## SCHEME OF INSTRUCTION AND EVALUATION
### I SEMESTER OF II YEAR OF 4-YEAR B.TECH. DEGREE PROGRAMME

### CIVIL ENGINEERING

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course</th>
<th>Periods of Instruction per week</th>
<th>Evaluation Scheme</th>
<th>Total Marks</th>
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<td>Tutorial</td>
<td>Drawing/Practicals</td>
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<td>Mathematics – II</td>
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<td>Fluid Mechanics – I</td>
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<td>ME 216</td>
<td>Mechanical Technology</td>
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<td>Electrical &amp; Electronics Engineering</td>
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<td>CE 217</td>
<td>Material Testing Laboratory</td>
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UNIT – I

1. COMPLEX INTEGRATION: (8 +3)
   Line integration in complex plane, Cauchy’s integral Theorem, Cauchy’s integral formula. Series expansion of complex functions: Taylor’s series and Laurent’s series, Zeros and singularities. Residues- Residue Theorem- evaluation of real integrals using Residue Theorem (contours of the type semi circle and circle only)

UNIT – II

2. LAPLACE TRANSFORMS: (8+3)

UNIT – III

3. FOURIER SERIES: (8+3)
   Expansion of a function as Fourier series for a given range- Fourier series of even and odd functions- Half range cosine and sine series expansions.

UNIT – IV

4. PARTIAL DIFFERENTIAL EQUATIONS: (12+3)
   Solution of wave equation, Heat flow equation, and Laplace equation by the method of separation of variables and problems of vibrating string. One dimensional unsteady heat flow, two dimensional steady state heat flow (Problems based on Fourier-Trigonometric series only

TEXT BOOK:

REFERENCE BOOKS:
UNIT – I

1. CONCEPTS OF STRESS AND STRAIN: (9+3)
   Simple stress, Types of stresses, Strain, Stress – Strain diagram, Elastic limit, Hooke’s law, Bars of varying sections, Uniformly tapering circular and rectangular sections, Elongation of bars due to self weight, Temperature stresses in uniform bars, Stresses due to lack of fit, Statically indeterminate problems, Elastic constants, Longitudinal strain, Lateral strain, Poisson’s ratio, Complimentary shear stress, State of simple shear, Modulus of elasticity (E), Modulus of rigidity (N), Bulk modulus (K), Relation between E, N & K, St. Venant’s principle, Strain energy, Resilience, Impact loading, Analysis of stresses: Principal stresses and their graphical representation by Mohr’s circle, Analysis of thin walled pressure vessels.

UNIT – II

2. SHEAR FORCE AND BENDING MOMENT: (9+3)
   Types of supports – Classification of beams – Concept of shear force and bending moment – SFD and BMD for simply supported, Cantilever and overhanging beams – Loading from shear force and bending moment diagram – Principle of superposition.

UNIT – III

3. THEORY OF SIMPLE BENDING: (5+2)
   Assumptions – Theory of simple bending – Application of bending equation and calculation of bending stresses in beams of homogeneous and Flitched beam material – Beams of Uniform strength.

4. SHEAR STRESS DISTRIBUTION: (4+1)
   Shearing stress variation (Equation) – Flexural shear stress distribution in various shapes of cross section of beams, shear resilience

UNIT – IV

5. TORSION OF CIRCULAR SHAFTS AND SPRINGS: (6+2)
   Close-coiled and open-coiled helical spring subjected to axial load and axial twist – springs in series – springs in parallel – strain energy in springs. Theory of pure torsion in solid and hollow circular shafts (Equation) – Shear stresses and angle of twist – Power transmitted by shaft.

6. THEORIES OF FAILURE: (3+1)
   Maximum principal stress theory – Maximum principal strain theory – Maximum shear stress theory – Strain energy theory – Shear strain energy theory – Applications to shafts under the action of combined bending and torque.

TEXT BOOKS

REFERENCES
CE 213 – BUILDING MATERIALS AND CONSTRUCTION

Class: II/IV B.Tech. I Semester
Branch: Civil Engineering
Duration of University Examination: 3 Hours
Lectures: 3
University Exam: 100 Marks
Sessionals: 50 Marks

BUILDING MATERIALS

UNIT – I

Introduction: Identification of materials for construction in Civil Engineering practice – Physical and Mechanical properties of building materials.


UNIT – II


UNIT – III

BUILDING COMPONENTS:


UNIT – IV

BUILDING CONSTRUCTION:


TEXTBOOKS:

REFERENCES:
6. Relevent IS Codes of Practice
UNIT – I

1. INTRODUCTION: (3+1)
   Fluid fundamentals; Concept of continuum; Fluid properties; Density; Specific weight, Viscosity, Pressure, Temperature, Compressibility, Surface tension, Cohesion and adhesion.

2. FLUID STATICS: (6+3)
   Equilibrium of fluid of constant density and variable density; Pressure at a point; Measurement of pressure; Principle of manometry, Simple applications; Sensitive manometers; Pressure gauges; Hydrostatic forces on submerged plane and curved surfaces; Center of pressure; Buoyancy; Archimedes principle; Meta centre; Stability of floating & Submerged bodies.

UNIT – II

3. FLUID KINEMATICS: (5+2)
   Classification of flow – steady and unsteady, uniform and non uniform, one, two and three dimensional flow, laminar and turbulent flow; Streamline, path line and streak line; stream tube; Acceleration of fluid particle; Continuity equation in one, two and three dimensional flow; Circulation and vorticity; Rotational; and irrotational flow; Conditions for irrotational flow; Velocity potential, stream function and flow net.

4. FLUID DYNAMICS: (7+3)
   Forces causing motion-Euler’s equation of motion and its integration; Bernoulli equation for ideal and real fluids; Engineering applications of Bernoulli equation; Linear momentum equation; Application of Linear momentum equation to forces on vanes, pipe bends, pipe expansion etc., Flow measurements-Pitot tube, Orifices, Mouthpieces, Flow through Notches and Weirs, Venturimeter and Orificemeter.

UNIT – III

5. DIMENSIONAL ANALYSIS AND SIMILITUDE: (5+1)
   Dimensions and dimensional homogeneity; Dimensional analysis by Reyleigh’s and Buckingham’s $\pi$-Theorums; Dimensionless numbers; Similitude studies and Modelling.

UNIT – IV

6. PIPE FLOW: (5+1)

7. LAMINAR FLOW: (5+1)
   Reynold’s experiment; Critical velocity; Steady laminar flow; One dimensional flow through a circular tube, Flow between fixed parallel plates. Stokes law; Measurement of viscosity by rotational viscometers – Navier Stokes equations of motion for laminar flow.

TEXT BOOKS

REFERENCES
LIST OF EXPERIMENTS:

2. Calibration of Rectangular Notch / Trapezoidal Notch
3. Calibration of sharp edged circular orifice (Both steady and unsteady flows).
4. Calibration of mouthpieces (external) (Both steady and unsteady flows).
5. Verification of Bernoulli’s theorem.
7. Losses in pipe lines due to sudden enlargements and sudden contractions.
8. Losses in pipe lines due to bends and elbows.
10. Analysis of performance of Nozzle meter and Rotameter.

REFERENCES:

ME 216 – MECHANICAL TECHNOLOGY

Class: II/IV B.Tech. I Semester
Branch: Civil Engineering
Duration of University Examination: 3 Hours

Lectures: 3; Tutorials: 1
University Exam: 100 Marks
Sessionals: 50 Marks

UNIT – I

1. FUNDAMENTAL CONCEPTS: (4+1)

2. FIRST LAW OF THERMODYNAMICS: (6+2)
   First law, Applications to closed systems, Internal energy, Applications to open systems, Enthalpy, SFEE and applications, Processes of closed systems, Isobaric, Isochoric, Isothermal, Adiabatic and Polytropic.

UNIT - II

3. SECOND LAW OF THERMODYNAMICS: (4+1)
   Limitations to first law, Statements of second law and their equivalence, Carnot cycle, Carnot theorem, Heat engine, Heat pump and Refrigerator.

4. THERMODYNAMIC CYCLES: (5+1)
   Classification of IC Engines, Working and comparison of two and four stroke SI & CI engines, Analysis of otto and diesel cycles, Simple vapour refrigeration cycle.

UNIT - III

5. HEAT TRANSFER: (5+2)
   Modes of heat transfer, Conduction, Fourier law, One dimensional steady state heat conduction through plain and composite walls, Convection, Newton’s law of cooling, Free and forced convection, Overall heat transfer coefficient, Radiation, Steffan Baltzman’s law, Absorption, Reflection and transmission, Emissive power, Emssivity, Kirchoff law Black body concept.

6. STEAM GENERATORS: (3+1)
   Classification of steam boilers, Construction and working of Lancashire, Babelock wilcore and sterling boilers, Compaction of water tube and fire tube boilers.

UNIT - IV

7. WELDING PROCESS: (2+1)
   Introduction, Gas Welding, Gas flames, Flame cutting, Electric Arc Welding, Thermite Welding, Brazing and Soldering.

8. FOUNDERY PRACTICE: (2+1)
   Patterns, Allowances, Moulds, Moulding materials, casting methods, Merits & Limitations.

9. FUNDAMENTALS OF MATERIAL HANDLING & POWER TRANSMISSION: (3+1)
   Types of power transmission, Merits & Demerits, Fundamentals of materials handling, Selection of material handling equipment.

10. BEARINGS, COUPLINGS AND LUBRICATIONS: (2+1)
    Types of bearings and couplings, Anti friction bearings. Lubrication, laws of friction for dry and lubricated surfaces, Method of lubrication of bearings.

TEXT BOOKS:
UNIT – I
(9+3)
1. D.C. CIRCUITS:
Ohm’s Law, Network Elements, Kirchoff’s Laws, Source Transformation, Mesh and Nodal Analysis, Star-Delta Transformation, Superposition, Thevenin’s, Norton’s and Maximum power transfer theorems for D.C. Circuits.

UNIT – II
(9+3)
2. A.C. CIRCUITS:
Phasor representation, Average, R.M.S. values and Form factor, A.C. through Resistor, Inductor and Capacitor, Analysis of R-L-C series and parallel circuits, Power factor, Power triangle. Voltage & Current relations of line and phase values for star and delta connections.

UNIT – III
(9+3)
3. D.C. MACHINES:
Constructional features, Types of D.C. machines, Operating principle of D.C. generator and D.C motor, E.M.F. equation, Torque equation.

UNIT – IV
(9+3)
4. TRANSFORMERS:
Constructional features, Operating principle, E.M.F. equation, Transformation ratio.

UNIT – III
(9+3)
5. SEMICONDUCTOR DIODES:
P-N junction, V-I characteristics of diode, Temperature dependence of V-I characteristics, Break down of junctions—zener and avalanche—Diode as a rectifier, Half wave rectifier, Full wave center tapped rectifier, Full wave Bridge rectifier.

UNIT – IV
(9+3)
6. TRANSISTORS:
PNP and NPN transistor, Symbols and diode equivalent of transistor, Transistor current components, CE, CB, CC characteristics, Comparison of three configurations.

7. DIGITAL CIRCUITS:
Logic gates and its truth tables, NAND and NOR as Universal gates, R-S Flip Flop, J-K Flip Flop, Concept of Raced Around condition, Master slave JK Flip Flop, D-Flip Flop & T-Flip Flops.
Block diagram of 8085 microprocessor.

TEXT BOOKS
1. Vincent Del Toro “Principles of Electrical Engineering”, PHI.

REFERENCES
2. Shalivahana, “Electronic Devices and Circuits”, TMH.
LIST OF EXPERIMENTS:

1. Stress – strain characteristics of (a) Mild steel and (b) Tor steel (UTM 40 tonnes).
2. Stress – Strain characteristics of (i) Copper and (ii) Aluminum (Hounse field Tensometer)
4. Determination of the Brinell’s and Vicker’s hardness numbers of the following materials –
   (a) Steel   (b) Brass   (c) Aluminum
5. Determination of the modulus of rigidity by conducting Torsion test on (a) Solid shaft and (b) Hollow shaft.
6. Determination of the stiffness and modulus of rigidity by conducting compression test on Springs.
7. Determination of the Young’s modulus of the given material by measuring deflection in Simply Supported Beam.
   (a) Wood   (b) Steel   (c) Brass
8. Determination of the Young’s modulus of the given material by measuring deflection in continuous beam.
   (a) Steel   (b) Brass   (c) Aluminum
9. Determination of the Young’s modulus of the given material by measuring deflection in propped cantilever beam
   (a) Steel   (b) Brass
10. Ductility test for steel.
11. Shear test for Mild steel rods.
12. Impact test on Metal Specimens.
    (a) Izod test   (b) Charpy test

REFERENCES:
# Scheme of Instruction and Evaluation

**II Semester of II Year of 4-Year B.Tech. Degree Programme**

## Civil Engineering

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<th>Practicals/Drawing</th>
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| Total      | 15 | 3  | 12 |                  |                   | 1050         |

The total marks for the semester are 1050.
UNIT – I

1. MATRICES:
   (8+3)
   Rank of matrix-Solution of system of linear equations-linear dependence and independence of vectors-Characteristic roots and characteristic vectors of a matrix-Cayley Hamilton’s Theorem (without proof) – Reduction of a matrix to diagonal form and normal form – Reduction of a quadratic form to canonical form.

UNIT – II

2. PROBABILITY & STATISTICS:
   (12+4)

UNIT – III

3. NUMERICAL ANALYSIS:
   (8+3)
   Interpolation – Newton’s and Lagrange’s formulae.

4. NUMERICAL DIFFERENTIATION AND INTEGRATION:

UNIT-IV

5. SOLUTION TO SYSTEM OF LINEAR EQUATIONS:
   (8+3)
   Jacobi, Guass Siedel Iteration Method – Solution of algebraic and transcendental equations – Bisection method, Regula-Falsi method and Newton Raphson’s method.

6. NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:
   Taylor’s method, Picard’s method, Euler’s method and Runge-Kutta methods of second and fourth order.

TEXT BOOK:


REFERENCE BOOKS:

UNIT – I

1. INTRODUCTION: (4)
   Definition, Principles of surveying; Classifications of surveys; Maps and Plans.

2. LINEAR MEASUREMENTS: (4)
   Chains, Tapes, EDMS; Relation between scale and accuracy; Definitions; Correction to
   lengths by tapes and EDMS.

UNIT – II

3. ANGLES AND DIRECTIONS: (10)
   Meridians; Bearings and their interrelationships; Advantages of angle measurements in
   horizontal and vertical planes compared to space angles; Theodolite; Organisation; Horizontal
   angle measuring sub system; Vertical angle measuring sub system; Errors and adjustment of
   Theodolite; Theodolite surveys; Heights and Distances; Traverse surveys; Plane co – ordiates;
   Descriptions; Computation; Adjustment of traverse surveys.

UNIT – III

4. MEASUREMENTS IN VERTICAL PLANE: (10)
   Spirit levelling; Definitions; Levelling surface; Horizontal and vertical planes; Limitations;
   Levelling instruments.
   Historic sequence resulting in gradual elimination of axes and adjustments; Methods of
   levelling and booking.

UNIT – IV

5. CONTOURS: (4)
   Definitions; Characteristics; Uses; Methods and interpretation.

6. MINOR INSTRUMENTS: (4)
   Field instruments; Abney level; Delisle clinometer; Tangent clinometer; Box sextant.
   Office instruments: Planimeter, Pentagraph, Ediograph.

TEXT BOOKS


REFERENCES

   Prakashan, Pune.
UNIT – I

1. **DEFLECTION OF BEAMS:**  
   (5+2)  

2. **STRAIN ENERGY:**  
   (4+2)  
   Strain energy of beams in bending – Deflection of beams from strain energy – Unit load method – Castigliano’s theorem No.1 – Application to deflection of determinate plane truss – Muller Breslau principle

UNIT – II

3. **DIRECT AND BENDING STRESSES:**  
   (4+1)  
   Stresses in a member subjected to axial load – eccentric loads (about both the axes) – Core or Kernel of a section – Wind pressures on chimneys.

4. **THEORY OF LONG COLUMNS:**  
   (5+1)  
   Euler’s theory – Euler’s critical load for columns with various end conditions – Limitations for the use of Euler’s formula – Rankine’s hypothesis – IS code formula – critical load of eccentrically loaded columns.

UNIT – III

5. **FIXED AND CONTINUOUS BEAMS:**  
   (5+3)  

6. **STATICALLY INDETERMINATE FRAMES:**  
   (4+1)  
   Application of Castigliano’s theorem (up to two degree of indeterminacy).

UNIT – IV

7. **THICK CYLINDERS:**  
   (5+1)  
   Lame’s theory – Stresses in cylinders subjected to internal land external pressure – compound cylinders - shrink fitting.

8. **UNSYMMETRICAL BENDING:**  
   (4+1)  
   Introduction, product of inertia, stress due to unsymmetrical bending, deflection of beams due to unsymmetrical bending, shear center, concept of shear center.

TEXT BOOKS


REFERENCES

UNIT – I

1. TURBULENT FLOW IN PIPES: (9+3)
   Characteristics of Turbulent flow; Shear stress due to turbulence, Reynolds stresses; Prandtl’s mixing length theory; Universal velocity distribution law near a solid boundary; Smooth and rough boundaries; Nikuradse’s experiments; Karman – prandtl resistance equations; Resistance of commercial pipes; Moody chart; Expressions for friction factor in different regimes; Energy losses in pipe lines; Minor losses; Reservoir problems; Pipe networks; Power transmission through pipes; Water hammer; Expression for pressure rise considering elasticity of pipe and fluid; Pressure relieving devices.

UNIT – II

2. BOUNDARY LAYER THEORY, DRAG AND LIFT FORCES: (9+3)
   Concept of boundary layer; Boundary layer growth over a flat plate; Boundary layer thickness; Displacement thickness, momentum thickness and energy thickness; laminar and turbulent boundary layers; Integral momentum equation for boundary layer; Separation of boundary layer and its control; Drag and lift forces on bodies – sphere, cylinder.

UNIT – III

3. FLOW THROUGH OPEN CHANNELS: (9+3)
   Distinction between pipe flow and channel flow; Classification of flow; Manning’s and Chezy’s equations; most economical cross sections; Velocity distribution; Critical depth; Condition for critical flow, specific energy, channel transitions; Broad crested weir, equation of gradually varied flow; Classification of surface profiles; Rapidly varied flow; Hydraulic jump, its characteristics.

UNIT – IV

4. HYDRAULIC MACHINES: (9+3)
   Introduction; Classification of Turbines – Impulse and Reaction; Essential components of Pelton, Francis, Propeller and Kaplan turbines; Calculation of angles, Velocity diagrams; dimensions, discharge, power similitude etc., Specific speed; Draft tube theory; Cavitation; Performance curves, Selection of turbines. Centrifugal pump; Head of pump; Expression for pressure rise; Simple problems; Net positive suction head; Cavitation in pumps; Performance curves; Series and parallel operation of pumps. Reciprocating pumps; Construction; Indicator diagram; Expressions for acceleration head and frictional head; Use of air vessels; Work done; Power saved in using air vessels.

TEXT BOOKS

REFERENCE BOOKS
UNIT - I

1. GENERAL GEOLOGY: (4)
   Branches and scope of geology - Surface futures and internal structure of earth - Weathering and its end products - A general study of the landforms.

2. MINERALOGY: (5)
   Definition of crystal and mineral - the study of the physical properties and occurrence of quartz and its varieties, feldspar, augite, hornblende, olivine, mica, granite, kyanite, calcite, talc, bauxite, corundum, gypsum, flourite, apatite and important ore minerals.

UNIT - II

3. PETROLOGY: (8)
   Formation and classification of rocks, texture & structure - Physical properties of rocks for constructional purposes - Engineering properties of rocks - Tests for rocks as building stone, aggregates, foundation stone - Dimensional & ornamental rocks.

UNIT - III

4. STRUCTURAL GEOLOGY: (4)
   Structural features like stratification, lamination, bedding planes, dip, strike, faults, folds schirrosity joints and their measurements - Unconformititives, overlaps, inliers, outliers - Importance of structures in Civil Engineering activities.

5. NATURAL HAZARDS: (3)
   Causes and effects of earthquakes and landslides - Remedial measures to prevent damage to engineering structures, causes and remedial measures of soil erosion.

6. GEOLOGICAL AND GEOPHYSICAL INVESTIGATIONS: (6)
   Interpretation of geological maps - Use of aerial maps and remote sensing imageries in natural resources surveying - Geological methods as applied to Civil Engineering for subsurface analysis.

UNIT - IV

7. DAMS: (4)
   Types of dams - Requirement of dam sites, reconnaissance - Preliminary and detailed geological investigations for a dam site. Geology of the major dam sites of India - Leakage and silting of reservoirs - remedial measures.

8. TUNNELS: (2)
   Purpose of tunneling and geological problems connected with tunnelling - Geothermal step, overbreak, logging of tunnel and its necessity.

TEXT BOOKS

REFERENCES
3. Legget, Engineering Geology.
CE 226  COMPUTER AIDED BUILDING DRAWING

Class: II/IV B.Tech. II Semester  Practical: 3
Branch: Civil Engineering    University Exam: 50 Marks
Duration of University Examination: 3 Hours    Sessionals: 25 Marks

3. Development of plan, Section and Elevation.
5. Planning of Public Buildings – Minimum space requirements for Bank, Post Office, School, and Dispensary etc.
6. Various types of doors, windows and ventilators.
7. Details of a Staircase.
8. Pitched Roof Construction – King Post Truss and Queen Post Truss.

MANUAL & COMPUTER AIDED DRAWINGS

1. Conventional signs.
2. Development of plan from line diagram.
3. Plan, Section and Elevation of Residential Building with Unrestricted Plinth Area.
4. Plan, Section and Elevation of Residential Building with Restricted Plinth Area.
5. Drawing of various types of Doors, Windows and Ventilators.
6. Plan of School Building and Dispensary.
7. Plan of Bank and Post Office.
9. Section and Elevation of a Staircase
12. Plan of a Residential Building with split level.

REFERENCES

LIST OF EXPERIMENTS

1. Identification of Minerals.
2. Identification of Igneous rocks.
3. Identification of Sedimentary rocks.
4. Identification of Metamorphic rocks.
5. Visual Interpretation of APs and RS imagery.
7. Study of geological maps: Bed thickness determination, and structural features.
8. Demonstration of working of field model of geophysical exploration technique.
LIST OF EXPERIMENTS

1. Determination of Rugosity coefficient in smooth and rough channels.
2. Study of hydraulic jump characteristics.
3. Study of flow through a Venturi flume and Standing wave flume.
4. Determination of Coefficient of discharge of Proportional weir.
5. Study of forces due to impact of jet on a surface.
10. Analysis of performance of Francis Turbine.
12. Study of Phenomenon of water hammer in pipes.

REFERENCES:

CE 229 – SURVEY FIELD WORK - I

Class: II/IV B.Tech. II Semester  
Branch: Civil Engineering  
Duration of University Examination: 3 Hours

Practicals: 3  
University Exam: 50 Marks  
Sessionals: 25 Marks

LIST OF EXPERIMENTS:

2. Chain Surveying: Use of Optical square/Cross staff, Check line, Tie line.
3. Horizontal Angle measurement by theodolite – Repitation and Re-iteration methods.
4. Determination of distance between inaccessible points by theodolite.
5. Closed traversing by Fixed Needle method.
6. Vertical angle measurement by single and double plane methods.
7. Levelling – Temporary adjustments and taking readings.
8. Fly levelling.
9. Profile levelling
10. Longitudinal and cross section exercises – 2 turns.
11. Block levelling
12. Plotting exercises on levelling, measurement with chain and theodolite – 2 turns.
13. Minor instruments for field and office use.

REFERENCES:

## SCHEME OF INSTRUCTION AND EVALUATION
### I SEMESTER OF III YEAR OF 4-YEAR B.TECH. DEGREE PROGRAMME
#### CIVIL ENGINEERING

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<tr>
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<th>Periods of Instruction per week</th>
<th>Scheme of Evaluation</th>
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</table>

The total marks are calculated based on the number of lectures, tutorials, and drawing/practicals, with the final marks being the sum of sessionals and external evaluations.
UNIT – I

ECONOMICS:

FACTORS OF PRODUCTION:

UNIT – II

MANAGEMENT:
Meaning and Definition, Scope of Management, Principles of Management, Scientific Management: Definition, Characteristics and Criticism.

FUNCTIONS OF MANAGEMENT:

UNIT – III

STAFFING:
Meaning and Functions of Personnel Management, Coordination: Definition, how to achieve Effective Coordination, Controlling: Definition and Process.

UNIT – IV

DOUBLE ENTRY BOOK – KEEPING:
Definition, Journalization of Transactions, Ledger Posting and Balancing, Preparation of Trial Balance.

PREPARATION OF FINAL ACCOUNTS:
Trading Account, Profit and Loss Account and Balance Sheet (with simple adjustments).

REFERENCES
UNIT – I

1. SLOPE DEFLECTION METHOD: (6+2)
   Development of SD equations, sign convention, construction of bending moment diagram,
   Analysis of continuous beams, rectangular portal frames, effect of yielding and sinking of
   supports, frames with side sway, Principles of symmetry.

UNIT – II

2. MOMENT DISTRIBUTION METHOD: (7+2)
   Introduction, distribution and carry over factors, Application to continuous beams, sinking and
   yielding of supports, portal frames, frames with side sway, Box culverts, symmetry principles.

UNIT – III

3. KANI’S METHOD: (5+2)
   Introduction, application to portal frames, frames with sway, Multi - storied frames, One bay-
   two storied structures, symmetry principles.

4. APPROXIMATE ANALYSIS OF MULTI STORIED FRAMES: (6+2)
   Substitute frame method, portal method and cantilever method.

UNIT – IV

5. MOVING LOADS: (6+2)
   Max. BM and SF diagrams for simple beams traversed by single point load, a pair of point
   loads, uniformly distributed load shorter and longer than the span, System of point loads,
   Absolute maximum bending moment and absolute maximum shear force enveloping parabola
   and equivalent UDL.

6. INFLUENCE LINE DIAGRAMS: (6+2)
   Influence line diagram for support reaction, bending moment and shear force for simple and
   over hanging beams, for girders with cross beams, ILD for stresses in members for warren
   girder and Pratt truss with sloping shed, for deck and trough type bridges, focal length and
   counter bracing.

TEXT BOOKS
   Delhi, India.

REFERENCES
2. Ramamrutham, Theory of Structures, Dhanpatrai and Sons, New Delhi
UNIT – I
LIMIT STATE DESIGN

1. **Fundamentals:** Introduction to reinforced cement concrete - Loads on structures - Methods of design - Code of practice - Stress-strain curves of concrete, Mild steel and Tor steel - Grades of concrete as per IS 456 - Characteristic loads and strengths - Partial safety factors.  
   
   (3+2)

2. **Limit State of Collapse in Flexure:** Analysis and design of Beams - singly and doubly reinforced rectangular and flanged-sections.  
   
   (7+6)

UNIT – II

3. **Analysis and design for limit state of collapse:** Shear, torsion and development length.(4+2)

4. **Limit state of serviceability** – Check for Deflection  
   
   (2+2)

5. **Design of one way and two way slabs as per IS code.**  
   
   (4+2)

UNIT – III

6. **COLUMNS AND FOOTINGS:**  
   Axially loaded rectangular columns, circular columns with lateral tier and helical reinforcement -- Uni-axial and eccentrically loaded columns. **Footings:** Design of isolated footing for axially loaded columns, Design of combined rectangular footings.  
   
   (8+4)

UNIT – IV

WORKING STRESS METHOD OF DESIGN

7. Design Principles - Under reinforced, balanced and over-reinforced beams - Analysis and design of rectangular beams - Design for shear  
   
   (8+6)

TEXT BOOKS


REFERENCES


UNIT - I

1. **INTRODUCTION:** (2+0)
   Soil formation - Soil structure - Definition of rock, soil and soil mechanics - Soil problems.

2. **BASIC DEFINITIONS AND PHASE RELATIONSHIPS:** (4+1)
   Phase diagrams - Water content - Specific gravity - Void ratio - Porosity - Degree of saturation - Density of soil - Mass, weight, volume relationships - Relative density.

3. **IDENTIFICATION AND CLASSIFICATION OF SOILS:** (4+2)
   Sieve analysis - Stoke’s law and its limitations - Grain size distribution curves - Atterberg limits - IS classification of soils - Field identification of soils.

UNIT – II

4. **PERMEABILITY AND SEEPAGE:** (5+2)
   Darcy’s law and its limitations - Laboratory determination of coefficient of permeability - Coefficient of permeability for different soils - Factors affecting permeability of stratified soils - Seepage pressure - Quick sand phenomenon - Total and effective stresses - Capillarity

5. **COMPACTION:** (3+1)
   Mechanism of compaction - Proctor’s compaction test - Zero air voids curve - Factors affecting compaction - Effect of compaction on soil properties - Field compaction.

UNIT - III

6. **CONSOLIDATION:** (5+2)
   Mechanism of consolidation - Characteristic compression curves - Basic definitions - Normally, under and over consolidated clays - Terzaghi’s one dimensional consolidation theory - Assumptions - Derivation - Laboratory determination of consolidation properties of soils - Magnitude and rate of consolidation - Settlements.

7. **STRESS DISTRIBUTION:** (5+2)
   Need for finding of stress distribution in soils - Assumptions in elastic theories - Boussinesq equation for point, line, circular and rectangular loads - Concept and use of pressure bulb - Principle and use of Newmark’s influence chart, contact pressure distribution under rigid and flexible footings in sands and clays.

UNIT - IV

8. **SHEAR STRENGTH:** (8+2)
   Normal, shear stresses - Coulomb’s equation - Mohr’s circle - Mohr’s envelope - Shear parameters of soils - Laboratory determination of shear parameters of soil: Direct shear test, unconfined compression test, Tri axial test, Vane shear test. Importance of drainage conditions - Consolidated drained, consolidated undrained and unconsolidated undrained shear tests - Factors affecting the shear strength of clays and sands – Liquefaction – Critical void ratio – Thixotropy.

**TEXT BOOKS**

**REFERENCES**
CE 315 SURVEYING - II

Class: III/IV B.Tech. I Semester
Branch: Civil Engineering
Duration of University Examination: 3 Hours

Lectures: 3
University Exam: 100 Marks
Sessionals: 50 Marks

UNIT – I
1. PLANE TABLE SURVEYING: (8)
   Plane table survey – Principles, Methods, plane tabling at different scales.

UNIT – II
2. TACHEOMETRY (8)
   Stadia tacheometry, auto reduction methods, subtense tacheometry, tangential tacheometry.

UNIT – III
3. SETTING OUT WORKS (10)
   Location of points – bridge piers in a long bridge; Simple curves; Chain and Tape methods:
   Rankine’s methods; Compound and Reverse curves; Methods of laying transition curves; Case
   of connection between straight and simple curve only.

UNIT – IV
4. TUNNEL SURVEYS: (4)
   Location of end points; alignment and levels; Transfer of direction and levels through vertical
   shafts; Adits and their location.

5. ELEMENTS OF PHOTOGRAMMETRY: (6)
   Vertical – aerial photographs; Principle of stereoscopy; Radial line methods of plotting; Relief
   displacement and measurement; Tilted photographs; Correction to heights obtained from
   stereo pair of tilted photographs.

TEXT BOOKS

REFERENCES:
   Prakashan, Pune.
UNIT - I
1. INTRODUCTION: (9+3)
   Definition, Hydrologic cycle, Water budgeting, Water potential in India.

2. STATISTICAL & PROBABILITY ANALYSIS OF HYDROLOGICAL DATA: (10+3)
   Probability density function- Probability distribution functions of normal and Gumbel type -
   Estimation of parameters of distribution function- Frequency analysis - Correlation and
   regression - Linear multiple regression. Catchment stream patterns - Description of basin.

3. PRECIPITATION AND ITS MEASUREMENT:
   Types of Precipitation, Recording & Non-recording type of rain gauges- errors in measurement
   - Location of rain gauges. Analysis of rain falls data by mass curves, Hyetograph, Intensity
duration analysis, Estimation of missing precipitation data, Consistency test of data by double
mass curve technique, Probable maximum precipitation.

UNIT – II
4. EVAPORATION AND EVAPOTRANSPIRATION:
   Factors affecting the processes and their estimation, Pan evaporation, Blaney Criddle,
   Hargreaves, Penmann and Lysimeter methods, Methods of reducing evaporation from
reservoirs.

5. INFILTRATION:
   Factors affecting infiltration, measurements of infiltration, infiltration indices.

6. RUNOFF:
   Factors affecting runoff- Estimation of runoff from rainfall - Flow duration curve & mass
curve and their uses.

UNIT – III
7. HYDROGRAPH ANALYSIS:
   Characteristics of hydrograph, separation of base flow, Unit hydrograph, S-Curve hydrograph,
   Synthetic unit hydrograph, and Dimensionless unit hydrograph.

8. GROUNDWATER:
   Types of Aquifers-Unconfined and Confined Aquifers, Well Hydraulics, Recuperation test for
yield of open well.

UNIT- IV
9. FLOODS: (8+3)
   Rating curve and its extension, Principle of floods routing in reservoirs - Methods of
estimation of design flood empirical formulae - rational method - Frequency analysis -
Gumble’s distribution and unit Hydrograph method.

TEXT BOOKS

REFERENCES
LIST OF EXPERIMENTS

1. Determination of Consistency Limits
   a) Liquid limit
   b) Plastic limit
   c) Shrinkage limit

2. Classification of Coarse Grained Soil through Sieve Analysis

3. Specific Gravity of Soils

4. Determination of In-situ Density
   a) Core cutter method
   b) Sand replacement

5. Determination of OMC and Maximum Dry Density
   a) IS light compaction test
   b) IS heavy compaction test

6. Determination of Coefficient of Permeability
   a) Constant head method
   b) Falling head method

7. Determination of Coefficient of Consolidation

8. Determination of Unconsolidated Undrained Shear Strength Parameters
   a) Direct shear test.
   b) Tri-axial shear test.
   c) Unconfined compression Test.

9. Demonstration of
   a) Hydrometer Analysis for Fine Grained Soils
   b) Standard penetration test.
   c) Plate load test

10. California Bearing Ratio test

REFERENCES

LIST OF EXERCISES

1. Radiation and Intersection methods by Plane table survey.
2. Traversing by Plane table survey
4. Three point problem by Bessel’s Method, Trial & Error and Tracing paper methods.
5. Curve setting using chain and tape.
6. Setting of Simple curve by Rankine’s method.
7. Setting Compound curve using theodolite.
8. Setting of Reverse curve using theodolite.
9. Setting of Transition curve.
10. Determination of Tacheometric constants.
11. Tangential Tacheometry.
12. Radial contouring using Tacheometer.

REFERENCES
### SCHEME OF INSTRUCTION AND EVALUATION
**II SEMESTER OF III YEAR OF 4-YEAR B.TECH. DEGREE PROGRAMME**

#### CIVIL ENGINEERING

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### OE 321 - Open Elective
- OE 321 A - Operations Research
- OE 321 B - Management Information Systems
- OE 321 C - Entrepreneurship Development
- OE 321 D - FOREX and Foreign Trade
UNIT – I

1. **LINEAR PROGRAMMING:**

UNIT – II

2. **NON-LINEAR PROGRAMMING:**
   - Unconstrained Optimization techniques, Random search methods, Decent method, Variable metric method, Constrained optimization techniques, Kuhn-Tucker conditions, Cutting plane method.

UNIT – III

3. **DYNAMIC PROGRAMMING:**
   - Introduction, Multistage decision process-Linear programming as a case of dynamic programming, Computational procedures in dynamic programming.

4. **SPECIAL TYPE OF LINEAR PROGRAMMING:**
   - Special type of linear programming problems-Transportation problems-balanced and unbalanced transportation, Transhipment model, Assignment problem as a special case of transportation problem.

UNIT – IV

5. **QUEUING THEORY**
   - Description of queuing models and applicability, Birth and death processes, Single server models with Poisson input and exponential service, Multiple service queuing models.

**TEXT BOOKS**

**REFERENCES**
OE 321B  MANAGEMENT INFORMATION SYSTEMS  
(OE 321 Open Elective)

Class:  III/IV B.Tech. II Semester  
Branch:  Common to all Branches  
Duration of University Examination:  3 Hours

Lectures: 3  
University Exam:  100 Marks  
Sessionals: 50 Marks

UNIT-I

1. INTRODUCTION TO MANAGEMENT INFORMATION SYSTEMS:  
   An overview of MIS- Definition of MIS, MIS as an evolving concept, MIS and other academic disciplines, Sub-system of MIS, Structure of MIS-Operating elements of an Information System, MIS support for decision making, MIS structure based on Management activity and organizational functions, Synthesis of MIS structure.

UNIT-II

2. CONCEPTUAL FOUNDATION:  
   The decision making process-phases in the decision making process, Intelligency and design phases concepts of decision making, Behavioural models for decision maker, Behavioural model for organizational decision making, Methods for deciding among alternatives, Concept of Information, Human as Information Processors, System concepts and Organizational structure and Management Concepts.

UNIT-III

3. INFORMATION BASED SUPPORT SYSTEMS:  
   Support system for planning, control and decision making-decision supporting system, expert system, support for decision-making phases. Support systems for Management of knowledge work- Definition, types of knowledge work, technology in support of knowledge work.

UNIT-IV

4. INFORMATION SYSTEM REQUIREMENTS:  
   Developing a long range information system planning. Planning for Information system content of Information system master plan. Strategic planning Stage: Derivation of information system strategy from organizational plan, Resource allocation: Strategic approach to the determination of Information requirements, The three levels of information requirements, Databases and database Management systems, Data model concepts and terminology.

UNIT-V

5. DEVELOPMENT IMPLEMENTATION AND MANAGEMENT OF INFORMATION SYSTEM RESOURCES:  
   A contingency approach to choosing an application development strategy. Prototyping approach to application system development, Life cycle definitions, development, Installation and operation, Quality assurance and evaluation of Information Systems: Concept of quality information system, Organization function for Control & Quality assurance, Quality assurance for applications, Organization and Management of the information resource function, Change from an information systems management to information resources management.

TEXT BOOKS

REFERENCES
UNIT –I

1. SMALL SCALE INDUSTRIES: (9)
Definition, types failures, problems and remedial measures, Industrial policy towards SSI units since independence, Need for an entrepreneur-entrepreneur as a factor of production. Characteristics of a person to become an entrepreneur, Performance of SSI units in India, Case studies of successful entrepreneurs, Agencies dealing with SSI-technical and financial assistance available to SSI units.

UNIT-II

2. PLANNING AND LAUNCHING OF A SMALL SCALE INDUSTRY: (9)
Sources of new product ideas, Screening, Feasibility studies and market research, Selection of the product, Forecasting the demand, Technical feasibility and financial feasibility, Break-even analysis, Preparation of a bankable project report, Infrastructure, Resources and fiscal incentives.

UNIT-III

3. PROJECT PLANNING: (9)

UNIT-IV

4. ENTERPRISE MANAGEMENT: (9)

TEXT BOOKS
1. P.Saravanavel, Entrepreneurship Development.

REFERENCES
UNIT I
1. ARCHES (9+2)
Principle of Arch action, Eddy’s theorem, three hinged arches, parabolic and segmental arches, determination of horizontal thrust, bending moment, normal thrust and radial shear force. Influence lines, rib shortening and temperature effects, tied arches, Principles and analysis of two hinged arches.

UNIT II
2. SUSPENSION BRIDGES (9+2)
Forces in loaded cables and hanging chains, cables with supports at different levels, Length of cable, different support conditions, Simple suspension bridges with two hinged and three hinged stiffening girders. BM and SF diagrams influence lines temperature effect on cables and stiffening girders.

UNIT III
3. FORCE METHOD (3+1)
Basics, introduction Review of matrix algebra, Force method, Basic concepts, Internal forces, external loads and redundants, Relation between internal forces and deformation, determination of redundant forces, various load conditions, relation between displacements and deformation.

4. Application of Force method to pin jointed and rigid jointed plane frames, continuous beams, stresses due to lack of fit, settlement etc. (6+3)

UNIT IV
5. DISPLACEMENT METHOD (3+1)
Relation between internal forces and displacements, relation between internal forces and internal loads, various load conditions, superposition of stiffness, transformation of stiffness matrix, stresses due to lack of fit, use of sub-matrices, Generalized derivation of stiffness matrix for flexure.

6. Analysis of pin jointed plane frame, rigid jointed plane frames and continuous beams by stiffness method. (6+3)

TEXT BOOKS

REFERENCES
UNIT - I

1. INTRODUCTION: (1+0)
   Properties of standard Rolled steel sections, working stresses as per IS 800-1984.

2. RIVETED CONNECTIONS: (8+6)
   Rivet dimensions, Assumptions in the theory of riveted connections, lap and butt joints,
   Failure of a riveted joint, rivet value and efficiency of joint. Types of eccentric riveted
   connections, Design of eccentric connections, Effects of eccentric connections on stresses in
   member, Rivets in Tension & shear, Design of connection angles & Tees, Simple beam, end
   connection, Design of framed connections, Design of un-stiffened seat connections, Design of
   stiffened seat connections, Moment Resistant connections.

UNIT – II

3. WELDED CONNECTIONS: (8+6)
   Welding process, types of welds, Design aspects of butt welds, fillet weld, Eccentric
   connections, Beam end connections, Direct web fillet welded connections, Direct web Butt
   welded connections, Double plate web connection, Double angle web connections, Un-
   stiffened seat connection, stiffened seat connections, Moment resistant connections.

UNIT - III

4. TENSION MEMBERS: (4+2)
   Introduction, Types of sections, Net area, Net effective section for Angles and tees in tension,
   Design of Riveted end connections, Lug angles, Tension splice welded connection, shear leg.

5. COMPRESSION MEMBERS: (6+4)
   Introduction, Allowable stresses for compression members, shapes of compression members,
   General specifications of compression members, Design of compression members, Design of
   built-up compression member, column splice.

UNIT - IV

6. DESIGN OF BEAMS: (4+3)
   Design criteria, Stresses in Beams and permissible stress, deflections, built up beams.

7. COLUMN BASES: (5+3)
   Column Bases, moment resistant column bases, attached base plate with initially tensioned
   bolts, attached base with un-tensioned bolts, unattached bases, Design of Grillage foundation
   to an isolated stanchion.

TEXT BOOKS

REFERENCES
UNIT – I

1. SITE INVESTIGATION AND SOIL SAMPLING: (3+1)
   Types of exploration - Types of samplers - SPT test - Static and dynamic cone penetration tests - Plate load test.

2. FOUNDATION TYPE AND SELECTION: (1+0)
   Types of foundations - Different types of loads coming on foundations - Choice of foundations.

3. SHALLOW FOUNDATIONS: (4+1)
   Bearing capacity - Definitions - Bearing capacity theories: Terzaghi, Meyerhof, Skempton, Vesic - Effect of size, shape, Ground water table, depth of embedment and load inclination on bearing capacity - Field determination of bearing capacity - Settlement of foundations: Elastic settlements, Permissible settlements.

UNIT - II

4. DEEP FOUNDATIONS: (8+3)
   Pile Foundation: Classification of piles - Load bearing capacity of piles - Static formulae - Dynamic formulae - ENR and Hiley’s formulae - Pile Groups - Pile load tests - Negative skin friction.
   Caissons: Types of well foundations - Construction of well foundation - Sinking of open wells and pneumatic caissons.

UNIT – III

5. FOUNDATIONS ON EXPANSIVE SOILS: (3+1)
   Identification of expansive soils – problems associated with expansive soils – design considerations for foundations in expansive soils – under reamed piles.

6. SLOPE STABILITY ANALYSIS: (7+3)

UNIT - IV

7. EARTH PRESSURES: (6+2)
   Introduction - Types of lateral earth pressure – Active, at rest and passive earth pressure - Rankine’s and Coulomb’s earth pressure theories - Culmann's Graphical solution - Stability analysis of retaining walls.

8. MACHINE FOUNDATIONS: (4+1)

TEXT BOOKS

REFERENCES
UNIT- I

1. INTRODUCTION: (4+1)

2. PROPERTIES OF HARDENED CONCRETE: (6+2)
   Strengths of Concrete – Factors affecting strength – Stress-strain Characteristics - Shrinkage and creep deformations – Influence of temperature and permeability on concrete - Other properties of concrete.

UNIT- II

3. PROPORTIONING OF CONCRETE MIXES: (9+3)
   Variables influencing the concrete proportioning mixes and their effect on the concrete strength – Some proportioning methods of mix design: (i) IS Code method (ii) ACI method (iii) British method (iv) Design of High strength concrete mix (v) Rapid method for mix.

UNIT- III

4. PRODUCTION OF CONCRETE: (8+3)
   Batching of materials in concrete – Compaction of concrete – Different types of compaction: Types of vibrators – Vibro pressing, Vibro tamping, Centrifugation – Methods of curing concrete – Protection of concrete from extreme weather conditions such as temperature and corrosion.

UNIT- IV

5. FATIGUE AND CREEP:

6. SPECIAL TYPES OF CONCRETE: (9+3)

TEXT BOOKS
1. M.S. Shetty, Concrete Technology, S.Chand & Co. Ltd. New Delhi

REFERENCES
2. Dr. K.T.K. Swamy, Dr. A.K.S. Rao & Dr. A.A. Khandekar, Concrete Technology, Dhanpatrai & Sons, New Delhi.
UNIT - I

1. TRANSPORTATION SYSTEMS: (6+2)
   Introduction, Role & Importance, Economical, Social, Political and Environmental Aspects, Conventional and unconventional Systems.

2. HIGHWAY NETWORK PLANNING: (3+1)

UNIT - II

3. HIGHWAY GEOMETRIC DESIGN: (8+3)
   Importance of Highway Geometric Design, Design factors, Road user, Roadway and Vehicular characteristics, Cross sectional elements, Camber carriage way, Kerbs, Medians, Road Margins, Formation, Right of way, Typical cross sections, Sight distances - Stopping sight distance and Overtaking sight distance, Horizontal alignment-Super elevation, Transition curves, Design of Vertical alignment, Gradient, Vertical curves.

UNIT - III

4. TRAFFIC ENGINEERING: (3+1)
   Traffic characteristics, Relation between traffic volume, speed, density and traffic volume and speed studies, Capacity and level of service, Parking studies and accident studies, Design of intersection, Introduction to Traffic Management and Control.

5. PAVEMENT MATERIALS: (5+2)

6. PAVEMENT DESIGN: (3+1)
   Types of Pavement structures, Function of Pavement component layers, Factors effecting the design of pavements, Design of flexile pavement, GI method, CBR method, IRC method, Design of Rigid Pavements, Wester Gaard’s method, IRC recommendations, Introduction to joints in Rigid Pavements.

UNIT - IV

7. HIGHWAY CONSTRUCTION: (5+0)
   Types of Highway construction, Construction of Earthen roads, Gravel roads, WBM roads, Bituminous roads, Types – Surface Dressing, Penetration Macadam, Bitumen Bound Macadam, Bituminous carpet, Bituminous concrete, Cement concrete pavements.

8. HIGHWAY MAINTENANCE AND EVALUATION: (5+0)
   Pavement failures, Structural and functional failures in Flexible and Rigid Pavements, Pavement maintenance, Periodic, Routine, Special repairs, Pavement evaluation, Strengthening of Pavements, Overlay design, Introduction to Highway Drainage.

TEXT BOOKS

REFERENCES
CE 327  CONCRETE LABORATORY

Class:  III/IV B.Tech. II Semester  
Branch:  Civil Engineering  
Duration of University Examination: 2 Hours

Practicals: 3  
University Exam: 50 Marks  
Sessionals: 25 Marks

TESTS ON CEMENT:
1. Fineness of Cement
2. Specific gravity of cement
3. Soundness of cement - Lechatlier’s apparatus
4. Standard consistency of cement
5. Initial and final setting time of cement
6. Compressive strength of cement

TESTS ON AGGREGATES:
7. Bulk density, specific gravity, voids ratio and porosity of fine and coarse aggregates.
8. Bulking of sand
9. Fineness modulus of fine and coarse aggregates, grading curves

TESTS ON CONCRETE:
10. Workability tests- slump, compaction factor and vee-bee consistometer.
11. Compressive strength of concrete
12. Tensile strength and modulus of rupture of concrete
13. Modulus of elasticity of concrete- using compressometer

TESTS ON BRICK:
16. Water absorption and compressive strength of bricks

REFERENCES
2. M.S.Shetty, Concrete Technology, S.Chand & Co., New Delhi.
3. Relevant IS Codes.
LIST OF EXPERIMENTS

1. Tests on Aggregate:
   - Aggregate Impact Value
   - Aggregate Crushing Value
   - Attrition / Abrasion Value
   - Shape test
   - Specific Gravity test
   - Water absorption test

2. Tests on Bitumen:
   - Penetration
   - Ductility
   - Softening Point
   - Flash point & Fire point
   - Viscosity of Bitumen
   - Bitumen Extraction

3. Design of Flexible Pavements by CBR Method

4. Bitumen Mix Design by Marshall’s Stability Test

5. Traffic Engineering:
   - Traffic volume and speed studies and analysis, Parking studies.

6. Design & Drawing:
   Design & Drawing of Rotary, C/S details of Urban Arterial Road.

REFERENCE

# SCHEME OF INSTRUCTION AND EVALUATION
## I SEMESTER OF IV YEAR OF 4-YEAR B.TECH. DEGREE PROGRAMME
### CIVIL ENGINEERING

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* Based on Report and Seminar

### CE 415 Professional Elective – I
- CE 415 A Earth Retaining Structures
- CE 415 B Advanced Transportation Engineering
- CE 415 C Earthquake Resistant Structures
- CE 415 D Remote Sensing & GIS
- CE 415 E Watershed Management
UNIT I

1. **STAIRCASE**: (4+3)
   Design and detailing of open well and doglegged staircase (Waist slab type).

2. **RETAINING WALLS**: (5+3)
   Design and detailing of cantilever type retaining wall, Design principles of counterfort type retaining wall.

UNIT II

3. **R.C.C. WATER TANKS**: (9+6)
   Introduction, Design requirements as per IS 3370 – 1965, Design principles of underground circular water tank, Design of elevated circular and Intz type water tank, Design principles of underground circular water tank, Design of staging.

UNIT III

4. **PLATE GIRDER**: (9+6)
   Design of plate girder, Riveted connections, web and flange splices, design of various types of stiffeners, Curtailment of flange plates.

UNIT IV

5. **GANTRY GIRDER**: (3+2)
   Design of crane gantry girder as per IS code.

6. **STEEL ROOF TRUSSES**: (6+4)
   Types of trusses for different spans, live load and wind load as per I.S. codes, Design of purlins, Detailed design of tubular and angular trusses.

TEXT BOOKS


REFERENCES

CE 412 IRRIGATION ENGG. & HYDRAULIC STRUCTURES

Class: IV/IV B.Tech. I Semester
Branch: Civil Engineering
Duration of University Examination: 3 Hours

Lectures: 4; Drawing: 2
University Exam: 100 Marks
Sessionals: 50 Marks

Scheme of University Examination

Section – A

1. Question from Unit – I
   With internal choice for 20 marks

2. Question from Unit – II
   With internal choice for 20 marks

3. Question from Unit – III
   With internal choice for 20 marks

Section – B

4. Question from Unit – IV (Design and Drawing)
   With internal choice for 40 marks
UNIT-I

1. INTRODUCTION: (12)
Necessity and scope of irrigation: Types of irrigation, Methods of applying water to crops, Soil-water-plant relationship, Soil moisture, Field capacity, Permanent wilting point, Function of irrigation water, Duty, Delta, Irrigation frequency, Water requirements of crops, Estimation of consumptive use, Irrigation efficiencies, Benefits and ill effects of irrigation, Crop rotation.

2. CANAL IRRIGATION:
Classification of canals, Canal alignment, Channel design based on Kennedy’s theory & Lacy’s regime theory, IS-code method, Tractive force theory, Channel cross-section in cutting and filling, Balancing depth, Necessity of canal lining, Types of lining, Canal outlets, Causes, Effects and remedial measures of water logging.

UNIT-II

3. DIVERSION HEAD WORKS: (16)
Components, layout of diversion head work, Weirs and barrages, Types of weirs, Bligh’s creep theory, Lane’s theory and Khosla’s theory on design of weirs on permeable foundations, Divide wall, Fish ladder, Under sluice, Silt ejectors and silt excluders, Upstream and down stream protection measures.
Canal fall, Necessity, Location and types of falls, Cistern design, Design principles of slopping glacis fall.
Head regulators and cross regulators, Design principles of head regulator and cross regulator.

UNIT-III


5. River meandering and its causes, River training works, Groynes and guide banks.

6. HYDROPOWER ENGINEERING:

UNIT-IV (36)


TEXT BOOKS

REFERENCES
UNIT – I

1. TRANSPORTATION SYSTEM & CHARACTERISTICS: (3+1)
   Different types of Transportation systems, Classification of Land, Water, and Air Transportation systems, Technological characteristics, Selection of system.

2. RAILWAY ENGINEERING: (3+1)
   Introduction, Role of railways, Comparison of railway and highway transportation, Components of permanent way, Description of gauge, Coning of rails, creep, Sleepers and ballast.

UNIT – II

3. GEOMETRIC DESIGN: (8+3)
   Principles of railway alignment, Horizontal alignment of curves, Super elevation, Equilibrium, Cant and cant deficiency, Transition curves, Vertical alignment, Grades, Design of a simple turnout, Points and crossings, Various types of track junctions.

4. RAILWAY STATIONS AND YARDS: (2+0)
   Types of layouts and functions.

UNIT – III

5. RAIL TRAFFIC CONTROL: (2+1)
   Signaling and Interlocking principles, Circuiting, Description of train control systems.

6. MODERNIZATION OF RAILWAY OPERATIONS: (2+0)
   Design of tracks for high speeds

7. AIR TRANSPORTATION: (3+1)
   Introduction, Airport types, Aircraft components planning, Airport site selection, Obstructions, Aircraft characteristics, Description of runways, Runway configuration, Design of runway.

8. AIR FIELD PAVEMENT DESIGN: (3+2)
   Taxi way, Apron, Airfield pavement design.

9. TERMINAL FACILITIES: (2+0)
   Introduction to air traffic control.

UNIT – IV

10. WATER TRANSPORTATION: (8+3)
    Harbour layout, Selection of site for harbour, Break water, Jetties, Piers, Wharves and Berthing facilities, Navigational aids entrance channel, Demarcation, Buoys, Light houses, Port facilities, Docks, Types, Description, Transit sheds, General lay out of port.

TEXT BOOKS

REFERENCES:
UNIT-I

1. INTRODUCTION:
   (8+3)
   The Environment - The impact of humans on the environment and vice-versa, The role of environmental Engineer.
   Water Quality - Physical, chemical and biological parameters of water quality; Standards of water quality, Wastewater: Characteristics of waste water from industries and municipal sewer.

UNIT-II

2. WATER DEMAND:
   (10+3)

UNIT-III

3. THEORY AND DESIGN OF WATER TREATMENT SYSTEMS:
   (9+4)
   Unit operations and processes, Aeration, Solids separation, Settling Coagulation, Softening, Removal of other dissolved salts, Filtration, Disinfection.

UNIT-IV

4. WATER SUPPLY SYSTEM DESIGN:
   (9+2)
   Sources of water: Classification and choice- Methods of distribution of water, Distribution of reservoirs, Distribution systems and its components, Capacity of reservoirs and fixation of pressure, Pipe network analysis, Appurtenances of piping systems, Testing of pipe lines leakage detection and prevention- pricing of water.
   Rural water supply: Principles practices and sanitary aspects.

TEXT BOOKS

REFERENCES
UNIT-I

1. EARTH AND ROCK FILL DAMS: (9)
   Rock fill dams: Definition, Types of rock fill dams, Construction methods, Merits and demerits of rock-fill dams.

UNIT-II

2. EARTH RETAINING WALLS: (3)
   Principles of design of retaining walls – Gravity retaining wall counter fort retaining wall – Constructional aspects of retaining wall, Expansion and contraction joints.

3. UNDERGROUND CONDUITS, SHAFTS AND TUNNELS: (6)

UNIT-III

4. SHEET PILE WALLS: (9)

UNIT-IV

5. BRACED CUTS AND COFFER DAMS: (9)

TEXT BOOKS

REFERENCES
UNIT – I
1. **INTRODUCTION TO URBAN TRANSPORTATION ENGINEERING:** (5)
   Urban Transportation Problems, Objective of Planning levels, Systems approach in Transportation Planning, Study area definition and delineation, Cordon lines, Zoning criteria.

2. **TRAVEL DEMAND ESTIMATION:** (5)
   Planning process, Concept of travel demand, Function, Factors, Travel demand estimation through trip generation, Trip distribution, Mode split and route assignment.

UNIT – II
3. **URBAN FORMS AND STRUCTURE:** (5)
   Urban activity systems, Movement hierarchies, Environmental area concept, Properties of urban structure.

4. **PLAN PREPARATION AND EVALUATION:** (5)
   Master plan preparation, Planning norms and standards description of various levels of plans, Urban transportation plan evaluation.

UNIT – III
5. **TRAFFIC AND TRANSPORTATION STUDIES:** (6)
   Traffic surveys, Volume, Speed–studies, Floating car technique Road user and vehicle characteristics, Roadside interviews, Home interviews.

6. **CAPACITY AND LEVEL OF SERVICE:** (5)
   Volume density and speed relationships, Compaction of AADT, Factors-affecting capacity level of service, Concept-capacity analysis.

UNIT – IV
7. **ENVIRONMENTAL IMPACT ASSESSMENT OF TRANSPORTATION:** (5)
   Introduction to methodologies, Techniques for assessing impacts, Pollution Air Pollution, Causes, Impacts E.I.A of Highways and Urban roads.

**TEXT BOOKS**

**REFERENCES**
UNIT – I

1. **FUNDAMENTALS OF STRUCTURAL DYNAMICS:** (9)
   Introduction, Single and Multi degrees of freedom, Damped and Undamped Systems, Free and Forced Vibrations, Duhamel integral, Time Period, Natural Frequency, Dynamic Load Factor, Response to a pulsating force, Characteristic shapes, Modal Analysis of Multi degree systems.

UNIT – II

2. **ELEMENTS OF EARTHQUAKE ENGINEERING:** (4)
   Earthquake magnitude and intensity, Focus and Epicentre, Causes and Effects of Earthquakes, Seismic waves: Magnitude, Intensity and Energy release, Characteristics of strong earthquake ground motion, Seismic zone mapping.

3. **ESSENTIALS OF STRUCTURAL SYSTEMS FOR SEISMIC RESISTANCE:** (5)
   Structural systems, Building configuration, Frames, Walls, Dual systems, Response in elevation and plan, Influence of structural classification, Concepts of seismic design.

UNIT – III

4. **GEOTECHNICAL ASPECTS:** (3)

5. **ANALYSIS OF EARTHQUAKE LOADS:** (6)

UNIT – IV

6. **DUCTILE DETAILING:** (6)
   Ductility of Reinforced Concrete Structures, confinement, Detailing as per IS: 13920-1993, Moment redistribution, Design principles of beams, columns, beam column joints, soft story concept.

7. **BASE ISOLATION:** (3)
   Isolation systems, Effectiveness of base isolation, Energy dissipation devices.

**TEXT BOOK**

**REFERENCES**
UNIT-I

1. PHOTOGRAMMETRY: (9)
   Definition of Photogrammetry terms, Geometry of aerial and terrestrial photographs, Aerial camera and photo-theodolite, Scale of a photography, Tilt and relief displacements, Stereoscopic vision and stereoscope, Height determination from parallax measurements, Flight planning, Maps and map substitutes and their uses, Photo geology.

UNIT-II

2. REMOTE SENSING: (9)
   Definition, Physical basis of remote sensing, Electromagnetic radiation and spectrum, Energy interactions with earth materials, Spectral signature, Resolutions of remote sensing data, Atmospheric windows, Types of platforms, Sensors and their characteristics, Orbital parameters of a satellite.

UNIT-III

3. IMAGE INTERPRETATION: (9)
   Principles and keys of photo-interpretation, Equipment’s and aids for visual interpretation, Ground truth- collection and verification, Advantages of multi date and multi band images, Digital image processing concepts, Pre-processing, Image enhancement and classification fundamentals.

UNIT-IV

4. GEOGRAPHIC INFORMATION SYSTEM: (9)
   Definition and terminology, Components of a GIS, Functional elements of GIS, Spatial information concepts, Basics of locational data automation, Processing, and manipulation techniques, Common applications in civil engineering.

TEXT BOOKS

REFERENCES
UNIT – I

1. INTRODUCTION: (2)
Scope of Civil Engineering works - Standard terminology used in quantity surveying - Standard method of measurement.

UNIT – II

2. MEASUREMENTS: (1)
Importance and maintenance of M-Book, Measurement of earthwork - Brick masonry work - Concrete work - Prestressed concrete work - Steel work - Timber works - Water, Sewer works - Road works and Finishings.

UNIT - III

3. ESTIMATING: (2)
Different types of estimates - Methods of estimation: Centre line method and Individual wall method - Preparation of detailed and abstract estimate.

UNIT - IV

4. RATE ANALYSIS: (3)
Detailed analysis of rates for various item of work, Standard schedule of rates, Standard data book.

5. TENDERS: (1)
Types of tenders - Principle of tendering - Notice inviting tender.

6. CONTRACTS: (2)
Types of contract - Remedies for Breach of contract - Departmental procedures for execution of works.

7. BUILDING VALUATION: (1)
Principles of valuation - Methods of valuation of property.

TUTORIAL ASSIGNMENTS (12 X 3= 36 Hours)

(A) Preparation of Detailed and Abstract Estimate for the following works.
   i) Residential Building    ii) Framed buildings    iii) Arch culvert and Slab culvert.
   iv) Septic tank with soak pit    v) Road Project    vi) Canal works

(B) Costing and Preparation of Tender Document.

TEXT BOOKS
LIST OF EXPERIMENTS

(A) CHEMICAL QUALITY OF WATER

1. Acidity, Alkalinity and pH
2. Hardness and Softening
3. Chlorine demand and Residual chlorine
4. Total solids and conductivity
5. Turbidity
6. Chloride
7. Coagulant dosage (Jar test)
8. Potassium and Fluoride by Spectrophotometer

(B) BIOLOGICAL QUALITY OF WATER AND WASTE WATER

9. Dissolved Oxygen and BOD
10. Chemical Oxygen Demand
11. Nitrogen (Kjeldahal)

(C) MICRO BIOLOGICAL QUALITY OF WATER

12. Total count and MPN

(D) AIR QUALITY

13. SO$_2$ and CO$_2$ by using gas analyzer

REFERENCES
SCHEME OF INSTRUCTION AND EVALUATION  
II SEMESTER OF IV YEAR OF 4-YEAR B.TECH. DEGREE PROGRAMME

CIVIL ENGINEERING

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* Based on Report, Seminar and Viva-Voce.

**CE 424 Professional Elective - II**

- **CE 424 A** - Geo-Technical Processes
- **CE 424 B** - Bridge Engineering
- **CE 424 C** - Finite Element Method
- **CE 424 D** - Natural Disaster Mitigation & Management
UNIT I
1. ROAD BRIDGES: (9+6)
   Types of bridges, IRC loading standards and impact factor, Design and detailing of RCC deck slab bridge, Design of kerb.

UNIT II
2. PLASTIC DESIGN OF STEEL BEAMS: (9+6)
   Basic concept, Shape factor, Moment curvature relations, Upper bound and lower bound theorems, Analysis and design of fixed and continuous beams.

PRESTRESSED CONCRETE

UNIT III
3. INTRODUCTION: (1+1)
   Fundamentals of pre-stressing, Classification and types of pre-stressing.
4. MATERIALS: (2+1)
   High strength concrete and high tension steel - Mechanical properties, Stress-strain characteristics, Creep and shrinkage of concrete, Relaxation of stress.
5. PRE-STRESSING SYSTEMS: (2+1)
   Principles of pre-tensioning and post-tensioning, Study of Hoyer, Freyssinet, Magnel and Gifford – Udalf system.
6. LOSSES OF PRESTRESS: (4+3)
   Losses of pre-stresses in pre-tensioned and post-tensioned members, I.S. code provisions.

UNIT IV
7. ANALYSIS OF SECTIONS FOR FLEXURE: (4+3)
   Simple sections in flexure, Kern distances, Cable profile, Limiting zones, Cracking moment of rectangular sections.
8. DESIGN OF SIMPLY SUPPORTED BEAMS: (5+3)
   Allowable stresses as per I.S: 1343 - 1980, Elastic design of rectangular and I-sections.

TEXT BOOKS

REFERENCES
3. IRC 5,6 and 21, “Code of Practice for Design of Bridges”, Indian Road Congress, New Delhi.
UNIT-I

1. SYSTEMS ENGINEERING: (2+0)
   Introduction - Civil Engineering systems- Engineering activity and design methodologies.

   Introduction to Optimization (7+3)
   Formulation of Linear Programming problems-Examples-Graphical method of solving a linear programming problems-Simplex method of solving the problems, Transportation and assignment problems (Simple examples only).

UNIT-II

2. PROJECT PLANNING: (9+3)
   Components of planning, Identification of objectives, Establishment of premises and site organizational programming, Actuating, Controlling and requirements of different stages, Economic considerations and comparisons, Discounted cash flows, Break-even cost analysis, Depreciation.

UNIT-III

3. PROJECT MANAGEMENT AND CONTROL: (9+3)
   Development of project network, Bar charts, CPM and PERT networks, Time estimates, Critical path, Slack and float, Crashing, Resource allocation, Leveling and smoothing.

UNIT-IV

4. CONSTRUCTION EQUIPMENT: (5+2)
   Brief details of equipment of earth moving: Tractors, Bulldozer, Scraper, and Grader. Hauling equipment: Trucks, Dumpers, Elevators & Conveyors, Trailers. Concrete construction equipment: Concrete-producing plants, Batchers, Concrete Mixers, Concrete Pump, Pneumatic concrete placer.

5. QUALITY CONTROL AND SAFETY MEASURES: (4+1)
   Techniques used for ensuring quality of construction, Safety measures taken to avoid accidents, Location hazards and their elimination, Safety in demolition of buildings, Safety in handling and transport of materials and equipment.

TEXT BOOKS

REFERENCES
UNIT-I

1. WASTEWATER: (8+3)
   Wastewater characteristics-domestic and industrial, BOD and DO profile-processes and kinetics involved, Estimation of various parameters, Effluent standards.

2. COLLECTION AND CONVEYANCE OF SEWAGE:
   Estimation of quantity, Types of collection systems, Types of sewers, Collection system appurtenances, Design of sewers and storm water sewer, Maintenance of sewer.

UNIT-II

3. WASTEWATER TREATMENT: (10+3)
   Primary treatments: Screens, Grit chambers, Primary sedimentation tank, Theory and design of various units.

4. BIOLOGICAL TREATMENT –I:
   Design principles, Microbiological metabolism, Basic kinetic equations, Continuous flow treatment methods, Trickling filters, Biotowers, and secondary settling tank.

UNIT-III

5. BIOLOGICAL TREATMENT –II: (7+2)
   Activated sludge process, Design considerations, Process parameters, Oxygen requirements. Septic and imhoff tank, Oxidation ponds and lagoons, Sludge characteristics, Digestion disposal.

6. SOLID WASTE MANAGEMENT: (3+1)
   Collection – Transportation and disposal methods, Design of land fills.

UNIT-IV

7. AIR POLLUTION: (8+3)
   Brief introduction to air pollution and control devices, Air quality, Units of measurements sources of pollutants, Classification of pollutants-particulates, Hydrocarbons, Carbon monoxide, Oxides of sulphur and nitrogen, Petrochemical oxidants, Indoor pollution, Control devices for particulate material, Settling chambers, Centrifugal collectors, Electrostatic precipitators, environmental impact assessment need, methodologies, environmental management plans.

TEXT BOOKS

REFERENCES
UNIT-I

1. DEWATERING: (5)

2. GROUTING: (4)
   Definition – objectives of grouting-grouts and their properties – grouting methods – ascending, descending and stage grouting – hydraulic fracturing in soils and rocks – post grout tests.

UNIT-II

3. COMPACtion: (5)

4. STABILISATION: (4)

UNIT-III

5. REINFORCED EARTH: (6)

6. IN-SITU REINFORCING TECHNIQUES: (3)

UNIT-IV

7. GROUND IMPROVEMENT TECHNIQUES: (4)
   Vertical drains, Sand wicks, Synthetic drains, Stone columns, Soil-lime columns, Soil-cement columns.

8. LIQUEFACTION CONTROL: (5)

TEXT BOOKS
UNIT – I

1. INTRODUCTION: (5)
   Classification of bridges, Components, Importance of bridges, Economic spans, Factors
   effecting suitable type of bridges-natural and economic considerations, Linear water ways and
   afflux.

2. DESIGN LOADS: (4)
   IRC standard loading, Impact factors, Wind loading, Seismic forces, Longitudinal forces,
   Centrifugal forces, Buoyancy forces, Thermal forces, Erection stresses, Temperature effects,
   Standards for railway loading.

UNIT – II

3. T- BEAM BRIDGES (5)
   General features, Introduction to Westerguard’s analysis, Design of interior panel slab,
   Courbon’s method of analysis for design of longitudinal and cross girders.

4. BOX CULVERTS: (4)
   General aspects, Analysis for different load conditions, Design example.

UNIT – III

5. PLATE GIRDER BRIDGE: (4)
   Components of plate girder bridge, Design of plate girder bridge for railway loading.

6. STEEL TRUSS BRIDGE: (5)
   General features, Types of trusses, Design of components of through type steel truss bridge
   for railway loading.

UNIT – IV

7. BRIDGE BEARINGS: (4)
   Types of bearing, Forces on bearing, Design of elastomeric bearings, Expansion joints.

8. PIER AND ABUTMENTS: (5)
   Materials for piers and abutments, Forces acting, Stability analysis and design.

REFERENCES:
3. Rama Chandra, Design of Steel Structures, Vol.II.
UNIT-I

1. INTRODUCTION: (3)
   General description, Need for study, Advantages, Disadvantages, Basic equations of elasticity – Plane stress, Plane strain and Axi Symmetric problems, Matrix displacement equations.

2. SHEAR FUNCTIONS: (6)
   Element shapes, Nodes, Polynomial shape functions, Convergence requirements, Lagrange and Hermitite polynomials, Serendipity elements.

UNIT-II

3. STRAIN DISPLACEMENT MATRIX: (2)
   Strain displacement matrix for bar element, Constant Strain Triangular element and Beam element.

4. ASSEMBLING STIFFNESS EQUATIONS: (7)
   Elements stiffness matrix and Nodal loads by direct approach, Galerkin’s method, Virtual work method, Variational method principle for minimum potential energy method.

UNIT-III

5. DISCRETIZATION OF A STRUCTURE: (3)
   Discretization of a continuum, Finite representation of bodies, Higher order elements, Bandwidth.

6. ANALYSIS: (6)
   Finite element analysis of bars and trusses, Plane stress and plane strain problems using Constant Strain Triangular elements.

UNIT-IV

7. ISOPARAMETRIC FORMULATION: (4)
   Coordinate transformation, Basic theorems, Concept of mapping, Isoparametric, Super parametric and Sub parametric elements. Assembling stiffness matrix, Numerical integration using Gauss-Quadrature and Jacobian method.

8. ANALYSIS OF BEAMS AND RIGID FRAMES: (5)
   Analysis of beams and rigid plane frames using two noded beam elements.

REFERENCES
UNIT-I

1. **Introduction:** Natural Disasters–Disaster classification and Statistics–Disaster management – Prevention, Preparedness and relief, Rehabilitation and reconstruction–Hazard vulnerability and Risk mapping – International decade of natural disaster management –Need for the study. (9)

UNIT-II

2. **Natural Hazards, Mitigation and their management:** Earthquakes, Tsunamis, Landslides, Tropical cyclones, Floods and Drought with case studies.
   (a) Earthquakes – principles of plate tectonics – zoning of areas of high seismic activity – Magnitude and its measurement – Primary and secondary effects – Best types of building construction in earthquake prone zones – Earthquake prediction and its effectiveness – Mitigation and preparation measures – Emergency activities.
   (b) Tsunamis – Physical characteristics – Geographic distribution and mode of travel – Primary and secondary effects – Steps for preparation and mitigation – Emergency responses.
   (c) Landslides – Classification, Causes, Effects and Mitigation; Landslide zonation – Landslide inventory, heuristic, deterministic and statistical approaches. (9)

UNIT-III

(d) Tropical Cyclones – Natural conditions for the cyclone to form regions of highest cyclonic activities – Different scales to measure cyclones – Primary and secondary effects – Identification of vulnerable land areas – Storm surges – Structural failures due to cyclones – Cyclone warning systems – Impact of cyclones – Steps in preparation, Mitigation and response to cyclonic disaster.


(f) Drought – Natural causes of drought – Primary and secondary effects – Drought prediction and monitoring techniques – Impact of drought on nation’s economy – Previous relief operations – Long term programmes that are useful in combating droughts – Emergency plans. (9)

UNIT-IV


4. Post Disaster Management – Concept of risk – Relief operations – Community education and involvement (9)

REFERENCES:

5. Selected Materials published by National Institute for Disaster Management, “*Ministry of Home Affairs, Govt. of India*”. 
(A) DEVELOPMENT OF SOFTWARE FOR THE FOLLOWING PROBLEMS:

1. Calculation of bending moment and shear force for simply supported beams.
2. Calculation of bending moment and shear force for cantilever beams.
3. Analysis of singly and doubly reinforced concrete beams.
4. Design of pile foundations.
5. Design of strip footing.
6. Highway geometric design.
7. Design of septic and sedimentation tank.

(B) PACKAGE RUN FOR THE FOLLOWING PROBLEMS WITH MANUAL CALCULATIONS:

8. Column Design.
9. Slab Design.
10. Concrete mix design.
11. Design of foundations. (isolated, strip and combined footings)
12. Design of Truss.
13. Design of simply supported steel beam.

REFERENCES