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

CIVIL ENGINEERING

Course No.	Course	Periods of Instruction per week			Evaluation Scheme			Total Marks
		Lectures	Tutorials	Drawing/ Practicals	External Evaluation		Sessionals	
					Duration of Exam	Max. Marks	Max. Marks	
HS 211	Mathematics – II	3	1	0	3 Hrs.	100	50	150
CE 212	Strength of Materials – I	3	1	0	3 Hrs.	100	50	150
CE 213	Building Materials and Construction	3	0	0	3 Hrs.	100	50	150
CE 214	Fluid Mechanics – I	3	1	0	3 Hrs.	100	50	150
ME 216	Mechanical Technology	3	1	0	3 Hrs	100	50	150
EE 219	Electrical & Electronics Engineering	3	1	0	3 Hrs.	100	50	150
CE 215	Fluid Mechanics Lab.	0	0	3	3 Hrs.	50	25	75
CE 217	Material Testing Laboratory	0	0	3	3 Hrs.	50	25	75
		18	**5**	**6**				**1050**

HS 211 MATHEMATICS-II

Class: **II/IV B.Tech. I Semester**   *Lectures:* **3***; Tutorial:***1**
Branch: **Civil Engineering**   *University Examination:***100 marks**
Duration of University Examination: **3 hours**   *Sessionals:* **50 marks**

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)**
   Laplace transform-Inverse Transform-Properties of Laplace Transforms- Laplace Transform of unit step function, impulse function, and periodic functions- Convolution theorem, Solution of ordinary differential equations with constant coefficients and system of ordinary differential equations with constant coefficients using Laplace Transforms.

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:
1. B.S.Grewal, *Higher Engineering Mathematics,* Khanna Publishers,New Delhi.
2. E.Kreyszig, *Advanced Engineering Mathematics,* Wiley Eastern Ltd., New Delhi.

REFERENCE BOOKS:
1. R.V.Churchill, *Complex Variables and its Applications,* McGraw-Hill, New York.
2. M.K.Venkataraman, *Engineering Mathematics*, *Vol.III,* National Publishing Co., Madras.

CE 212 – STRENGTH OF MATERIALS - I

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. 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 Morh'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
1. Punmia B.C., Arun K. Jain, Ashok K. Jain, *Machanics of Materials,* Laxmi Publications, New Delhi.
2. Popov. E.D., *Engineering Mechanics of Solids.*

REFERENCES
1. Ramamrutham S., *Strength of Materials,* Dhanpat Rai & Sons, New Delhi
2. Timoshenko and Gere, *Mechanics of Materials,* Mc Grahill International.
3. Andrew Pytel, Ferdinand L. Singer, *Strength of Materials 4th Edition,* Harper & Row Publishers, New York.

CE 213 – BUILDING MATERIALS AND CONSTRUCTION

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

BUILDING MATERIALS
UNIT – I

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

Naturally Available Materials: Classification of stones – Properties of stones – Characteristics of good building stones – Tests on stones. **Artificial Stones:** Composition of good brick – Manufacturing process of brick – Characteristics of good building bricks – Classification of bricks – Tests on bricks.   **(5)**

UNIT – II
Lime: Source – Different types of lime – Calcination of lime – Slaking of lime – Properties of lime – Tests on lime. **Cement:** Raw materials – Manufacturing process – Types of cement – Hydration of cement – Properties of cement – Tests on cement – IS recommendations. **Timber:** Classification of trees – Seasoning of timber – Preservation of timber – Industrial timber – Defects in timber. **Concrete:** Manufacturing process of cement concrete – Workability – Segregation – Bleeding. **Miscellaneous Building Materials:** Glass – Plastics – Asbestos – Thermocoal – Fly ash.   **(9)**

UNIT – III
BUILDING COMPONENTS:

Introduction: Functional planning of building – Components of building – IS / NBC recommendations.

Walls: Types of walls – Thickness of walls – Cavity wall. **Openings in Buildings:** Doors and Windows – Types – Functions – Sizes and types suitable for different locations. Ventilators. **Roofs:** Flat roofs – Brief description of RCC roof – Madras terrace and jack arch roof – Method of construction of RCC roof. **Floors:** Common types of flooring used in buildings. **Vertical Transportation in Buildings:** Types of vertical transportation in building, stairs: Different types of stairs – Design of stairs. **Building Services:** Plumbing services – Electrical services – Air conditioning – Acoustics and sound insulation – Fire protection measures.   **(11)**

UNIT – IV
BUILDING CONSTRUCTION:

Masonry Works: Stone masonry: Dressing of stones – Specifications for stone masonry. Brick masonry: Bonds in brick masonry – Specifications for construction of brick masonry. **Temporary Supporting Structures:** Brief description of Centring – Formwork – Scaffolding – Shoring – Underpinning. **Finishing Works:** Brief description of Plastering – Pointing – White and colour washing – Types of wall coverings – False ceiling works. **Reinforced Concrete Construction:** Reinforced columns, Beams & RCC framed buildings. Prefabricated construction – Advantages & Disadvantages. **Maintenance and Repairs in Building:** Brief introduction on dampness in buildings.   **(11)**

TEXTBOOKS:
1. Rangwala, *Building Materials,* Charoter Publishers.
2. Bindra S.P., Arora K.R., *Building Construction,* Dhanpat Rai and Sons.

REFERENCES:
1. T.T.I., *Building Technology and Evaluation,* Tata Mc Graw hill Co.
2. Setty M.S, *Concrete Technology,* S.Chand Company, New Delhi.
3. Sushil Kumar, *Materials for construction,* Standard Publishers, New Delhi.
4. Punmia B.C., *Building Construction,* Laxmi Publications.
5. *National Building Code of India,* Bureau of Indian Standards.
6. Relevent IS Codes of Practice

CE 214 – FLUID MECHANICS – I

Class: **II/IV B.Tech. I Semester**   Lectures: **3**; Tutorials: **1**
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

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. FLUD 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 π-Theorms; Dimensionless numbers; Similitude studies and Modelling.

UNIT – IV

6. PIPE FLOW: **(5+1)**
Loss of head in pipes – Critical Reynold's number – Friction factor for Laminar and Turbulent flows – Various minor losses in pipes – HGL & TEL lines – Series and parallel connections – Power transmission through pipes – Flow through nozzles.

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
1. Jain A.K., *Fluid Mechanics*, Khanna Publishers, New Delhi.
2. Modi P.N., Seth S.M., *"Fluid Mechanics and Hydraulic Machines"*, Standard Publishers, New Delhi.

REFERENCES
1. Streeter V.L. *Fluid Mechanics*, McGraw Hill Book Co.
2. F.M. White *"Fluid Mechanics"*, 6th Edition, Mc.Grah Hill Publishers, New York.
3. Mascy *"Fluid Mechanics"*, ELBS, U.K.

CE 215 – FLUID MECHANICS LABORATORY

Class: **II/IV B.Tech. I Semester**   *Practicals:* **03**
Branch: **Civil Engineering**   *University Exam:* **50 Marks**
Duration of University Examination: **2 Hours**   *Sessionals:* **25 Marks**

LIST OF EXPERIMENTS:

1. Calibration of V- Notch.

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.

6. Analysis of performance of Venturimeter and orifice meter.

7. Losses in pipe lines due to sudden enlargements and sudden contractions.

8. Losses in pipe lines due to bends and elbows.

9. Determination of friction factor in Pipes.

10. Analysis of performance of Nozzle meter and Rotameter.

11. Broad crested weir – discharge measurement.

REFERENCES:

1. Asawa, G.L., "*Experimental Fluid Mechanics",* New Age Publications.

ME 216 – MECHANICAL TECHNOLOGY

Class: **II/IV B.Tech. I Semester**   *Lectures: 3; Tutorials: 1*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

UNIT – I

1. **FUNDAMENTAL CONCEPTS:**   **(4+1)**
   Introduction SI units, System, Thermodynamic state, Property, Process and Cycle, Intensive and extensive properties, Energy, Work and Heat, Microscopic Vs Macroscopic view point, Thermodynamic equilibrium, Zeroth law and its applications.

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, Babclock 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. **FOUNDRY 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:
1. Mathur, Mehta and Tiwari, *Elements of Mechanical Engg.,* Jain Brothers, New Delhi.
2. P.K. Nag, *Engg. Thermodynamics,* Tata McGraw Hill, New Delhi.

EE 219 ELECTRICAL & ELECTRONICS ENGINEERING

Class: **II/IV B.Tech. I Semester**   *Lectures: 3; Tutorials: 1*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

UNIT – I
1. D.C. CIRCUITS: **(9+3)**
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.

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

4. TRANSFORMERS:
Constructional features, Operating principle, E.M.F. equation, Transformation ratio.

UNIT – III
5. SEMICONDUCTOR DIODES: **(9+3)**
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
6. TRANSISTORS: **(9+3)**
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. Vinvent Del Toro *"Principles of Electrical Engineering",* PHI.
2. N.N.Bhargava, D.C. Kulshreshtha, S.C.Gupta, *"Basic Electronics & Linear Circuits"*, TTTI Publications,Tata McGraw-Hill, New Delhi.
3. R.P. Jain, *"Digital Electronics and Microprocessor",* TMH.
REFERENCES
1. B.L. Thereja, A.K. Thereja, *"Electrical Technology",* S.Chand & Company Ltd.
2. Shalivahana, *"Electronic Devices and Circuits",* TMH.

CE 217 – MATERIAL TESTING LABORATORY

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

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)

3. Determination of the compressive strength of wood and punching shear strength on G.I. sheet.

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:
1. Davies, Troxell and Huck, *Testing and Inspection of Engineering Materials;* McGraw Hill Publishers
2. Suryanarayana, *Testing of Metallic Materials;* PHI Publishers.
3. Davies, Troxell and Whiscosil, Testing and Inspection of Engineering Materials; McGraw Hill Publishers.

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

CIVIL ENGINEERING

Course No.	Course	Periods of Instruction per week			Evaluation Scheme			Total Marks
					External Evaluation		Sessionals	
		Lectures	Tutorials	Practicals/ Drawing	Duration of Exam	Max. Marks	Max. Marks	
HS 221	Mathematics – III	3	1	0	3 Hrs.	100	50	150
CE 222	Surveying – I	3	0	0	3 Hrs.	100	50	150
CE 223	Strength of Materials – II	3	1	0	3 Hrs.	100	50	150
CE 224	Fluid Mechanics – II	3	1	0	3 Hrs.	100	50	150
CE 225	Engineering Geology	3	0	0	3 Hrs.	100	50	150
CE 226	Computer Aided Building Drawing	0	0	3	3 Hrs.	50	25	75
CE 227	Engineering Geology Laboratory	0	0	3	2 Hrs.	50	25	75
CE 228	Hydraulics & Hydraulic Machinery Laboratory	0	0	3	2 Hrs.	50	25	75
CE 229	Survey Field Work – I	0	0	3	3 Hrs.	50	25	75
		15	3	12				1050

HS 221 MATHEMATICS – III

Class: **II/IV B.Tech. II Semester**   *Lectures: 3; Tutorials: 1*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

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-Caylay 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)**
Curve fitting – Method of least squares – Straight line and parabolic curves – Correlation coefficient – Rank correlation – Regression – Linear regression equations. Random variables – Discrete land continuous distributions – Density and distribution functions – Illustration through binomial, Poisson and normal distributions.

UNIT – III
3. NUMERICAL ANALYSIS: **(8+3)**
Interpolation – Newton's and Lagrange's formulae.

4. NUMERICAL DIFFERENTIATION AND INTEGRATION:
First and second derivatives using forward and backward interpolation–Numerical integration – Trapezoidal and Simpson's Rule.

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:

1. B.S.Grewal, *Higher Engineering Mathematics,* Khanna Publishers*,* New Delhi.

REFERENCE BOOKS:

1. S.S.Sastry, *Introduction to Numerical Analysis,* Prentice Hall of India, New Delhi.
2. E.Kreyszig, *Advanced Engineering Mathematics,* Wiley Eastern Ltd., New Delhi.
3. Gupta and Kapoor, *Fundamentals of Mathematical Statistics*, S.Chand and Co., New Delhi.

CE 222 – SURVEYING – I

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

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 – ordinates; 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

1. Arora K.R., *Surveying (Vol. I),* Standard Publishers Delhi.
2. Punmia B.C., *Surveying (Vol. I)* Laxmi Publications, New Delhi.

REFERENCES

1. David Clarke, *Plane and Geodetic Surveying (Vol. I),* CBS Publishers, Delhi.
2. Kanetkar T.P., Kulkarni C.V., *Surveying and Levelling (Vol. I and II),* Pune Vidyarthi Griha Prakashan, Pune.

CE 223 – STRENGTH OF MATERIALS – II

Class: **II/IV B.Tech. II Semester**   *Lectures: 3; Tutorials: 1*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

UNIT – I

1. DEFLECTION OF BEAMS: **(5+2)**
Double integration method – Macaulay's method – Moment area method – Conjugate beam method – Application of above methods in calculation of slope and deflections of simply supported, cantilever and overhanging beams.

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)**
Analysis of fixed beams for shear and bending moments – Deflection of fixed beams – Effect of sinking of supports – Analysis of continuous beams using clapeyron's theorem of three moments – Effect of sinking of supports.

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
1. Punmia B.C., Arun K. Jain, Ashok K. Jain, *Machanics of Materials,* Laxmi Publications, New Delhi.
2. Popov. E.D., *Engineering Mechanics of Solids.*

REFERENCES
1. S.B. Junnarkar, *Mechanics of Structures Vol.-I. & Vol.-II,* Charotar Publishing Company, Anand.
2. Timoshenko and Gere, *Mechanics of Materials,* Mc Grahill International.
3. Andrew Pytel, Ferdinand L. Singer, *Strength of Materials 4th Edition,* Harper & Row Publishers, New York.

CE 224– FLUID MECHANCIS – II

Class: **II/IV B.Tech. II Semester**   *Lectures: 3; Tutorials: 1*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: **3 Hours**   *Sessionals: 50 Marks*

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. HYDRUALIC 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
1. Jain A.K., *"Fluid Mechanics"*, Khanna Publishers, New Delhi.
2. Modi P.N., Seth S.M., *"Fluid Mechanics and Hydraulic Machines",* Standard Publishers, New Delhi.

REFERENCE BOOKS
1. Ven-Te-Chow*, "Open Channel Flow",* Tata Mc.Grah Hill Publishers, New Delhi.
2. Streeter V.L. *Fluid Mechanics*, McGraw Hill Book Co.
3. Jagdeesh Lal*, "Hydraulic Machines"*, Metropolitan Book Co.
4. R.K. Rajput, *"Fluid Mechanics and Hydraulic Machinery",* S.Chand & Company Ltd., New Delhi.

CE 225 ENGINEERING GEOLOGY

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

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 schirtosity joints and their measurements - Unconformitives, 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
1. Parbin Singh, *Engineering & General Geology,* S.K. Kataria & Sons, New Delhi.
2. N. Chenna Keshavulu, *Textbook of Engineering Geology*, New Age International Publishers.

REFERENCES
1. Joseph M. Trefethen, *Geology for Engineering.*
2. B.S.S. Narayanaswamy, *Engineering Geology,* Dhanpat Rai & Co.
3. Legget, *Engineering Geology*.
4. Krynine & Judd, *Engineering Geology & Geotechniques*.

CE 226   COMPUTER AIDED BUILDING DRAWING

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

1. Types of Buildings, Functional Planning, Building by–laws and Regulations, Orientation of Buildings.
2. Principles of Planning – Planning of space.
3. Development of plan, Section and Elevation.
4. Planning of Residential Buildings-Minimum requirements.
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.
8. Plan of an Industrial Structure.
9. Section and Elevation of a Staircase
10. Plan of Dream House.
11. Plan of Duplex Building.
12. Plan of a Residential Building with split level.

REFERENCES

1. National Building Code of India, 1983 – *Bureau of Indian Standards*, New Delhi.
2. Shah, Kale and Patki, *Building Drawing,* Tata Mc Graw hill Book Company Limited, New Delhi.
3. Y.N.Raja Rao, Y. Subramanyam, *Planning ad Designing of Residential Buildings,* Standard Publishers Distributors, New Delhi.
4. Manual of 3D Home Architect / Chief Architect.

CE 227   ENGINEERING GEOLOGY LABORATORY

Class: **II Year B.Tech. II Semester**   *Practicals:* **3**
Branch: **Civil Engineering**   *University Exam:* **50 Marks**
Duration of University Examination: *2 Hours*   ***Sessionals:*** *25 Marks*

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.

6. Study of Geological maps: Out crop completion and profile drawing.

7. Study of geological maps: Bed thickness determination, and structural features.

8. Demonstration of working of field model of geophysical exploration technique.

9. Demonstration of compressive strength of rocks.

CE 228 – HYDRUALICS & HYDRAULIC MACHINERY LABORATORY

Class: **II/IV B.Tech. II Semester**   *Practicals: 3*
Branch: **Civil Engineering**   *University Exam: 50 Marks*
Duration of University Examination: 2 Hours   *Sessionals: 25 Marks*

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.

6. Analysis of performance of Centrifugal pump.

7. Analysis of performance of Turbine pump.

8. Analysis of performance of Reciprocating pump.

9. Analysis of performance of Submersible pump.

10. Analysis of performance of Francis Turbine.

11. Analysis of performance of Pelton wheel.

12. Study of Phenomenon of water hammer in pipes.

REFERENCES:

1. Kumar K.L., "*Fluid Mechanics*", S.Chand Publications, New Delhi.
2. Asawa G.L., "*Experimental fluid mechanics – Vol. II*", New Age Publications.

CE 229 – SURVEY FIELD WORK - I

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

LIST OF EXPERIMENTS:

1. Chain surveying: Ranging and Chaining.

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:

1. Punmia B.C., *Surveying (Vol.I);* Laxmi Publications, New Delhi.

2. Arora K.R., *Surveying (Vol. I);* Standard Publishers, New Delhi.

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

Course No.	Course	Periods of Instruction per week			Scheme of Evaluation			Total Marks
					External Evaluation		Sessionals	
		Lectures	Tutorials	Drawing/ Practicals	Duration of Exam	Max. Marks	Max. Marks	
HS 311	Management, Economics & Accountancy	3	1	0	3 Hrs.	100	50	150
CE 312	Structural Analysis - I	3	1	0	3 Hrs.	100	50	150
CE 313	Structural Design-I	3	2	0	3 Hrs.	100	50	150
CE 314	Geotechnical Engineering – I	3	1	0	3 Hrs.	100	50	150
CE 315	Surveying – II	3	0	0	3 Hrs.	100	50	150
CE 316	Hydrology	3	1	0	3 Hrs.	100	50	150
CE 317	Geotechnical Engineering Laboratory	0	0	3	3 Hrs.	50	25	75
CE 318	Survey Field Work – II	0	0	3	3 Hrs.	50	25	75
		18	6	6				1050

HS 311 MANAGEMENT, ECONOMICS & ACCOUNTANCY

Class: **III/IV B.Tech. I Semester**   *Lectures:***3**, *Tutorials:***1**
Branch: **Civil Engineering**   *University Exam:* **100 Marks**
Duration of University Examination: **3 Hours**   *Sessionals:* **50 Marks**

UNIT – I
ECONOMICS: **(2)**

Meaning, Definition, Scope: Micro and Macro, Assumptions and Methods. Usefulness.

FACTORS OF PRODUCTION: **(6)**

Meaning and Definition, Characteristics of Land Labour, Capital and Entrepreneurship, Division of Labour: Advantages and Disadvantages. Formation of Capital, Forms of Business Organization, Sole Proprietaryship, Partnership Concern, Cooperative Societies, Joint Stock Company, Types of Partners, Types of Joint Stock Companies, Merits and Demerits.

UNIT – II
MANAGEMENT: **(4)**

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

FUNCTIONS OF MANAGEMENT: **(10)**

Planning: Definition and Process. Organizing, Definition of Organization, Characteristics and Types, Principles of Organization, Departmentation: Meaning and Fundamentals of Departmentation, Centralization and Decentralization: Definition, Features, Merits and Demerits, Communication: Process of Communication, Channels, Media and Barriers.

UNIT – III
STAFFING: **(4)**

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

UNIT – IV
DOUBLE ENTRY BOOK – KEEPING: **(10)**

Definition, Journalization of Transactions, Ledger Posting and Balancing, Preparation of Trial Balance.

PREPARATION OF FINAL ACCOUNTS: **(7)**

Trading Account, Profit and Loss Account and Balance Sheet (with simple adjustments).

REFERENCES
1. *Modern Economic Theory,* by K.K. Dewett.
2. *Principles and Practice of Management,* by L.M. Prasad.
3. *Introduction to Accountancy,* by T.S. Grewal.
4. *Business Organization and Management,* by Y.K. Bhushan.

CE 312 – STRUCTURAL ANALYSIS – 1

Class: **III/IV B.Tech. I Semester**   *Lectures:***3**, *Tutorials:***1**
Branch: **Civil Engineering**   *University Exam: **100 Marks***
*Duration of University Examination: **3 Hours***   *Sessionals: **50 Marks***

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
1. C.S. Reddy, *Basic Structural Analysis*, Tata Mc Graw Hill Co.,New Delhi.
2. B.C.Punmia, *Strength of Materials and Theory of Structures Vol. II,* Laxmi Publications, New Delhi, India.

REFERENCES
1. C.K. Wang, *Indeterminate Structural Analysis,* McGraw Hill Book Co.
2. Ramamrutham, *Theory of Structures,* Dhanpatrai and Sons, New Delhi

CE 313 – STRUCTURAL DESIGN – I

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

Lectures:3, Tutorials:2
University Exam: 100 Marks
Sessionals: 50 Marks

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:**   **(8+4)**
   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.

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
1. S. Unnikrishna Pillai & Devdas Menon, *Reinforced Concrete Design*, Tata Mc.Graw-Hill Publishing Company Limited, New Delhi.
2. A.K. Jain, *Limit State Design,* Nem Chand Brothers, Roorkee.

REFERENCES
1. Jai Krishna & O.P. Jain, *Plain and Reinforced Concrete*, Nem Chand Brothers, Roorkee.
2. B.C. Punmia, *Reinforced Concrete Structures,* Laxmi Publishing Company, New Delhi.
3. IS: 456 - 2000: *Code of practice for Plain and Reinforced Concrete*, Bureau of Indian Standards, New Delhi.

CE 314   GEOTECHNICAL ENGINEERING-I

Class: **III/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. 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 – Thixotrophy.

TEXT BOOKS
1. Gopal Ranjan & A.S.R. Rao, *Basic and Applied Soil Mechanics*, New Age Publications.
2. K.R. Arora *, Soil Mechanics and Foundation Engineering,* Standard Publishers, New Delhi.

REFERENCES
1. C. Venkatramaiah, G*eotechnical Engineering,* New Age Publications.
2. Lambe T.W.& Whiteman, R.V Soil Mechanics, New Age Publications.

CE 315 SURVEYING - II

Class: **III/IV B.Tech. I Semester**   *Lectures: 3*
Branch: Civil Engineering   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *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
1. Arora K.R., *Surveying (Vol. II),* Standard Publishers Delhi.
2. Punmia B.C., *Surveying (Vol. I, II and III)* Laxmi Publications, New Delhi.

REFERENCES:
1. Kilford W., *Elementary Air Survey,* ELBS and Pitman.
2. David Clarke, *Plane and Geodetic Surveying (Vol. I),* CBS Publishers, Delhi.
3. Kanetkar T.P., Kulkarni C.V., *Surveying and Levelling (Vol. I and II),* Pune Vidyarthi Griha Prakashan, Pune.

CE 316 HYDROLOGY

Class: **III/IV B.Tech. I Semester**   *Lectures: 3; Tutorials: 1*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

UNIT - I

1. **INTRODUCTION:**   (9+3)
   Definition, Hydrologic cycle, Water budgeting, Water potential in India.

2. **STATISTICAL & PROBABILITY ANALYSIS OF HYDROLOGICAL DATA:**
   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   (10+3)

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   (9+3)

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
1. K.Subramanya, *"Engineering Hydrology",* Tata Mc Graw Hill Book Co., New Delhi.
2. P. Jayarami Reddy, *"A TextBook of Hydrology",* Laxmi Publishers, New Delhi.

REFERENCES
1. R.K. Linsley, M.A. Kohler & J.L.Paulus, *Hydrology for Engineers,* Mc Graw Hill Book Co.
2. R.S. Varshney, *Hydrology for Engineers,* Nemchand Bros., Roorkee.
3. H.M. Raghunath, *Hydrology,* New Age International Pulishers.

CE 317 GEOTECHNICAL ENGINEERING LABORATORY

Class: **III/IV B.Tech. I Semester**   *Practicals:* **3**
Branch: **Civil Engineering**   *University Exam: 50 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 25 Marks*

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 Insitu 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

1. B. M. Das, *Soil Mechanics Laboratory Manual,* Oxford University Press.
2. SP 36 (Part – I): 1987 - *Compendium of Indian Standards on Soil Engineering,* Bureau of Indian Standards, New Delhi.

CE 318 – SURVEY FIELD WORK - II

Class: **III/IV B.Tech. I Semester**   *Practicals:* **3**
Branch: Civil Engineering   *University Exam:* **50 Marks**
Duration of University Examination: 3 Hours   *Sessionals:* **25 Marks**

LIST OF EXERCISES

1. Radiation and Intersection methods by Plane table survey.

2. Traversing by Plane table survey

3. Resection by plane table – Two-point problem.

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
1. Punmia B.C., *Surveying (Vol.II);* Laxmi Publications, New Delhi.
2. Arora K.R., *Surveying (Vol. II);* Standard Publishers, New Delhi.
3. Agor R., *Surveying and Levelling;* Khanna Publishers, New Delhi

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

CIVIL ENGINEERING

Course No.	Course	Periods of Instruction per week			Scheme of Evaluation			Total Marks
					External Evaluation		Sessionals	
		Lectures	Tutorials	Drawing/ Practicals	Duration of Exam	Max. Marks	Max. Marks	
OE 321	Open Elective	3	0	0	3 Hrs.	100	50	150
CE 322	Structural Analysis-II	3	1	0	3 Hrs.	100	50	150
CE 323	Structural Design-II	3	2	0	3 Hrs.	100	50	150
CE 324	Geotechnical Engineering – II	3	1	0	3 Hrs.	100	50	150
CE 325	Concrete Technology	3	1	0	3 Hrs.	100	50	150
CE 326	Transportation Engineering.-I	3	1	0	3 Hrs.	100	50	150
CE 327	Concrete Laboratory	0	0	3	3 Hrs.	50	25	75
CE 328	Transportation Engineering Laboratory	0	0	3	3 Hrs	50	25	75
		18	6	6				1050

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

OE 321A   OPERATIONS RESEARCH
(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. LINEAR PROGRAMMING: **(9)**
Mathematical Model, Assumptions of linear programming, Principles of simplex method, Big M-method, Duality, Dual simplex method, Revised simplex method.

UNIT – II
2. NON-LINEAR PROGRAMMING: **(9)**
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: **(5)**
Introduction, Multistage decision process-Linear programming as a case of dynamic programming, Computational procedures in dynamic programming.

4. SPECIAL TYPE OF LINEAR PROGRAMMING: **(5)**
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   `` **(8)**
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
1. Hamdy.A. Taha, *Operations Research*, Prentice Hall of India Ltd., New Delhi.
2. Kantiswaroop, et.al, *Operations Research*, S. Chand & Sons, New Delhi.

REFERENCES
1. S.S. Rao, *Optimization Techniques*, New Age International, New Delhi.
2. V.K.Kapoor, *Operations Research*, S. Chand & Sons, New Delhi.
3. J.C. Pant, *Introduction to Optimization*, Jain Brothers, New Delhi.
4. G. Hadley, *Linear Programming*, Addison Wesley, New York.
5. Gillett, *Introduction to Operations Research*, McGraw-Hill, New York.

Class: **III/IV B.Tech. II Semester**   *Lectures:* **3**
Branch: **Common to all Branches**   *University Exam:* **100 Marks**
Duration of University Examination: **3 Hours**   *Sessionals:* **50 Marks**

UNIT-I

1. **INTRODUCTION TO MANAGEMENT INFORMATION SYSTEMS:**   **(8)**
   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:**   **(10)**
   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.

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-III

4. **INFORMATION SYSTEM REQUIREMENTS:**   **(8)**
   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-IV

5. **DEVELOPMENT IMPLEMENTATION AND MANAGEMENT OF INFORMATION SYSTEM RESOURCES:**   **(10)**
   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
1. Gordon B.Davis, Margrethe.H.Olson, *Management Information Systems: Conceptual Foundations, Structure and Development, 2/e,* Tata McGraw-Hill, New Delhi.
2. Jerome Kanter, *Management-Oriented Management Information Systems, 2/e,* Prentice Hall of India, New Delhi, 1982.

REFERENCES
1. *Notes on Management of Information Systems IGNOU,* School of Management Studies, New Delhi, 1997.
2. Henry, C. Lucas, Jr., *Information Technology for Management, 7/e,* TataMcGraw-Hill, New Delhi.

OE 321C ENTREPRENEURSHIP DEVELOPMENT
(OE 321 Open Elective)

Class: **III/IV B.Tech. II Semester**   *Lectures:* **3**
Branch: **Common to all Branches**   *University Exam:* **100 Marks**
Duration of University Examination: **3 Hours**   *Sessionals:* **50 Marks**

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)**
Plant layout-principles of layout, Types of layout-factors influencing, Layout-effects of good and bad plant layouts, Procedure for plant layout, Estimation of requirements of machinery, Men and materials, Development of sources and their availability-procurement and installation, Materials management, Objectives and functions of materials management.

UNIT-IV
4. ENTERPRISE MANAGEMENT: **(9)**
Production planning and control-concept, Functions and long run and short run problems, Marketing-meaning, Definition and functions. Marketing mix: Product, Price, Place and Promotion-Analysis, Market segmentation: Types, Financial management: Objectives and functions. Personnel management: Definition and functions.

TEXT BOOKS
1. P.Saravanavel, E*nterpreneurship Development.*

REFERENCES
1. H*andbook for New Entrepreneurs,* Entrepreneurship Development Institute of India, Ahmedabad.
2. T.R.Banga, P*roject Planning and Entrepreneuship Development,* CBS Publishers, New Delhi.
3. *Personnel efficiency in Entrepreneurship Development–A Practical Guide to Industrial Entrepreneurs,* S.Chand & Co., New Delhi.

CE 322 – STRUCTURAL ANALYSIS – II

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

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

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
1. Pandit & Gupta, *Matrix analysis of Structures*, Tata McGraw-Hill, New Delhi.
2. C.S. Reddy, *Basic Structural Analysis*, Tata Mc Graw Hill Co., New Delhi.

REFERENCES
1. R.S. Jindal, *Indeterminate Structures*, S.Chand & Company, New Delhi.
2. Weaver & Gere, *Analysis of framed structures,* Van Nostrand Company.
3. Junnarkar S.B., *Theory of structures Vol II*, Charotar Pub. Co., Anand.

CE 323 – STRUCTURAL DESIGN - II

Class: **III/IV B.Tech. II Semester**   *Lectures:* **3***; Tutorials:* **2**
Branch: **Civil Engineering**   *University Exam:* **100 Marks**
Duration of University Examination: **3 Hours**   *Sessionals:* **50 Marks**

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
1. A.S. Arya & J.C. Ajmani, *Design of Steel Structures,* Nem Chand Bros. Roorkee.
2. Ramachandra, *Design of Steel Structures, Vol. I,* Standard Publishers, New Delhi.
REFERENCES
1. R.S. Jindal, *Design of Steel Structures*, Standard Publishers, New Delhi.
2. L.S. Negi, *Design of Steel Structures,* Tata Mc.Graw Hill Publishing Co., New Delhi.
3. IS: 800-1984: *Code of practice for steel construction*, Bureau of Indian Standards, New Delhi.

CE 324 GEOTECHNICAL ENGINEERING – II

Class: **III/IV B.Tech. II Semester**   *Lectures:3, Tutorials:1*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

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)**
   Introduction – Infinite and Finite slopes - Types of slope failures - Different factors of safety - Stability analysis of finite slope by Swedish and Friction Circle methods – Taylor's stability number - Stability analysis of earthen dam for different conditions.

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)**
   Types of machine foundations - Basic definitions – Field methods of determining design parameters – cyclic plate load test -- block vibration test -- Design criteria and detailing for machine foundations - Degree of freedom of block foundation - Vibration analysis of machine foundation.

TEXT BOOKS
1. K.R. Arora, *Soil Mechanics and Foundation Engineering*, Standard Publishers, New Delhi.
2. Gopal Ranjan & ASR Rao, *Basic and Applied Soil Mechanics*, New Age Publications, Delhi.
3. J.E. Bowles, Mc Grawhill Publications, *Foundation Analysis and Design*, New York.

REFERENCES
1. Peck, Hanson & Thornborn, *Foundation Engineering,* John Wiley Publications, New York.
2. Srinivasulu & Vaidyanathan, *Handbook of Machine Foundations*, Tata Mc Graw Hill Publications, New Delhi.

CE 325 CONCRETE TECHNOLOGY

Class: **III/IV B.Tech. II Semester** *Lectures: 3; Tutorials:1*
Branch: **Civil Engineering** *University Exam: 100 Marks*
Duration of University Examination: 3 Hours *Sessionals: 50 Marks*

UNIT- I

1. **INTRODUCTION:** **(4+1)**
   Brief review of concrete making materials, Cement, Aggregate and water - Use of admixtures in concrete and the effects produced by them on concrete: Workability – Pozzolonas – Air entraining mixtures – Accelerators and Retarders Properties of fresh concrete.

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:**
   General principles – Application to concrete – Endurance limit – Factors effecting fatigue and creep – Mechanics of creep and allowance in design.

6. **SPECIAL TYPES OF CONCRETE:** **(9+3)**
   Light weight concrete -- Vacuum concrete – Mass concrete – Silica fume concrete – Fly ash concrete – Self Compacting Cement (SCC) – Polymer concrete – Prepacked concrete – Under water concreting – Ferrocement – Fibre reinforced concrete – Shotcrete and Guniting and other types of concrete.

TEXT BOOKS
1. M.S.Shetty, *Concrete Technology*, S.Chand & Co. Ltd. New Delhi
2. Neville, *Properties of Concrete,* McGrawHill Publications.

REFERENCES
1. M.L. Ghambir, *Concrete Technology,* Tata Mc.Graw Hill Publishing Co. Ltd., New Delhi.
2. Dr. K.T.K. Swamy, Dr. A.K.S. Rao & Dr. A.A. Khandekar, *Concrete Technology,* Dhanpatrai & Sons, New Delhi.

Class: **III/IV B.Tech. II Semester**   *Lectures:***3**, *Tutorials:***1**
Branch: **Civil Engineering**   *University Exam:* **100 Marks**
Duration of University Examination: **3 Hours**   *Sessionals:* **50 Marks**

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)

Classification of Highways, Network Patterns, Highway way planning, 20 year Road Development Plans, Principles of Highway Alignment, Planning Surveys, Preparation of Master Plans, Evaluation by saturation system, Introduction to Highway Economics.

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)

Sub grade soil, Properties, CBR test, Stone aggregates, Desirable properties, Tests, Bitumen, Properties of Bitumen, Tests, Design of Bitumen mixes by Marshall Stability Test.

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, Penodic, Routine, Special repairs, Pavement evaluation, Strengthening of Pavements, Overlay design, Introduction to Highway Drainage.

TEXT BOOKS
1. Khanna S.K. & Justo C.E.G., *Highway Engineering*, Nem Chand Bros, Roorkee.
2. Kadiyali L.R., *Traffic Engineering and Transportation Planning*, Khanna Publishers, Delhi.

REFERENCES
1. Papacostas C.S., *Fundamentals of Transportation Engineering*, Prentice Hall of India, Delhi.
2. Kadiyali L.R., *Principles of Highway Engineering*, Khanna Publishers, Delhi.
3. MORTH Publications, *Specifications for Roads and Bridges-Manncal for Maintenance of Roads.*

CE 327   CONCRETE LABORATORY

Class: **III/IV B.Tech. II Semester**   *Practicals:* **3**
Branch: **Civil Engineering**   *University Exam:* **50 Marks**
Duration of University Examination: **2 Hours**   *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
14. Non-Destructive testing of concrete – Demonstration.
15. Design of concrete mixes using IS-Code method.

TESTS ON BRICK:

16. Water absorption and compressive strength of bricks

REFERENCES

1. A.M.Neville, *Properties of Concrete,* Mc.Graw Hill Publishing Co. Ltd., New York.
2. M.S.Shetty, *Concrete Technology,* S.Chand & Co., New Delhi.
3. Relevant IS Codes.

CE 328   TRANSPORTATION ENGINEERING LABORATORY

Class : **III Year B.Tech. II Semester**   *Practicals: 3*
Branch: **Civil Engineering**   *University Exam: 50 Marks*
Duration of University Examination: 2 Hours   *Sessionals: 25 Marks*

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

1. Khanna S. K. & Justo C.E.G., *Highway Material Testing,* Nemchand Bros, Roorkee.

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

CIVIL ENGINEERING

Course No.	Course	Periods of Instruction per week			Scheme of Evaluation			Total Marks
		Lectures	Tutorials	Drawing/ Practicals	External Evaluation		Sessionals	
					Duration of Exam	Max. Marks	Max. Marks	
CE 411	Structural Design – III	3	2	0	3 Hrs.	100	50	150
CE 412	Irrigation Engg & Hydraulic Structures	4	0	2	3 Hrs.	100	50	150
CE 413	Transportation Engineering – II	3	0	0	3 Hrs.	100	50	150
CE 414	Environmental Engineering – I	3	0	0	3 Hrs.	100	50	150
CE 415	Professional Elective – I	3	0	0	3 Hrs.	100	50	150
CE 416	Estimation & Valuation	1	3	0	3 Hrs.	100	50	150
CE 417	Environmental Engineering Laboratory	0	0	3	3 Hrs	50	25	75
CE 418	Project Work*	0	0	3		--	50*	50
		17	5	8				1025

*   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

CE 411 – STRUCTURAL DESIGN – III

Class: **IV/IV B.Tech. I Semester**   *Lectures: 3; Tutorials: 2*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

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
1. B.C. Punmia, *Reinforced Concrete Structures, Vol. 1 & 2,* Standard Publishers, New Delhi.
1. S.Ramchandra, *Design of Steel Structures, Vol.1 & 2,* Standard Publishers, New Delhi.

REFERENCES

1. IS: 3370 – 1965, *Code for water tanks (Parts I, II, III & IV),* Bureau of Indian Standards, New Delhi.
2. IS: 875 - 1987: *Code of Practice for Design loads (Parts I, II, III, IV & V),* Bureau of Indian Standards, New Delhi.
3. IS: 800-1984: *Code of practice for steel construction*, Bureau of Indian Standards, New Delhi.
4. IS: 456-2000: *Code of practice for Plain and Reinforced Concrete*, Bureau of Indian Standards, New Delhi.

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

CE 412 IRRIGATION ENGINEERING AND HYDRAULIC STRUCTURES

Class: **IV/IV B.Tech. I Semester**　　　　　　　　　　　*Lectures:* **4**; *Drawing:* **2**
Branch: **Civil Engineering**　　　　　　　　　　　　　*University Exam:* **100 Marks**
Duration of University Examination: **3 Hours**　　　　　*Sessionals:* **50 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　　　　　　　　　　　　　　　　　　　　　　　　　　　　**(12)**

4. Necessity, Types of cross-drainage works and selection, Design principles of Aqueduct and Siphon aqueduct, Bank connections, Bed and bank protection.

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

6. **HYDROPOWER ENGINEEING:**
   Introduction – Source of energy, Power potential studies, Flow duration and Power duration curves, Load curves, Load factor, Utilization and capacity factor - Classification of hydropower plants, General layout and components, Penstock and water hammer effect. Power house general layout and its classifications based on location.

UNIT-IV　　　　　　　　　　　　　　　　　　　　　　　　　　　　**(36)**

7. Design and Drawing of (1) Vertical drop weir, (2) Sloping glacis weir, (3) Sloping glacis fall. (4) Fall with Baffle wall (5) Head regulator, (6) Aqueduct, (7) Siphon Aqueduct.

TEXT BOOKS
1. R.S. Varshney, et al "*Theory and Design of Irrigation of Structures – Vol.I & II,* Nem Chend Bros, Roorkee.
2. B.C. Punmia, *"Irrigation and Water Power Engineering",* Standard Publishers, New Delhi.
3. S.K. Garg, *"Irrigation Engineering and Hydraulic Structures",* Khanna Publishers, New Delhi.

REFERENCES
1. Bharat Singh, *Irrigation Engineering,* Nem Chend Bros, Roorkee.
2. G.L. Asawa, *"Irrigation Engineering",* New Age Publications, New Delhi.
3. K.R. Arora, *"Irrigation, Water Power and Water Resources Engineering",* Standard Publications, New Delhi.

CE 413 TRANSPORTATION ENGINEERING – II

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

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
1. Subhash C. Saxena & S.P.Arora, *Railway Engineering*, Dhanpat Rai & Sons, Delhi.
2. Bindra S.P., *Docks & Harbour Engineering,* Dhanpat Rai & Sons, Delhi.
3. Khanna & S.P. Arora, *Air Port Engineering,* Nemchand Bros, Roorkee.

REFERNCES:
1. C. Jotin Khisty & B. Kenthall, *Transportation Engineering,* Eastern Economy Edition.

CE 414 ENVIRONMENTAL ENGINEERING – I

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

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)**
Fluctuations, Forecasting future requirements, Water for fire fighting, Natural water purification process: Physical processes, Chemical processes, Biochemical processes. Response of streams to biodegradable organic waste.

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
1. S.R.Qasim, *Water Works Engineering,* Prentice Hall of India, 2002.
2. Santosh Kumar Garg, *Water supply and Sanitary Engineering Vol.1,* Khanna Publishers.
3. B.C.Punmia, *Water Supply Engineering,* Standard Publishers, New Delhi.

REFERENCES
1. Howard S. Peavy & Donald R. Rower, George Tchobanoglous, *Environmental Engineering,* Mc Graw-Hill International Edition (1985).
2. J.A.Nathanson, *Basic Environmental Technology - 4th Edition,* Prentice Hall of India (2004).

CE 415A   EARTH RETAINING STRUCTURES
(CE 415 Professional Elective - I)

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

UNIT-I
1. EARTH AND ROCK FILL DAMS: **(9)**
Earthen Dams: Selection of site- Material and dam construction – Design for slope stability – Design for performance, Seepage, Uplift control, Filters and other drains – Construction techniques – Dam failures-structural, Hydraulic and seepage failures – Advantages and disadvantages of earthen dams.

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)**
Arching in soils – Types of conduits: positive, negative projecting and ditch conduits – Imperfect ditch conduit – Tunnel conduit – Loads on Conduits – Construction of conduits – Stresses in the vicinity of vertical shafts – Tunnels – Construction of conduits.

UNIT-III
4. SHEET PILE WALLS: **(9)**
Use of sheet pile walls – Types of sheet piles – Design of cantilever sheet pile walls in granular and cohesive soils – Design of anchored sheet pile walls by free earth method in granular and cohesive soils – Rowe's moment reduction theory – Design of anchored sheet pile wall by fixed earth method – Design of anchors – Location of anchorage.

UNIT-IV
5. BRACED CUTS AND COFFER DAMS: **(9)**
Introduction – Lateral earth pressure on sheeting in sand and clayey soils – Types of sheeting and bracing system – Design components of braced cuts – Safety of bottom of excavation against boiling and heave – Uses of coffer dams – Types of coffer dams – Relative merits and demerits – Design of cellular coffer dams by TVA method – Diaphragm type and circular types.

TEXT BOOKS
1. K.R.Arora, *Soil Mechanics and Foundation Engineering,* Standard Publishers Distributors, Delhi.
2. Bharath Singh & H.G. Sharma, *Rock fill and Earth Dams,* Saritha Prakashan.
3. Wayne C. Teng, *Foundation Design,* Prentice Hall of India Pvt. Limited, New Delhi.

REFERENCES
1. Tschebotarioff & Gregory P., *Soil Mechanics, Foundations and Earth Structures,* Mc Graw Hill Book Co., New York

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

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
1. Kadiyali L.R., *Traffic Engineering and Transportation Planning,* Khanna Publications, New Delhi.
2. Jotin Klusty C., *Transportation Engineering on Introduction,* Prentice Hall of India Pvt. Ltd., New Delhi.

REFERENCES
1. Hutchinson B.G., *Principles of Urban Transport Systems Planning,* Mc.Graw Hill Publishers, New York.
2. Pop Kostas C.S., *Fundamentals of Transportation Engineering,* Prentice Hall of India Pvt. Ltd., New Delhi.

CE 415C   EARTHQUAKE RESISTANT STRUCTURES
(CE 415 Professional Elective – I)

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

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)**
   Liquefaction, Land slides, Differential settlements, Foundation treatment, Multi-storied building frames, Water tanks, Chimneys.

5. **ANALYSIS OF EARTHQUAKE LOADS:**   **(6)**
   Introduction to Response Spectrum method, IS-1893-2002-Seismic Coefficient method, Modal analysis, Applications to multi-storied building frames, Water tanks, Chimneys.

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.

<u>**TEXT BOOK**</u>
1. Krishna, Chandrashekaran and Chandra, "*Elements of Earthquake Engineering*", *1994,* 2nd edition, South Asian Publishers, New Delhi.
2. A.K. Chopra, *"Dynamics of Structures",* Prentice Hall of India, New Delhi.

<u>**REFERENCES**</u>
1. Mario Paz, "*Introduction to Structural Dynamics: Theory and Computations",* 3rd edition, Van Nostrand Reinhold.
2. T.Paulay and MJN Priestley, *"Seismic Design of RC and masonry buildings",* John Wiley & Sons.
3. D.J. Dowrick, *"Earthquake Resistant Design",* John Wiley & Sons.
4. IS: 13920 – 1993: *"Indian Standard of Practice for Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces",* Bureau of Indian Standards, New Delhi.
5. IS: 1893-2002, *"Criteria for Earthquake Resistance Design of Structures",* Bureau of Indian Standards, New Delhi.
6. IS: 3370: *"Code for water tanks (Parts I, II, III & IV)"*, Bureau of Indian Standards, New Delhi.

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

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
1. Curran, P.J., *Principles of Remote Sensing*, Longman, London, 1985.
2. Thomas. M. Lillesand R.W. Kiefer, *Remote Sensing and Image Interpretation*, 1987.

REFERENCES
1. Wolf, P.R., *Elements of Photogrammetry*, Tata Mc. Graw Hill, New Delhi, 1986.
2. Campbell, J.B., *Introduction to Remote Sensing*, The Guilford Press, London, 1986.
3. Reddy, M.Anji., *Remote Sensing and GIS,* JNTU, Hyderabad, 2000.
4. B.C. Punmia, *Surveying Vol. III,* Laxmi Publishers, New Delhi.

CE 416 ESTIMATION & VALUATION

Class: **IV/IV B.Tech. I Semester**   *Lectures:1; Tutorials:3*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

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
1. B.N. Datta, *Estimating and Costing in Civil Engineering*, UBS Publishers, New Delhi.
2. Standard Data Book, Public Works Department.

CE 417 ENVIRONMENTAL ENGINEERING LABORATORY

Class: **IV/IV B.Tech. I Semester**   *Practicals:* **3**
Branch: **Civil Engineering**   *University Exam:* **50 Marks**
Duration of University Examination: **2 Hours**   *Sessionals:* **25 Marks**

<u>LIST OF EXPERIMENTS</u>

(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

<u>REFERENCES</u>
1. Dr. B. Kotaiah, N. Kumara Swamy, *Environmental Engineering Laboratory Manual*, Charoter Publishing House, Anand, India

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

CIVIL ENGINEERING

Course No.	Course	Periods of Instruction per week			Scheme of Evaluation			Total Marks
		Lectures	Tutorials	Drawing/ Practicals	External Evaluation		Sessionals	
					Duration of Exam	Max. Marks	Max. Marks	
CE 421	Structural Design-IV.	3	2	0	3 Hrs.	100	50	150
CE 422	Construction Management	3	0	0	3 Hrs.	100	50	150
CE 423	Environmental Engineering – II	3	0	0	3 Hrs.	100	50	150
CE 424	Professional Elective – II	3	0	0	3 Hrs.	100	50	150
CE 425	Civil Engineering Software Application Laboratory	0	0	3	3 Hrs.	50	25	75
CE 426	Project work*	0	-	8		100	150*	250
		12	2	11				925

* 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

CE 421 – STRUCTURAL DESIGN – IV

Class: **IV/IV B.Tech. II Semester**   *Lectures:***3***; Tutorials:***2**
Branch: **Civil Engineering**   *University Exam:* **100 Marks**
Duration of University Examination: **3 Hours**   *Sessionals:* **50 Marks**

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.

UNIT III

PRESTRESSED CONCRETE

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
1. Ramchandra.S., *"Vol.2., Design of steel structures",* Standard Publishers, New Delhi.
2. Krishna Raju.N., *"Pre-stressed concrete",* Tata Mc.Grah Hill Publishers Ltd, New Delhi.
3. Krishna Raju N., *"Design of Bridges",* Oxford and IBH Publishers Limited.

REFERENCES
1. N.C. Sinha& S.K. Roy, *"Fundamentals of pre-stressed concrete",* S. Chand & Co. Ltd., New Delhi.
2. Dr. B.C. Punmia, *"Reinforced Concrete Design, Vol. 2",* Standard Publishers, New Delhi
3. IRC 5,6 and 21, *"Code of Practice for Design of Bridges"*, Indian Road Congress, New Delhi.
4. IS: 1343-1980*, "Code of Practice for Pre-Stressed Concrete Construction"*, Bureau of Indian Standards, New Delhi.
5. IS: 800-1984: *"Code of practice for steel construction"*, Bureau of Indian Standards, New Delhi.
6. IS: 456-2000: *"Code of practice for Plain and Reinforced Concrete"*, Bureau of Indian Standards, New Delhi.

CE 422 CONSTRUCTION MANAGEMENT

Class: **IV/IV B.Tech. II Semester**   *Lectures:***3***; Tutorials:***1***
Branch: **Civil Engineering**   *University Exam: **100 Marks***
*Duration of University Examination: **3 Hours***   *Sessionals: **50 Marks***

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-Eexamples-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 smoothening.

UNIT-IV
4. CONSTRUCTION EQUIPMENT: **(5+2)**
Brief details of equipment of earth moving: Tractors, Bulldozer, Scrapper, 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
1. Allan. A.Smith, Earnest Hinton, Ronald W Lews, "*Civil Engineering Systems Analysis and Design*", John Willey.
2. Mahesh Verma, "*Construction Planning and Equipment*".
3. L.S.Srinath, "*PERT and CPM*", East - West Press.

REFERENCES
1. B. Satya Narayana and S.C.Saxena, "*Construction Planning and Equipment*", Standard Publishers, Delhi.
2. Robert L Peurifoy, William B. Ledbetter, "*Construction Planning, Equipment and Methods*", Mc Graw Hill Book Company.

CE 423 ENVIRONMENTAL ENGINEERING –II

Class: **IV/IV B.Tech. II Semester**   *Lectures:3; Tutorials:1*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

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
1. Howard S.Peavy, Donald R.Rowe & George Tchbanoglouse, *"Environmental Engineering",* International Edition.
2. Birdie.S., *"Environmental Engineering",* Dhanpat Rai and Sons, Delhi.
3. S.K.Garg, *"Water Supply and Sanitary Engineering (Vol. 2)",* Khanna Publishers, New Delhi.
4. B.C.Punmia, *"Waste Water Engineering",* Standard publishers, New Delhi.

REFERENCES
1. M.N.Rao, *"Air Pollution and Control",* Tata Mc.Graw.Hill Book Co. Ltd, New Delhi.
2. M.N.Rao & A.K. Datta, *"Waste Water Treatment",* Oxford & IBH Pub. Co. Ltd.

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CE 424A GEOTECHNICAL PROCESSES
(CE 424 Professional Elective-II)

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Class: **IV/IV B.Tech. II Semester**   *Lectures: 3; Tutorials: 0*
Branch: **Civil Engineering**   *University Exam: 100 Marks*
Duration of University Examination: 3 Hours   *Sessionals: 50 Marks*

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UNIT-I

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1. DEWATERING: **(5)**
Definition – methods of de-watering – sumps and interceptor ditches – single, multi stage well points – vacuum well points – horizontal wells – foundation drains – blanket drains – criteria for selection of fill material around drains.

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.

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UNIT-II

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3. COMPACTION: **(5)**
Theory of compaction – effect of compaction on soil properties – compaction equipment for shallow /surface compaction – placement water content – factors affecting field compaction of soils – deep compaction – vibration techniques, vibro-flotation – Terra Probe method – blasting – compaction piles – field compaction and control.

4. STABILISATION: **(4)**
Introduction - methods of stabilization – mechanical – cement – lime – bituminous - chemical stabilization with calcium chloride, Sodium silicate and gypsum.

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UNIT-III

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5. REINFORCED EARTH: **(6)**
Concepts of reinforced earth – effect of reinforcement on soils – materials – geotextiles – types – functions and applications – principles of interfacial friction and its determination – factors affecting friction coefficient – applications of reinforced earth.

6. IN-SITU REINFORCING TECHNIQUES: **(3)**
Necessity – ground anchors: types and application – tie back – Soil nailing: driven and grouted nails – anchored spider netting.

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UNIT-IV

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

8. LIQUEFACTION CONTROL: **(5)**
Liquefaction – differences between liquefaction and quick sand condition – damage potential of liquefaction – factors affecting liquefaction – laboratory studies on liquefaction – cyclic tri-axial test – oscillatory box shear test and vibration table test – methods to prevent liquefaction.

TEXT BOOKS
1. Monfred.R.Hausmann, *Engineering Principles of Ground Modification,* Mc.Graw Hill Publishing Co, New York.
2. Peck,Hanson & Thornborn, *Foundation Engineering,* Wiley Eastern Limited, New York.
3. Purushotham Raj.P., *Geotechnical Engineering,* Tata Mc.Graw Hill Publishers, New Delhi.

CE 424B BRIDGE ENGINEERING
(CE 424 Professional Elective-II)

Class: **IV/IV B.Tech. II Semester**   *Lectures:* **3***; Tutorials:* **0**
Branch: **Civil Engineering**   *University Exam:* **100 Marks**
Duration of University Examination: **3 Hours**   *Sessionals:* **50 Marks**

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:
1. Victor DJ., *Essentials of Bridge Engineering* , Oxford and IBH Publishing Company Pvt. Ltd.
2. B.C. Punmia, *Design of Reinforced Concrete Strctures, Vol.II,* Laxmi Publishers, New Delhi.
3. Rama Chandra, *Design of Steel Structures, Vol.II*.
4. N. Krishna Raj, *Design of Bridges, 3rd edition,* Oxford and IBH Publishing Company Pvt. Ltd.

CE 424C FINITE ELEMENT METHOD
(CE 424 Professional Elective-II)

Class: **IV/IV B.Tech. II Semester**   *Lectures:* **3***; Tutorials:* **0**
Branch: **Civil Engineering**   *University Exam:* **100 Marks**
Duration of University Examination: **3 Hours**   *Sessionals:* **50 Marks**

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 EQUAITONS: **(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
1. Tirupathi R. Chadrupatla & Ashok D. Belegandu, *"Introduction to Finite Elements in Engineering"* Pearson Education (Singapore), Ptc. Limited.
2. Rajasekharan, *"Finite Element Analysis in Engineering Design",* Wheeler Publishers.
3. Chandrakant S. Desai & John F. Abel, *"Introduction to Finite Element Method",* CBS Publishers & Distributors, Delhi.
4. Rao S.S., *"Finite Element Method",* John-Wiley Eastern Limited.
5. Krishna Murthy C.S., *"Finite Element Analysis – Theory and Programming",* Tata Mc.Graw Hill, New Delhi.
6. Zienkiwicz O.C., *"The Finite Element Method",* III Edition, Mc. Graw Hill.

CE 424D NATURAL DISASTER MITIGATION AND MANAGEMENT
(CE 424 Professional Elective-II)

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

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.
   (e) Floods – Flood prone areas – Physical factors that affect flood severity – Long term and short term flood prediction methods – Flood damage assessment – Mitigation methods – Emergency response plans.
   (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

3. Remote Sensing and GIS applications in Natural Disaster Management.

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

REFERENCES:
1. Cutter S.L. (1999), "*Environmental Risks and Hazards",* Prentice Hall of India, New
2. Lintz J Jr and D.S. Simonett (1976) *"Remote Sensing of Environment", Addison Wesley Publishing Company, Massachusetts.*
3. Corrol, t et al (2002), The Risk Fab, "*The Risk Factor-how to make Risk Management for you in Strategic Planning",* Wiley International Edition.
4. Clarke K.C. et al (2002), *"Geographic Information System and Environmental Modelling",* Prentice Hall of India.
5. Selected Materials published by National Institute for Disaster Management, "*Ministry of Home Affairs, Govt. of India".*

CE 425 CIVIL ENGINEERING SOFTWARE APPLICATION LABORATORY

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

(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.

14. Analysis and Design of concrete frames.

15. Analysis and Design of steel frames.

REFERENCES

1. *Manual of STAAD PRO 2000,* Research Engineers, Calcutta.
2. *Manual of BUILD MASTER, 1999,* Ensoft Consultants, Mumbai.
3. *Manual of STRAP, 1999,* ATIR Engineering Software Development Ltd., Israel.