(BOD)
7. Break point Chlorination
8. Bacteriological quality measurement: MPN

BT6CE09-CP02: Steel Structures Design

Credit:2 **Max. Marks: 100 (IA:40, ETE:60)**
0L+0T+3P **End Term Exam: 3Hours**

Analysis and design Problems as per different topics of syllabus of theory 6CE4-05, with latest version of IS 800 and other relevant IS codes. In addition to numerical problems, following exercises:

1. Case study of foot over bridges/truss- girder bridge in vicinity /home town of the students, preferably in groups of 8-10 students. A report including photographs marked with names and section details of different members in it (maximum limit of words:1000).
2. Case study of a structure using tubular sections or light gauge sections in vicinity /home town of the students, preferably in groups of 8-10 students. A report including photographs marked with names, size and section details of different members in it (maximum limit of words:1000).

BT6CE10-CP03: QUANTITY SURVEYING AND VALUATION

Credit: 1 **Max. Marks: 50 (IA:20,ETE:30)**
0L+0T+2P **End Term Exam: 2Hours**

Contents
1. Preliminary Estimate (Plinth Area and CubicContent) 2. Detailed Estimate of buildings (Long wall-Short wall and Centre linemethod) 3. Rate Analysis of different Items of Works (Earthwork, Concrete Work, DPC, Stone masonry, Brickwork, RCC, Roofing, Flooring, and Finishingetc.) 4. Earthwork Calculation for Roads, Irrigation Canals and Channels (cutting andfilling) 5. Valuation of Buildings andProperties

BT6CE11-CP04: WATER AND EARTH RETAINING STRUCTURES DESIGN

Credit:1 **Max. Marks: 50(IA:20, ETE:30)**

0L+0T+2P **End Term Exam: 2Hours**

Assignments/ Exercises on the following topics:	
SN	**CONTENTS**
1	**Continuous Beams:** Analysis and Design of continuous beams using coefficients (IS Code), concept of moment redistribution
2	**Curved Beams:** Analysis and design of beams curved in plan.
3	**Circular Domes:** Analysis and design of Circular domes with u.d.l. & concentrated load at crown.
4	**Water Tanks and Towers:** Water Tanks and Water Towers-design of rectangular, circular and Intze type tanks, column brace type staging.
5	**Retaining walls:** Analysis and design of Cantilever Retaining Walls: Introduction to counter fort and buttress type retaining walls, their structural behaviour and stability analysis.

BT6CE12-CP05: FOUNDATIONENGINEERING

Credit:1 **Max. Marks: 50(IA: 20, ETE:30)**
0L+0T+2P **End Term Exam: 2 Hours**

1. Design of isolated shallow footings, combined footings, raft foundations.
2. Design of pile foundations.
3. Design of wells and cassions.
4. Design of machine foundation.
5. Design of retaining structures etc

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Semesters VII

Syllabus

BT7CE01-CT01: Transportation Engineering

Credit 3 **Max. Marks: 150 (IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course **Highway planning and alignment:** Different modes of transportation – historical Development of road construction- Highway Development in India –Classification of roads- Road pattern – Highway planning in India- Highway alignment - Engineering Surveys for alignment – Highway Project- Important Transport/Highway related agencies In India. PMGSY project. Introduction about IRC, NRRDA	**8**
2	**Geometric Design of highways:** The highway crosses sectional elements- Camber-Sight Distance - Types of sight distances -Design of horizontal alignments - Super elevation, Widening of Pavements on horizontal curves- transition Curves- Design of Vertical alignments – Gradients- summit and Valley Curves- Recommendations of IRC Codes of Practice. **Design of flexible and rigid pavements as per IRC:** IRC provisions including those of IRC 37, IRC 58	**8**
3	**Highway Materials:** Desirable Properties, Testing Procedures, Standards and standard values relating to Soil, Stone Aggregates, Bitumen and Tar, fly- ash/pond-ash. Role of filler in Bituminous mix, materials of filler. Specifications of DLC and PQC for rigid pavement	**8**
4	**Highway Construction and Equipments:** Methods of constructing different types of roads viz. Earth roads, Stabilized roads, WBM, WMM roads, earthen embankments, DLC and embankments with fly ash. Bituminous roads and Concrete roads. Berms and Shoulders, Features of rural roads including those in PMGSY. Hot mix plant for Bituminous roads- components, layout, control panel, quality assurance. Highway construction of rigid and flexible pavements including types of road rollers, specifications of compact ion of different layers of bituminous roads, modern pavers for CC roads. Roller compacted concrete road construction	**8**
5	**Introduction of Railway Engineering:** Types and Selection of Gauges, Selection of Alignment, Ideal Permanent Ways and Cross- sections in different conditions, Drainage, Salient Features and types of Components viz. Rails, Sleepers, Ballast, Rail Fastenings. **Introduction of Airports and Harbours: Airport Engineering: -** Introduction: Requirements to Airport Planning, Airport Classifications, Factors in Airport Site Selection, Airport Size. Planning of Airport: Requirements of Airport- Terminal Area, Runway Length etc. **Harbours:** history of water transportation, modern trends in water transportation, components of harbour, classification of harbours. Ports and docks.	**8**
	Total	**40**

BT7CE03-CP01: Road Material Testing Lab

Credit 1 **Max. Marks: 50(IA:20, ETE:30)**

0L+0T+2P

1. **Aggregate Impact Test**
2. **To determine the Angularity Number, Flakiness Index & Elongation Index of aggregates**
3. **Los Angeles Abrasion Test**
4. **Aggregate Crushing Value Test**
5. **Standard Tar Viscometer Test for given bitumen sample**
6. **Ductility Test for a given bitumen sample**
7. **To determine the softening point for given sample of bitumen.**
8. **Marshall Stability Test**
9. **Float Test**
10. **Preparation of Dry lean concrete mix and testing of its strength**

BT7CE04-CP02: Professional Practices and Field Engineering Lab

Credit 1 **Max. Marks: 50(IA:20, ETE:30)**

0L+0T+2P

1. **Different types of Knots**
2. **Site plan, index plan, layout plan, plinth area, floor area of buildings**
3. **Foundation plan layout infield**
4. **Bar bending schedule**
5. **Specifications- For different classes of building and Civil Engineering works**
6. **Specifications of building components**
7. **Valuation of buildings and properties**
8. **Work at heights – scaffolding and ladders use, type of scaffolds, safety requirements, design and load factors, defects and inspection norms, type of ladders, upkeep, defects and good maintenance tips**

BT7CE06-CP04: Environmental Monitoring and Design Lab

Credit 1 **Max. Marks: 50(IA:20, ETE:30)**

0L+0T+2P

Design:

1. Sewer design and estimation of Waste/Storm water by software.
2. Design of Water Treatment Plant and Sewage Treatment Plant
3. Design of Oxidation pond, stabilization pond and aerated lagoons.
4. Design of aerobic and anaerobic digester.

Lab:

1. Demonstration of air pollution monitoring instruments namely, High volume sampler
2. Determination of SPM, $PM_{10}$and$PM_{2.5}$.
3. Demonstration of noise pollution monitoring equipment namely, modular precision sound level meter.
4. Air quality monitoring for Traffic/Residential locality and its effect on the environment.
5. Noise quality monitoring for Traffic/Residential locality and its effect on the environment.
6. Latest technology for management of municipal solid waste, e-waste, bio-medical waste and their prevalent rules and regulations.

BT7CE05-CP03: Soft Skills Lab

Credit 1 **Max. Marks: 50(IA:20, ETE:30)**

0L+0T+2P

SOFT SKILLS- Introduction to Soft Skills, Aspects of Soft Skills, Identifying your Soft Skills, Negotiation skills, Importance of Soft Skills, Concept of effective communication. SELF-DISCOVERY- Self-Assessment, Process, Identifying strengths and limitations, SWOT Analysis Grid.

PREPARING CV/RESUME – Introduction, meaning, difference among bio-data, CV and resume, CV writing tips. Do's and don'ts of resume preparation, Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

INTERVIEW SKILLS - Introduction. Types of interview, Types of question asked, Reasons for rejections, Post-interview etiquette, Telephonic interview, Dress code at interview, Mistakes during interview, Tips to crack on interview, Contextual questions in interview skills, Emotional crack an interview, Emotional intelligence and critical thinking during interview process.

DEVELOPING POSITIVE ATTITUDE – Introduction, Formation of attitude, Attitude in workplace, Power of positive attitude, Examples of positive attitudes, Negative attitudes, overcoming negative attitude and its consequences,

IMPROVING PERCEPTION- Introduction, Understanding perception, perception and its application in organizations.

CAREER PLANNING – Introduction, Tips for successful career planning, Goal setting immediate, short term and long term, Strategies to achieve goals, Myths about choosing career.

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

TIME MANAGEMENT: The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to prioritize using decision matrices, to beat the most common time wasters, how to plan ahead, how to handle interruptions , to maximize your personal effectiveness, how to say "no" to time wasters, develop your own individualized plan of action.

STRESS MANAGEMENT – Introduction, meaning, positive and negative stress, Sources of stress, Case studies, signs of stress, Stress management tips, Teenage stress. Group discussion practice on current topics, Quantitative aptitude and reasoning preparation.

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Semesters VIII

Syllabus

BT8CE01-CT01: Project Planning and Construction Management

Credit 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3Hours**

SN	Course Content	Hours
1	**INTRODUCTION:** Objective, scope and outcome of the course **FINANCIAL EVALUATION OF PROJECTS AND PROJECT PLANNING:** Capital investment proposals, criterions to judge the worthwhile of capital projects viz. net present value, benefit cost ratio, internal rate of return, Risk cost management, main causes of project failure. Categories of construction projects, objectives, project development process, Functions of project management, Project management organization and staffing, Stages and steps involved in project planning, Plan development process, objectives of construction project management.	**8**
2	**PROJECT SCHEDULING:** Importance of project scheduling, project work breakdown process – determining activities involved, work breakdown structure, assessing activity duration, duration estimate procedure, Project work scheduling, Sequence of construction activities, Project management techniques – CPM and PERT networks analysis, concept of precedence network analysis.	**8**
3	**PROJECT COST AND TIME CONTROL:** Monitoring the time progress and cost controlling measures in a construction project, Time cost trade-off process: direct and indirect project costs, cost slope, Process of crashing of activities, determination of the optimum duration of a project, updating of project networks, resources allocation.	**8**
4	**CONTRACT MANAGEMENT:** Elements of tender operation, Types of tenders and contracts, Contract document, Legal aspects of contracts, Contract negotiation & award of work, breach of contract, determination of a contract, arbitration.	**8**
5	**SAFETY AND OTHER ASPECTS OF CONSTRUCTION MANAGEMENT:** Safety measures to be followed in various construction works like excavation, demolition of structures, explosive handling, hot bitumen work. Project Management Information System – Concept, frame work, benefits of computerized information system. Environmental and social aspects of various types of construction projects.	**8**
	Total	**40**

BT8CE03-CP01: Project Planning and Construction Management Lab

Credit 1 **Max. Marks: 50(IA:20, ETE:30)**

0L+0T+2P

1. Assignments on net present value, benefit cost ratio, internal rate of return
2. Types of contracts – Tenders, tender form, submission and opening of tenders, measurement book, muster roll, piecework agreement and work order.
3. Drafting of tender documents, special terms and conditions
4. Drafting of tender notices for different types of works
5. Different models of PPP like BOT, BOOT etc.
6. Arbitration
7. Preparation of bar diagram
8. Network Analysis using PERT and CPM

BT8CE04-CP02: Pavement Design

Credit 1 **Max. Marks: 50(IA:20, ETE:30)**

0L+0T+2P

1. **Pavement Mix Analysis**: Aggregate blending, bituminous mix design – Marshall Stability approach, concrete mix design for DLC and PQC with IS code provisions.
2. **Pavement Basics:** Types & comparison, vehicular loading pattern, factors affecting design and performance of pavements, sub grade requirements.
3. **Design of Flexible Pavements**: Analytical approach, flexible pavement layers, ESWL, repetitions of load, techniques of design methods, wheel load analysis, traffic analysis, stress distribution in sub grade soil, Burmister's theories, group index method, CBR approach, IRC 37 and other guidelines.
4. **Design of Concrete Pavements**: Westergaard's approach, temperature & frictional stresses, design of expansion & longitudinal joints, design of dowel & tie bars, IRC 58 and other guidelines.
5. **Specifications for rural roads:** Important aspects of IRC SP 020, Rural Road Manual. NRRDA publications