## DEPARTMENT OF CIVIL ENGINEERING

II / IV BTech (Civil Engineering)  
&  
II / IV BTech (Civil Engineering with Environmental Engineering Elective)  
&  
II / VI BTech + MTech (Civil Engineering)  

**Scheme of Instruction and Examination under CBCS**  
(with effect from 2015-16 Admitted Batch)

### I – SEMESTER

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## DEPARTMENT OF CIVIL ENGINEERING

### III / IV BTech (Civil Engineering)

**&**

### III / IV BTech (Civil Engineering with Environmental Engineering Elective)

**&**

### III / VI BTech + MTech (Civil Engineering)

**Scheme of Instruction and Examination under CBCS**

*(with effect from 2015-16 Admitted Batch)*

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DEPARTMENT OF CIVIL ENGINEERING

IV / IV BTech (Civil Engineering)
&
IV / VI BTech + MTech (Civil Engineering)

Scheme of Instruction and Examination under CBCS
(with effect from 2015-16 Admitted Batch)

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## DEPARTMENT OF CIVIL ENGINEERING

**IV / IV BTech (Civil Engineering)**  
&  
**IV / VI BTech + MTech (Civil Engineering)**

**Scheme of Instruction and Examination under CBCS**  
(with effect from 2015-16 Admitted Batch)

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*Half the number of students shall do the project work during the first semester (of fourth year of study) and the remaining half the number of students shall do the project work during the second semester (of fourth year of study)

+ Viva voce examination only.
**DEPARTMENT OF CIVIL ENGINEERING**

**IV / IV BTech (Civil Engineering with Environmental Engineering Elective)**

**Scheme of Instruction and Examination under CBCS**  
(with effect from 2015-16 Admitted Batch)

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<td>CE4208</td>
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*Half the number of students shall do the project work during the first semester (of fourth year of study) and the remaining half the number of students shall do the project work during the second semester (of fourth year of study)

+ Viva voce examination only.
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<thead>
<tr>
<th>Course Code (PE – I)</th>
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<tbody>
<tr>
<td>CE3106A</td>
<td>Remote Sensing and GIS</td>
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<td>CE3106B</td>
<td>Introduction to Rock Mechanics</td>
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<td>CE3106C</td>
<td>Elements of Coastal Engineering</td>
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<td>CE3106D</td>
<td>Advanced Concrete Technology</td>
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<td>Ground Improvement Techniques</td>
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<td>CE3206C</td>
<td>Marine Structures</td>
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<td>CE3206D</td>
<td>Solid Waste Management</td>
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<td>Industrial Waste Treatment</td>
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<td>CE4105E/4205E</td>
<td>Industrial Structures</td>
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<td>CE4105F/4205F</td>
<td>Traffic Engineering and Management</td>
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<td>CE4106E/4206E</td>
<td>Geo-Environmental Engineering</td>
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<td>CE4106F/4206F</td>
<td>Bridge Engineering</td>
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<td>CEE4205B</td>
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<tr>
<td>CEE4206A</td>
<td>Air Pollution and Control</td>
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<tr>
<td>CEE4206B</td>
<td>Environmental Impact Assessment</td>
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</table>
VECTOR CALCULUS-1: Differentiation of vectors, curves in space, velocity and acceleration, relative velocity and relative acceleration, scalar and vector point functions, vector operator $\nabla$ applied to scalar point functions- gradient, $\nabla$ applied to vector point functions- divergence and curl. Physical interpretation of $\nabla f$, $\nabla \cdot \vec{F}$, $\nabla \times \vec{F}$, $\nabla$ applied twice to point functions, $\nabla$ applied to products of two functions; Irrotational and Solenoidal fields.

VECTOR CALCULUS-2: Integration of vectors, line integral, circulation, work done, surface integral-flux, Green’s theorem in the plane, Stoke’s theorem, volume integral, Gauss Divergence theorem.
Introduction of orthogonal curvilinear coordinates, cylindrical and spherical polar coordinates

Homogeneous linear equations with constant coefficients- rules for finding the complementary function, rules for finding the particular integral (working procedure), non- homogeneous linear equations.

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS: Method of separation of variables, One dimensional wave equation-vibrations of a stretched string, one dimensional Heat equation, Two dimensional heat flow in steady state - solution of Laplace’s equation in Cartesian and polar coordinates (two dimensional).


REFERENCE BOOKS:
Duties / obligations Accountability of structural engineer for the design of a structure:
a) economy b) safety: (i) strength consideration (ii) stiffness consideration. Need for assessment of strength of a material – analysis for strength requirement for design purposes – Review of IS code provisions.


Effect of transverse force, Shear force, Bending moment and Axial thrust diagrams for a) Cantilever b) Simply supported and c) Over hanging beams for various patterns of loading. Relation between (i) intensity of loading (ii) Shear force and (iii) Bending moment at a section. Theory of simple bending : flexural normal stress distribution. Flexural shear stress distribution for various shapes of cross section.

Deflections of Beams : (i) Cantilever (ii) simply supported and (iii) over hanging beams, using (a) double integration and (b) Macaulay’s method.

Stresses on oblique plane – Resultant stress – Principle stress and maximum shear stress and location of their planes. Mohr’s circle for various cases of stresses; Theory of pure torsion for solid and hollow circular sections – torsional shear stress distribution, effect of combined torsion, bending and axial thrust – equivalent B.M and T.M.

Longitudinal and Hoop stresses in thin cylinders subjected to internal pressure. Wire wound thin cylinders.


References:
(1) Elements of strength of materials by Timoshenko and Young.
(2) Introduction to mechanics of solids by Popov.
(3) Structural Analysis by Pundit & Gupta
(4) Strength of materials by Hyder.
(5) Elementary mechanics of solids by P.N. Singer and P.K. Jha.
(6) Strength of materials by Ramamrutham.
(7) Strength of materials by Vazirani and Ratwani.
CE 2103 BUILDING MATERIALS AND BUILDING CONSTRUCTION

Bricks And Clay Products: Bricks: Sources and qualities of Brick Earth, Classification of Bricks, Manufacture of Bricks, including burning types, general qualities of Bricks as per IS code, tests for good bricks as per IS code, including field tests, special forms of Bricks and their uses. Clay Products: Various types of tile manufacturing and their uses, Earth-wares, Terra-cotta, stone ware, porcelain, glazing of tiles etc.

Wood, Wood Based Products: Wood: Classification of various trees, cross section details of trees, their general properties, various types of defects in wood and timber, Methods of seasoning and their importance, felling and conversion, various Mechanical Properties of timber, Decay of timber, preservation methods, common Indian trees and their uses. Wood based Products: Veneers, Plywood and its types, Manufacturing of Plywood, plywood grades as per IS code, Laminated wood, merits of plywood and laminated wood, Lamin Boards, Block Boards, Batten board, Hard board, Particle boards and Composite boards.

Paints, Varnishes: Paints and Varnishes: Constituents and characteristics of paints, types of paint, their uses and preparation on different surfaces, painting defects, causes and remedies. Constituents of varnishes, uses of varnishes, different kinds of varnish, polishes. Painting of interior walls, exterior walls, wooden doors and windows – steel windows – various types of paints (chemistry of paints not included) including distempers; emulsion paints etc., Varnishes wood work finishing types.

Asbestos & Asphalt Bitumen & Tar: Availability and uses of asbestos, properties of asbestos, various types of asbestos, difference between asphalt & bitumen, Types, uses and properties of Asphalt & Bitumen, composition of coal tar, wood tar, mineral tar and Naphtha.

Foundations: Types of Foundations: Strip, Isolated, Strap, Combined Footings, Raft – Mat – Slab and Beam Raft, Box Type Raft, inverted arch foundations, SHELL foundations, Grillage foundations – Minimum depth of Foundation – Bearing capacity of soils


Roofing: Mangalore tiled Roof, RCC roof, Madras Terrace, Hollow Tiled Roof, Asbestos Cement, Fibre glass, Aluminium G.I. Sheet roofing’s.

Trusses: King Post & Queen Post Trusses – Steel roof Truss for 12m Span with details.

Wooden Doors And Windows: Parallel – Glazed – Flush shutters, Plywood, Particle Board Shutters – Aluminum, PVC, Steel doors, windows and ventilators, various types of windows, Glazing – different varieties.
Stair Cases: Stair cases or Stairway design (Architectural design or planning only) various types such as, straight flight – dog legged, quarter landing, open spiral, spiral stairs etc.

Cements, Modern Renovation Materials: Cements: Natural and artificial cements, types of various artificial cements and their uses. Wet and dry process of manufacturing ordinary Portland cement (OPC), Chemical and Physical analysis of OPC, various field and Laboratory Tests on OPC as per IS code. Storing of cement in the field and godowns Modern renovation materials: Cement bound, polymer cement bound and pure polymer bound materials, their properties & uses.

Concrete Technology And Mix Design: Polymer Concrete, Types of cement concretes, ingredients and their characteristics, Cement concrete properties and relevant tests, storage, batching, mixing & Transporting, placing & vibrating and curing. Concrete grades & mix designs upto M 20 as per IS code. Introduction to polymer concrete and it’s uses.

References:

7. “Concrete Technology Theory & Practice” by M.S. Shetty, ‘S. Chand & Company Ltd.’
CE2104 SURVEYING – I

Introduction: Classification and principles of surveying. Triangulation and Trilateration Earth as spheroid, datum, geoid, Azimuth, latitude, longitude, Map projections, scales, plans, & Maps.

Chain surveying: Instrumentation for chaining – Errors due to incorrect chain-Chaining on uneven and sloping ground-Errors in chaining-Tape corrections – Problems: Base line measurement-chain Triangulation-Check lines, Tie lines, Offsets. Basic problems in chaining-obstacles in chaining-Problems-Conventional signs.

(b) Traverse Surveying: Chain and compass traversing-Free or loose needle method – Fast needle method-Checks in closed and open traverse-Plotting methods of traverse Survey-Closing error-Balancing the traverse-Bowditch’s method-Transit method, gale’s Traverse table.


Minor instruments: Uses and adjustments of the following minor instruments:
Line Ranger, Optical Square, Abney level, and Clinometer, Ceylon Ghat tracer, Pentagraph, Sextant and Planimeter.

Contouring: Definitions-Interval, Characteristics of contours-methods of locating contours-Direct and indirect methods-interpolation of contours-Contour gradient-Uses of contour maps. Contours mapping using computer techniques (surfer, CAD)

References:
2. Surveying Vol. 1,2 and 3 – By Pumia, Standard Book House.
4. Surveying: Theory & Practices by James M. Anderson and Edward M. Mikhail

Fluid Statics, Pressure and its measurement – Forces Acting on a Fluid Element – Pascal’s law; Variation of Pressure in Static Fluid; Absolute, Gauge and Total Pressure; Pressure Measurement – Piezometers, Manometers, Micro-manometers, Mechanical Gauges and Pressure Transducers.

Forces on Immersed Bodies in Static Fluids – Force on a Plane Surface – Centre of Pressure; Pressure Diagram; Forces on Curved Surfaces; Forces on radial Crest Gates and Lock Gates. Buoyancy & Floatation – Archimedes Principle; Stability of Floating Bodies – Centre of Buoyancy, Metacentric Height and its Determination. Liquids in Relative Motion – Pressure of Liquids in a Container Subjected to Linear Acceleration and Rotation.


Fluid Kinematics – Translation, Deformation and Rotation of a Fluid Element in Motion; Local, Convective and Total Accelerations; One, Two & Three Dimensional Analysis of Flows. Ideal Fluid Flow – Stream Function, Velocity Potential; Rotational & Irrotational Flows – Vorticity & Circulation; Laplace Equation in terms of Stream Function and Velocity Potential; Flow Nets.

Principle of Conservation of Mass – Concepts of System and Control Volume; Continuity Equation in three dimensional Cartesian coordinates; Continuity Equation for flow through a Stream tube.


Flow through Tanks and Reservoirs – Measurement of Discharge from Tanks and Reservoirs – Steady and Unsteady Flow through Orifices and Mouthpieces – Small & Large Orifices – Different types of Mouthpieces; Discharge from tanks through Drowned Orifices, Time of Emptying Tanks, Discharge from a Tank with Inflow.


Flow through Pipes: Introduction to Pipe Flow and Laws of Friction – Reynolds Experiment; Steady Turbulent Flow through Pipes; Laws of Friction; Darcy-Weisbach Equation.


Flow between Two reservoirs; Three Reservoir Problems; Distribution Mains; Working Pressures, Design Pressure and Test Procedures; Choice of Pipe Material; Siphon; Pipe Network Analysis by Hardy-Cross Method; Hydraulic Power Transmission through Pipes and Nozzles, Water hammer (only concept).

Laminar flow: Equation of Motion for Real Fluids – Modifications in Equation of Motion, Stress Strain Relationships, Tangential Stress Terms.


References:
3. Engineering Fluid Mechanics Kumar, K.L., S. Chand & Co. Ltd.
Introduction: Definition, scope and importance. Measuring and defining environmental development; indicators.

Ecosystems: Introduction, types, characteristic features, structure and functions of ecosystems like Forest, Grass Land, Desert, Aquatic (Lake, rivers and estuaries)


Value of bio-diversity - consumptive and productive use, social, ethical, aesthetic and option values. Bio-geographical classification of India – India as a mega diversity habitat. Threats to bio-diversity – Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity – In situ and Ex-situ conservation.


Case Studies: Chipko movement, Narmada Bachav Andolan, Silent Valley Project, Madhura Refinery and Taj Mahal, Industrialisation of Patancheru, Nuclear reactor at Nagarjuna Sagar, Tehri dam, Ralegaon Siddhi (Anna Hazare), Kolleru lake – aquaculture, Florosis in Andhra Pradesh.

Field work: Visit to a local area to document and mapping environmental assets – river / forest / grass land / hill / mountain. Study of local environment – common plants, insects, birds. Study of simple ecosystems – pond, river, hill, slopes etc. Visits to industries, water treatment plants, affluent treatment plants.

References:
1. Introduction to Environmental Science, Y Anjaneyulu, B S Publications
2. Environmental Studies, Suresh K. Dhamija, S K Kataria & Sons Publications
3. Environmental Studies, Anindita Basak, Pearson Education
CE2107 ENGINEERING MECHANICS


Equilibrium: Free body diagrams – Equations of equilibrium for a concurrent coplanar force system – Equilibrium of Bodies acted on by two or three forces – Equilibrium of bodies acted on by non-concurrent coplanar force system – Equilibrium of bodies acted on by parallel, non-coplanar force system – Equilibrium of non-concurrent, non-coplanar, non-parallel force system.

Analysis of statically determinate trusses by (a) Method of joints and (b) Method of sections.

Centroids and Centres of Gravity: Centre of gravity of parallel forces in a plane – Centre of gravity of parallel forces in space – centroids and centres of gravity of composite bodies – Theorems of Pappus – Distributed Loads on Beams.

Moments of Inertia, Definition – Parallel axis theorem for areas – Second moments of areas by integration – Radius of gyration of areas – Moments of inertia of composite areas – Parallel axis and parallel plane theorems for masses – Moments of inertia of masses by integration – Radius of gyration of mass – Moments of inertia of composite masses.

Friction: Nature of friction – Laws of friction – Coefficient of friction – Angle of friction – Cone of friction – Problems involving frictional forces


Rectilinear translation of a rigid body – Curvilinear translation of a rigid body – Rotation of a rigid body – Plane motion of a rigid body.


References:
(2) Engineering Mechanics by Timoshenko and D.H. Young.
(3) Engineering Mechanics by J.L. Meriam
(4) Mechanics for Engineers Statics and Dynamics by F.B. Beer and E.R. Johnston
CE2108  STRENGTH OF MATERIALS LABORATORY

(1) Tension test on Mild/HYSD bars
(2) Compression test on wood (parallel and perpendicular to grains)
(3) Tests on springs for the determination of rigidity modulus and spring constant
(4) Brinell’s and Rockwell hardness tests.
(5) Charpy and Izod impact tests.
(6) Double shear test on mild steel specimen.
(7) Bending test.: Load deflection test for the determination of young’s modulus on simply supported and cantilever beam for wood and steel.
(8) Study of forces in coplanar force system.

CE2109  SURVEYING FIELD WORK – I

Chain Surveying: Introduction of instruments used for chain survey, Folding and unfolding of chain-Line ranging (direct method)-Pacing. Chain traversing –Preparation of plan of a residential building by making use of chain, ranging rods, by oblique off-set method, introduction of check line. Preparation of residential building by perpendicular offset, introduction of tie lines. Finding the distance between inaccessible points by making use of chain, cross staff, tape, ranging rods; Arrows and field problems of obstacles to chaining.


Plane Table Survey: Introduction to plane table-Use of its accessories: Two & Three Point Problem. Finding the distance between inaccessible points by making use of plane table, its accessories-Ranging rods and tape.

Levels: Introduction to dumpy level, levelling staff. Reading of level staff, temporary adjustments of dumpy level. Introduction to fly levelling-Booking the readings by height of collimation method. Introduction to fly levelling-Booking the readings by rise and fall method-To find closing error. Check levelling.- L.S. & C.S. of a road profile.

Preparation of contour plan for an open area by taking level of the site.

Strain – energy due to (i) Axial load, (ii) Shear force, (iii) Bending Moment and (iv) Torque; Deflections of Statically Determinate Structures: (a)Single storey, single bay rectangular portal frames using (i) Unit load method, (ii) Castigliano’s theorem –1. (b) Trusses (having 9 members or less) using (i) Unit load method, (ii) Castigliano’s theorem-1.

Analysis of (a) fixed beams, (b) three span continuous beams using (i) Theorm of three moments, (ii) Slope deflection method and (iii) Moment distribution method

Moving loads: Maximum Shear force and Bending moment diagrams for different types of loads. Maximum Bending moment at a section under a wheel load and absolute maximum Bending moment in the case of several wheel loads. Equivalent uniformly distributed live load for Shear force and Bending moment. Reversal of nature of Shear force, focal length, counter bracing for truss panels, Influence lines for (i) Beams and (ii) members of Warren and Pratt trusses.

Thick cylinders –Lamme’s theory, Compound tubes – Theory of failure (i) Principal Stress theory, (ii) Principal Strain theory, (iii) Maximum Shear Stress theory and (iv) Maximum strain energy theory.

References:
(1) Structural Analysis By Pundit & Gupta.
(2) Strength of Materials – Ramamrutham.
(3) Elementary strength of materials – Timoshenko and Young.
(4) Strength of materials – Singer.
(5) Strength of materials – Jain and Arya.
(6) Analysis and Design of structures – Vazirani and Ratwani
CE2202  REINFORCED CONCRETE STRUCTURES – I

General: Loading standards as per IS 875, Grades of steel and cement, Stress-Strain characteristics of concrete and steel, Introduction to working stress method and Limit State Method (L.S.D.) of design.


Design of one way and two way slab: Simply supported slabs on all four sides, Moment in two way slabs with corners held down. Choosing slab thickness. Design of restrained slabs (with torsion at corners) I.S. code provisions. Detailing of reinforcement. Load from slabs on supporting beams. Different kinds of loads on slabs including partition walls, Shear in slabs.


Columns: Short and Long columns, Minimum eccentricity, short column under axial compression, column with helical and tie reinforcement. Short columns subjected to uniaxial and biaxial moments.

Footings: Analysis and design of isolated Square and rectangular footings. Design of stair case.

TEXT BOOKS:
1. Limit State of Design of Reinforced Concrete – P. C. Vergheese

References:
1. Reinforced Concrete Limit state Design, P. Dayaratnam
2. Reinforced Concrete Structures by R Park and Paulay
CE2203  SURVEYING – II


Total Station Surveying: Electronic Theodolite, Electronic Distance Measurements, Total Station, Errors in measurements, Advantages, Disadvantages, Applications; Contour mapping, determination of height of remote point, position of hidden point, free station, Area measurement, volume measurement.


References:
2. Surveying Vol. 1,2 and 3 – By Punmia, Standard Book House.
5. Surveying: Theory & Practices by James M. Anderson and Edward M. Mikhail
CE2204  BUILDING PLANNING AND DESIGN

Residential Buildings: Different types of Residential Buildings Selection of Site for Residential Building. Brief Information of Housing Colonies for Different Income Groups in India-Sizes of Plots - Public Spaces, Evolutionary Housing Concept.


Preliminary Drawings: (a) Conventional signs of materials various equipment used in a Residential Building (copying exercise) (b) Plan section and Elevation of a small House (one room and varandah) (copying exercise) (c) Plan section and Elevation of Two Bed Room House (copying exercise) (d) (e) (f) Plan section and Elevation of three bed room house in Hot and Humid zone, Hot and Arid zone, cold zone (copying exercises)
(a) Design of Individual rooms with particular attention to functional and furniture requirements. Building regulations and Byelaws of Residential Buildings;
(b) Auto Cad drawing of residential building (only for internal assessment)

Drawing the Plan Section and Elevation of Houses with given Functional requirements and climatic data. (Emphasis may be given to Hot and Humid zones.)

References:
CE2205  FLUID MECHANICS – II

Viscous Effects on Fluid Motion: Navier-Stokes Equations (No Derivation) – N.S. equations for standard cases of Plane two Dimensional and Axisymmetric Flows.

Boundary Layer Theory: Theory of Boundary Layer – Characteristics of Laminar Boundary Layer – Boundary Layer growth over a Flat Plate (without pressure gradient) – Boundary Layer Thickness and its Characteristics – Displacement, Momentum and Energy Thicknesses; Stability Parameter; Laminar and Turbulent boundary layers.
Boundary Layer Separation – Mechanism of Separation, Control of B.L. Separation; Boundary Layer on rough surfaces - Laminar Sublayer, Shear friction velocity; Friction Drag.

Analysis of Turbulent Flows – Shear Stress due to turbulence – Semi-empirical Theories, Boussinesq Eddy Viscosity Model, Prandtl Mixing Length Concept; Velocity distribution for hydrodynamically smooth and rough pipes; Variation of Friction Factor in turbulent flow; Friction Factor for commercial pipes – Moody diagram.

Distribution of Fluid Pressure on immersed bodies – Pressure Distribution for flow past a circular disk, sphere; Effects of eddy pattern in two dimensional flow –Distribution of pressure for two dimensional flow past a cylinder – von Kármán vortex trail, Eddy shedding; Drag of immersed bodies – Variation of Drag Coefficient with Reynolds Number – Drag on Cylinder – Resistance diagram for bodies of revolution; Drag Coefficient of Practical Bodies.


Open Channel Flows: Basic Concepts – Introduction, Classification of Open Channels – Classification of Flow; Channel Geometry – Geometric Elements of a Channel Section; Velocity Distribution in a Channel Section; Wide Open Channel; Measurement of Velocity; Velocity Distribution Coefficients; Pressure Distribution in a Channel Section – Effect of Slope on Pressure Distribution; Basic Equations – Chezy’s Equation, Manning’s Equation.

Uniform Flow Computation; Conveyance of a Channel Section – Section Factor and Hydraulic Exponent. Flow Characteristics in a Closed Conduit with Open Channel Flow; Determination of Normal Depth and Velocity; Design of Channels for Uniform Flow; Design of Non-erodible Channels; Best Hydraulic Section; Determination of Section Dimensions for Uniform Flow; Most Economical Channel Sections – Rectangular, Trapezoidal, Circular and Triangular Channel Sections; Critical Flow – Computation of Critical Flow, Section Factor for Critical Flow.
Application of Energy Principle in Open channels – Definition of Specific Energy, Specific Energy Diagram, Critical depth, Critical Velocity, Conjugate or Alternate Depths, Sub-critical, Critical and Super-critical Flows, Froude Number, Relationship between Critical depth and Specific Energy for Rectangular, Trapezoidal Sections; Application of Momentum Principle in Open channels – Specific Force; Canal Transitions – Change of Depth in Channels with Change in Cross-section and Hump in the Bed; Control Sections; Venturi Flume and Parshall Flume.


Rapidly Varied Flow – Hydraulic jump, Types of jump, Hydraulic jump in horizontal rectangular Channels; Surges.

References:
3. Engineering Fluid Mechanics, Kumar, K.L., S. Chand & Co. Ltd.
Introduction: Importance and Necessity of Protected Water Supply systems, Objectives of Protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities.

Water Demand and Quantity studies: Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Studies, Population Forecasting Studies.


References:
1. Environmental Engineering – Peavy, Rowe, Tchenobolus
2. Elements of Environmental Engineering – K.N. Duggal
4. Water Supply Engineering – Dr. P.N.Modi
5. Water Supply and Wastewater Engineering – Dr. B.S.N.Raju
7. Water Supply Engineering – Hussain
8. Water Supply Engineering – Chatterjee
CE2207  FLUID MECHANICS LABORATORY – I

1. Study of Small orifice, by constant head method and Time of emptying a tank through a small orifice.
2. Study of Cylindrical mouthpiece by constant head method and Time of emptying a tank through a cylindrical mouthpiece.
3. Study of floating body and determination of Metacentric Height.
5. Study of Venturimeter.
7. Study of Flow nozzle meter.
8. Study of Sharp – crested full width and contracted weirs.
10. Study of Broad-crested weir.

CE2208  TOTAL STATION AND GEOMATICS LAB

1. Measurement of Horizontal Angles by Repetition & Reiteration, Measurement of Vertical Angles, Heights & Distances
2. Distance between two in-accessible points by theodolite
3. Tachometry
4. Setting out curve by deflection angle method by two theodolites
5. Point positioning using GPS
6. Contour mapping using total station
7. Height of remote point using total station
8. Position of hidden point using total station
9. Area & volume measurement using total station
10. GIS related surveying applications
Analysis of statically indeterminate trusses (having not more than 7 members and 3 supports) containing (a) external redundant supports (b) internal redundant members using (i) method of consistent deformation of unit load method (ii) Castigliano’s theorem – II.

Analysis of statically indeterminate frames (single storey, single bay portal frames only) using (i) slope-deflection method (ii) moment distribution method (iii) Kani’s method, (iv) Column Analogy.

Arches: Normal thrust, radial shear and bending moment in three hinged and two hinged parabolic and segmental arches. Effects of rib-shortening and temperature change.

Suspension bridges: Stresses in loaded cables with supports at the same and different levels. Length of cable; Two and Three hinged stiffening girders.

Introduction to matrix methods of structural analysis (Very elementary treatment only) Static indeterminacy, Kinematic indeterminacy, Stiffness and flexibility method for two span continuous beams only. – Truss with 3 supports and 7 members.

References
1. Statically indeterminate structures – C.K. Wang
3. Indeterminate Structures by R.I. Jindal
Note: All the designs should be taught in the limit state design method as per IS 800-2007

Fundamental Concepts of limit state design of structures, Different types of rolled steel sections available to be used in steel structures. Stress – Strain relationship for mild steel.

Bolted connections: Behavior of bolted joints, Design strength of ordinary black bolts, high strength friction grip bolts, Simple connections, Moment resistant connections.

Welded Connections: Advantages of welding, Types and prosperities of welds, Types of joints, weld specifications Design of welded joints subjected to axial load, Eccentric welded connections.

Tension members: Types of tension members, Design of strands, slenderness ratio, displacement of tension members, behavior of tension members, modes of failure, factors affecting strength of tension members, angles under tension, design of tension members, Lug angles, splices.

Compression members: Possible failure modes, classification of cross-section, behavior of compression members, Effective length, radius of gyration and slenderness of compression members, Allowable stresses in compression, Design of axially loaded compression members, built up compression members, Laced and Battened columns, eccentrically loaded columns, Column splices.

Beams: Beam types, section classifications, lateral stability of beams, Allowable stress in bending, Shear and Bearing stresses, Effective length of compression flange, Laterally supported and unsupported beams, Design of built up beams.

Roof trusses: Types of trusses, Economical spacing of roof trusses, loads on roof trusses, Estimation of wind load on roof trusses as per IS : 875. Design of members of roof truss and joints, Design of purlins.

Column bases and Foundations: Allowable stress in bearing, Slab base, Gusset base and Grillage foundations.

Introduction to pre-engineered structures, concepts and advantages, disadvantages.

References:
1. Design of Steel structures by N. Subramanian, Oxford University Press.
INTRODUCTION AND HYDROLOGICAL ASPECTS: Water Resources in India, Hydrology in water Resources Planning – Hydrologic Planning –Water budget equation;

Climate and Weather – Importance of monsoon rains, clouds, storms and precipitation - Precipitation – Types, Measurement of rainfall; Influence and feedbacks of hydrological changes due to climate change; Average depth of rainfall over an area, Mean annual rainfall, Analysis of Rainfall Data – Consistency of rainfall record, Double mass curve, Depth –Intensity, Depth-Area-Duration curves, frequency of point rainfall – Intensity-Duration-Frequency (IDF) curves, Probable Maximum Precipitation (PMP) curves; Infiltration – Factors affecting and its determination, Infiltrometers; Evaporation and Evapotranspiration – Pan Evaporation; Runoff – Factors affecting Runoff, Methods of determination of Runoff, Hydrograph Analysis, Base flow separation, Unit Hydrographs, Hydrograph of different durations, Applications of Unit Hydrograph; S-hydrograph, Synthetic Unit Hydrograph; Stream flow measurement – Gauge discharge curves.

GROUND WATER FLOW: Mechanics of interstitial flow, definitions, subsurface distribution of water, ground water movement; Darcy’s law; Permeability – Intrinsic permeability; Well hydraulics – Steady flow in different types of aquifers and wells; Determination of hydraulic properties of aquifer; Well losses; Specific capacity of well; Well efficiency – Pumping tests – Recuperation test method for determination of well yield.

Rain water Harvesting & Recharging of underground storage – Methods of recharging – Infiltration galleries, Infiltration wells, Springs.

Methods of construction of open well-yield of an open well – Methods of construction of Tube Wells, Well shrouding and Well development, Spacing of tube wells, Design of tube well; Pumping requirements, Centrifugal and bore hole type pumps; Collector wells.

RESERVOIR PLANNING AND FLOOD ROUTING: Types of reservoir – Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir; Purpose of reservoir, Design studies, Reservoir regulation, Reservoir yield, Mass curve and Demand curve, Determination of reservoir capacity, Yield from a reservoir of given capacity; Operating schedules – Rule Curve for reservoir operation; Economics of Water resources Projects – Apportionment of total cost of a Multi Purpose project, Benefit - Cost Ratio; Reservoir Losses – Measures to reduce evaporation loss in reservoirs sedimentation, Control of reservoir sedimentation.

Flood Routing – Hydrologic reservoir routing by Puls method of routing, Channel routing by Muskingum method.

IRRIGATION: Definition of irrigation, Types of irrigation systems – Direct and Indirect, Lift and Inundation irrigation Systems, Methods of irrigation – Surface and Sprinkler methods, Trickle or Drip Irrigation, Soil moisture Constants, Depth of water held by soil in different zones, Water extraction – Quality of irrigation water, Irrigation efficiencies – Soil moisture –


References:
6. Impacts of climate change and climate variability on hydrological regimes, Jan C. van Dam, Cambridge University Press.

Mechanical analysis and Soil Classification: Sieve analysis, stoke’s law, hydrometer and Pipette Analysis Textural Classification, Structural Classification based on size, Unified soil classification and Indian Standard Soil Classification Systems, Field Identification of Soils

Soil Hydraulics: Types of soil water, capillary rise and surface tension, Darcy’s law and its limitations, constant head and variable head permeability tests, pumping tests, Factors effecting coefficient of permeability, permeability of stratified soils. Total, neutral and effective stresses, Effective Stress Principle, Upward flow conditions, quick sand conditions, critical hydraulic gradient.

Stress Distribution in Soils: Bousinesq’s theory for determination of vertical stress, assumptions and validity, extension to Line, Strip, rectangular and circular loaded areas, Pressure Bulb and Influence diagrams, westergaard’s theory, Newmarks influence chart - construction and use, 2:1 approximate method, contact pressure distribution beneath footings.

Compaction: Mechanism of compaction, Factors effecting compaction: water content, compactive effort, Type of soil. IS Light and IS Heavy compaction tests, Effect of compaction on soil Properties, Field compaction: compaction Equipment and Evaluation of field compaction.

Consolidation: Basic Definitions: compression index, coefficient of compressibility and coefficient of volume decrease. Terzaghi’s one dimensional consolidation theory - assumption, derivation of differential equatuion and Solution, Oedometer Test, Determination of coefficient of consolidation by time fitting methods, initial compression, primary compression and secondary compression, determination of preconsolidation pressure. Normally consolidated, over consolidated and under consolidated clays.

Shear Strength of Soils: Stress at a point, Mohr circle of stress, Mohr coulomb failure theory, shear parameters, laboratory shear tests – shear box, triaxial and unconfined compression tests, laboratory and field vane shear tests, Sensitivity of clays, Types of shear tests on drainage conditions, shear strength of sands, critical void ratio and dilatancy, Liquefaction of soils, Factors affecting shear strength of clays and sands, Total stress analysis and Effective stress analysis, skemptons pore pressure coefficients, Stress Paths.

TEXT BOOKS:

3. Geotechnical Engineering by P. Purushothama Raj


Bacteriology of sewage: Sewage characteristics – Physical, Chemical and Biological Examination– decomposition- cycles of decomposition— Sampling and analysis of wastewater – BOD-COD-Treatment of sewage - Primary treatment: Screens-grit chambers – grease traps – floatation – sedimentation – design of primary and pretreatment units..


Anaerobic Processes: Septic Tanks and Imhoff tanks-Principles and Design-sludge treatment and disposal-Fundamentals of UASB. Biosolids (Sludge): Characteristics- thickening – digestion,drying and sludge disposal,.

References:
4. Sewage treatment and disposal by Dr. P.N. Modi.
5. Water supply and Waste Water Engineering by Dr. B.S.N. Raju
Remote Sensing: Introduction, Basic components of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Sensors- types and characteristics, passive sensor, active sensor, platforms-airborne remote sensing, spaceborne remote sensing, data pre-processing, Important Remote Sensing programmes.

Geographic Information System: Introduction, key components, spatial data, raster data models, vector data models, raster versus vector, data input methods and editing, non-spatial data, map projections.

Image analysis: introduction, elements of visual interpretations, digital image processing- digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, image preprocessing, image rectification, image enhancement, image classification, supervised classification, unsupervised classification.

GIS analysis: introduction, digital elevation models, RS and GIS data integration, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, some neighbourhood operations.

RS and GIS applications in Civil Engineering: Land cover and land use, urban applications, Hydrological studies, runoff modeling, flood zone delineation and mapping, groundwater prospects and recharge, reservoir storage estimation, water management, irrigation planning, drought monitoring, environmental impact assessment and other watershed studies.

TEXT BOOKS:
1. Remote sensing and image interpretation by Thomas M. Lillesand and Ralph W. Kiefer, John Wiley and Sons Inc.
2. GIS by Kang tsung chang, TMH Publications & Co.,

REFERENCES:
1. Remote Sensing and its applications by Dr George Joseph.
PE I: CE3106B: Introduction to Rock Mechanics

Introduction: Geological formation of rocks, Structural Geology, classification of rocks, Defects in rock, Physical, mechanical properties of rocks, Exploration techniques – RQD and RMR, Laboratory tests for shear strength, tensile strength, flexural strength, elastic constants, Field tests – test for deformability, shear tests and strength tests

Improvement techniques for rock – Grouting, Rock bolting, Rock reinforcement - Mechanism, types of reinforcement, steps involved in installation, Foundations on rock, Rock blasting-explosives, Selection criteria for explosives, steps involved in blasting

References:
3. Rock mechanics on the design of structures in rock by Oberti and Duvalk, W. L. John Wiley.


Beach profiles and surf zone wave breaking. Sediment transport.

Impacts of coastal structures on shoreline changes. Seawalls, Breakwaters, Groins, Jetties, Wharves.

Wave forces on walls. Design of breakwaters: rubble mound-type, wall-type, structural cross-section.

Wave forces on piles – Basic assumptions – Values of the inertia and drag coefficients and their dependence on the wave theory used.

REFERENCES:
3. Dean and Darlymple, “Water wave mechanics for engineers and scientists”
4. J.S. Mani, “Coastal Hydrodynamics” PHI Learning
Chemical and mineral admixtures: Water reducers, air entrainers, set controllers, specialty admixtures - structure properties, and effects on concrete properties. Introduction to supplementary cementing materials and pozzolans-Fly ash, blast furnace slag, silica fume, and metakaolin - their production, properties, and effects on concrete properties. Other mineral additives - reactive and inert.

Dimensional stability and durability: Creep and relaxation - parameters affecting; Shrinkage of concrete - types and significance. Parameters affecting shrinkage; measurement of creep and shrinkage.

Durability of concrete: Introduction to durability; relation between durability and permeability- Chemical attack of concrete; corrosion of steel rebars; other durability issues.

Mix design: Review of methods and philosophies of IS, BS and ACI methods, mix design for special purposes. Acceptance criteria for compressive strength of concrete


References:
3. Concrete Technology Theory and Practice, M.S.Shetty, S.Chand & Company Ltd, New Delhi.
MAINTENANCE OF BUILDING: White washing, colour washing and distempering, painting, replacement of glass panels, re-polishing of terrazo and mosaic, replacement of decayed timber, easing of doors and windows, repairs to damaged part of the flooring, cleaning of fire chimneys and gutters, removal of stains from concrete and terrazzo floor, anti termite treatment (in building, foundations, floors and wood work), repairing of plumbing, drain and sanitary works. Repair of water storage sumps and tanks, repair of any joints i.e. wall-beam joint leak, beam-column, slab-beam, etc…

SPECIAL REPAIRS: Strengthening of foundation and foundation soils, rectification of leaking roof and concrete cover spalled roof, repairs to crack in masonry wall, repairs to leakage at window sill, special repairs to joinery work at roof level, providing D.P.C. to the exciting buildings, repairs to expansion and contraction joints, repairs to ramped floors. Repair of electrical installation system, repair of fire services system, repair of gas supply system. Repair of broadcast reception installation system, repair of security system, etc…

TEXT BOOK:


References:
1. General Specification for Building Maintenance Works in Residential Buildings, prepared by Building Surveying Division, HKIS
CE3107 GEOTECHNICAL ENGINEERING LABORATORY – I

1. Atterberg limits
2. Field density by Core Cutter and Sand replacement method.
3. Grain size analysis
4. Hydrometer/pipette analysis.
5. Specific gravity by pycnometer/density bottle method.
6. Permeability of soil – Constant and variable head tests.
7. IS light compaction.

DEMONSTRATION EXPERIMENTS:
1. Consolidation test.
2. Quick sand model and others if any.

CE3108 ENVIRONMENTAL ENGINEERING LABORATORY-1

1. (a) $p^H$.
   (b) Conductivity.
2. (a) Turbidity.
   (b) Jar Test.
3. Hardness.
5. Alkalinity estimation.
7. Fluorides.
10. D.O.
11. B. O. D.
12. C. O. D.
13. Chlorides.
CE3109  SOFT SKILLS(COMMON WITH OTHER BRANCHES)

Communication:
   Importance of communication
   Non verbal communication
   Personal appearance Gestures
   Facial expressions
   Eye contact
   Space distancing

Goal setting:
   Immediate, short term, long term,
   Smart goals, strategies to achieve goals

Time management:
   Types of time
   Identifying time wasters
   Time management skills

Leadership and team management:
   Qualities of a good leader
   Leadership styles
   Decision making
   Problem solving
   Negotiation skills

Group discussions:
   Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
   Group behaviour, analysing performance

Job interviews:
   Identifying job openings
   Preparing resumes & CV
   Covering letter
   Interview (Opening, body-answer Q, close-ask Q),
   Types of questions

Reference books:
1. ‘Effective Technical Communications’ by Rizvi M. Ashraf, McGraw–Hill Publication
2. ‘Developing Communication Skills’ by Mohan Krishna & Meera Banerji, Macmillan
3. ‘Creative English for Communication’ by N.Krishnaswami & T.Sriraman, Macmillan

Water Tanks: Stress in concrete and steel in water tanks, Modular ratio, Impermeability requirements, Under ground rectangular tanks, Elevated rectangular and circular tanks, Design of these tanks for strength and cracking, Design of staging of rectangular tanks.


Piles and Pile caps: Design of bored cast in situ piles (bearing and friction types), under reamed piles. Pile Caps design; bending and truss methods.

Prestressed Concrete – Reinforced Concrete Versus Prestressed Concrete. – Prestressing Systems (Fressinet, Gifford Udal, Magnel Blatten) – Prestressing Losses – Steel and Concrete for Prestressing – Homogeneous Beam Concept, limiting eccentricities, Pressure line, Elastic Stress distribution across the depth due to D.L. eccentric prestress and L.L.

References:
1. Limit State of Design of Reinforced Concrete – P.C. Vergheese
3. Design of reinforced Concrete Structures – P. Dayaratnam
CE3202  STEEL STRUCTURES – II

Note: All the designs should be taught in the limit state design method as per IS 800-2007”.

Plate Girders (Bolted and Welded): Components of a plate girder, Economical depth, proportioning of web and flanges, shear buckling resistance of web by simple post critical and tension field methods, curtailment of flange plates, connection of flange angles to web and flange angles to flange plates.

Web stiffeners: Design of bearing stiffeners. End panel design, design of intermediate stiffeners, connections.

Bridges: Classification, Loadings, Deck type and through type bridges, Plate girder bridges, design of stringers, cross girders, wind bracings.


Plastic analysis: Introduction, Upper and Lower bound theorems, Uniqueness theorem, Shape factor, Load factor; Beams: Collapse load for fixed and continuous beams, Design of beams; Frames: Collapse load for a frame of single bay single storey frame.

References:
1. Design of Steel structures by N. Subramanian, Oxford University Press.
Subsoil Exploration: Methods of subsoil exploration Direct, semi direct and indirect methods, Soundings by Standard, Dynamic cone and static cone penetration tests, Types of Boring, Types of samples, Criteria for undisturbed samples, Transport and preservation of samples, Borelogs, planning of exploration programmes, report writing.

Bearing Capacity: Safe bearing capacity and allowable bearing pressure, General and local shear failures, Terzaghi’s bearing capacity equations its modifications for square, rectangular and circular foundations, Factors affecting bearing capacity of Soil, Effect of water table on bearing capacity, IS Code method for Bearing capacity of footings, Allowable bearing pressure based on N-values. Bearing capacity from plate load tests.

Shallow Foundations: Factors effecting locations of foundation and design considerations of shallow foundations, choice of type of foundations, Foundations on expansive soils.


Pile Foundations: Types, Construction, load carrying capacity of single pile – Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups, settlement of pile groups, Negative skin friction, under reamed pile.

Caissons: Types of caissons, pneumatic caissons, Different shapes of well foundations, Relative advantages and disadvantages, Different Components of well and their function, Grip length, problems in well sinking and remedial measures.


Earth Pressure: Types of Earth pressure, Rankines Active and passive earth pressure, Smooth Vertical wall with horizontal and inclined backfills. Coloumbs wedge theory, Culmans and Rebhanns graphical method for active earth pressure, Retaining walls: Types and Stability Analysis.

Bulkheads: Classification, Cantilever Sheet Piles in Sandy soils and clayey soils, Analysis of Anchored bulkheads – free earth support and fixed earth support methods.

TEXT BOOKS:
4. Foundation Engineering by P.C. Vargheese
Dimensional Analysis and Similitude: Fundamental Concepts of Dimensional Analysis – Importance of Dimensional Analysis & Model Study; Units and Dimensional Formulae for Various Engineering Quantities; Fourier Concept of Dimensional Homogeneity.

Methods of Arriving at Dimensionless Groups – Non-dimensional Parameters; Rayleigh’s Method; Buckingham \( \pi \) method – Buckingham modified method; Omitted and Superfluous variables.

Examples in Dimensional Analysis – Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller,

Similarity and Similarity Laws – Concepts of Similarity – Geometric, Kinematic and Dynamic Similarities; Modeling Criteria; Similarity Laws – Important Dimensionless Numbers – Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number.

Application of Similarity Laws to Practical Problems – Bodies Completely Submerged in Fluids, Bodies subjected to Gravity and Viscous Forces, River Models – Manning’s Law; Distorted Models – Depth distortion and slope distortion; Problems related to Modeling of Spillways, Ships and Pumps & Turbines.

Impact of jets: Force exerted by fluid jet on stationary and moving flat and curved vanes, Torque and Work done by series of Moving Vanes.

Hydraulic Machines– Turbines: Introduction and Classification of Turbines – Function of Prime movers and Pumps, Hydraulic Turbines, Classification Based on Head, Discharge, Hydraulic Action – Impulse and Reaction Turbines, Differences between Impulse and Reaction Turbines; Choice of Type of Turbine – Specific Speed.


Performance & characteristics of Turbines: Unit Quantities, Specific Speed and its importance; Model Relationships; Operating Characteristic Curves; Cavitation problem in Turbines – Thoma’s Cavitation Factor.


References:
3. Engineering Fluid Mechanics Kumar, K.L., S. Chand & Co. Ltd.
CE 3205 TRANSPORTATION ENGINEERING – I


Airport Engineering: Layout of Airports – Components functions – Aircraft characteristics – Airport site selection – Airport obstructions – Runway design – Visual aids – Air traffic control.

References:
  1) Highway Engineering by Khanna & Justo.
  2) Highway Engineering by Sharma & Sharma.
  3) Airport planning and Design by Khanna & Arora.
Matrix methods of Analysis - Introduction, Analysis of beams and Portal Frames (One bay, one storey Two bay, two storey) by stiffness method.

Matrix methods of Analysis - Introduction, Analysis of beams and Portal Frames (One bay, one storey Two bay, two storey) by flexibility method.


Basic theory relating to the formulation of the finite element method, element shapes, nodes, nodal degree of freedom, node numbering, Coordinate system (local and global), Convergence requirements, Compatibility requirement, Geometric Invariance.

Finite element analysis of - single bar element(One –Dimensional problem) – Shape functions, derivation of stiffness matrix, stress-strain relations– All with reference to bar element and trusses under axial forces.

Text Books:

References:
In-situ densification Methods in granular soils – Introduction of Vibration at the ground surface, Impact at the Ground surface, Vibration at depth, Impact at depth. In-situ Densification methods in cohesive soils, introduction, preloading or dewatering, drainwalls, sand drains, sand wicks, geodrains/banddrains, stone and lime columns, forced vacuum preconsolidation, thermal methods.


Geotextiles: Introduction, types of geotextiles; Functions and their application, tests for geotextile materials, geogrids, functions. Mechanical stabilization: Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques.

Lime and Bituminous Stabilization: Types of admixtures, mechanism, factors affecting, design of mixtures, construction methods.

Stone columns, introduction, construction practice, design principles, vibrofloatation techniques and other techniques like dynamic replacement etc.

References:
2) Principles of pavement design, E. J. Yoder: John Wiley and sons.
3) Foundation Engineering, Leonards, G.A.
PE II:CE3206C: MARINE STRUCTURES

Introduction: Waves, tides, tsunamis, storm surge and currents. Wave forces on small and large cylinders, Sea walls, Design of break waters and jetties.


Load Calculations:
  I. Environmental loads on offshore structures due to a) Wind b) Wave c) Current d) Ice e) Earth quake
  II. Functional loads; III. Buoyant Forces; IV. Installation forces, Soil structure interaction.

Preliminary design aspects of offshore structures. Construction, Towing and installation procedure of Jacket platforms and Gravity platforms.

Text Books:
1. J.S. Mani, “Coastal Hydrodynamics” PHI Learning
6. API code.
Introduction: Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes. Characteristics of Solid Wastes: Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

Solid Waste Management: Definition- Reduction, reuse, recycling and recovery principles of waste management- Functional elements of Solid Waste management- Waste generation and handling at source-Collection of solid wastes- Collection methods and services- guidelines for collection route layout.

Transfer and Transport of Wastes: Transfer station-Processing and segregation of the solid waste- various methods of material segregation.


References:
1. Integrated Solid Waste Management by Tchobanognous
2. Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Tchobanognous
PR II :CE3206 E :IRRIGATION ENGINEERING


Soil Water Plant Relationship: Soil physical properties influencing Soil-water relationship- Forms and occurrence of Soil Water- Classification of Soil Water- Soil Water Constants- Energy concept of Soil Water-Forces acting on Soil Water- Soil Water Potential concept- Soil Water retention- Soil Moisture Measurement.


Surface Irrigation Methods: Canal network and canal design- Surface irrigation methods- Types- Border irrigation, Furrow irrigation and Strip irrigation- Specifications, Hydraulics and Design.

Drip And Sprinkler Irrigation Method: Sprinkler and Drip- History and development, Types, Components, Design and Layout, Performance Evaluation, Operation and Maintenance.


TEXT BOOKS

REFERENCES
1. Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice Hall of India (P), Ltd, 2000
CE3207 CONCRETE LABORATORY

1) Specific gravity and unit weight of cement
2) Specific gravity and unit weight of coarse and fine aggregates.
3) Determination of normal consistency of cement
4) Determination of initial and final setting time
5) Fineness of cement.
6) Determination of compressive strength of cement (for different grades of cement).
7) Bulking characteristics of sand.
8) Sieve analysis of coarse and fine aggregates and classification as per IS 383.
10) Tests on Hardened concrete.
11) Compressive Strength
12) Split tensile strength
13) Modulus of rupture
14) Design of concrete mix by using IS code method (for class work only)
15) Case studies on a) framed structures and b) plate girder brid

CE3208 GEOTECHNICAL ENGINEERING LAB. – I

1. Field identification & classification of soils
2. Unconfined compression test
3. CBR test/plate bearing test
4. Triaxial compression test
5. Direct sheartest
6. Vane sheartest
7. Relative density
8. Triaxial test
10. Consolidated drained
11. Demonstration experiments (subject to availability)
12. S.P.T.
13. Consolidated undrained Foundation models
14. Plate load test
15. Pressuremeter test
16. Field vane shear.
1) Study of Characteristics of a hydraulic jump – To measure and draw \( \frac{E_1-E_2}{E_1} \) vs \( F_1 \) and \( \frac{L_j}{y_2} \) vs \( F_1 \), and compare with theoretical results wherever possible.

2) Study of Rugosity coefficients in an open channel flow.

3) Study of major losses in pipes – Pipe friction – To compute Darcy- Weisbach friction factor.

4) Study of Drag characteristics of a circular cylinder with its axis normal to the direction of flow.
   (a) To measure the pressure distribution on the surface of a cylinder and plot the dimensionless pressure variation around the cylinder and compute the pressure drag.
   (b) To measure the velocity variation in the wake of the cylinder, velocity of approach, and compute the total drag by momentum principle.

5) Study of performance characteristics of a centrifugal pump – To measure the discharge, head developed, and power input at various discharges for centrifugal pump and draw the performance characteristics.

6) Study of performance characteristics of a reciprocating pump – To measure the discharge, head developed, and power input at various discharges for reciprocating pump and calculate percentage slip and efficiency.

7) Study of performance characteristics of a Pelton turbine – To measure the discharge, head difference across the turbine, the brake load, speed of turbine for various discharges and draw the performance characteristics.

8) Study of performance characteristics of a Francis turbine – To measure the discharge, head difference across the turbine, the brake load, speed of turbine for various discharges and draw the performance characteristics.

9) Study of impact of a jet on flat and curved vanes.
CE4101/CE4201  ESTIMATING AND QUANTITY SURVEYING

Introduction: Standard units, Units of measurement of different items of work. Meaning of estimating. Errors in estimation, Different types of estimates. Contingencies and related terms in the estimate, different types of approvals. Plinth area and related terms used in the estimation of various structures, rules and methods of measurements of different works.

Specialisations: Meaning, purpose, types of specialisations, Method of preparation of specification, general specification, detailed specifications of different items of buildings and other structures – Race analysis – Data sheet for materials and various items of work in buildings and other structures, schedule of rates, abstract estimate of buildings.

Detailed estimate of buildings. Different items of work in building; Principles of taking out quantities, detailed measurement form; long walls and shortwalls method of building estimate, Centre line method of building estimate. Estimate of RCC building, slope roof buildings; G.I. and A.C. Sheet, Detailed estimate of different types of doors and windows, electricity and water supply. Sanitation works etc.

Estimate of earth work; different formulae for calculations, estimate of metalled road, Tar road, concrete road, Railway tract, Estimate of culverts and bridges etc. Valuation of buildings; purpose, different method of building valuation; different terms used in valuation and their meaning.

References:
1. Estimation, Costing, Specifications and Valuation in civil Engineering by M.Chakraborti.
3. Textbook of estimating and costing by G.S. Birdie.
CE4102 / CE4202 TRANSPORTATION ENGINEERING – II


References:
2) Railway Engineering by Rangwala.
3) Dock & Harbour by Birdie.
4) Tunnelling by Rangwala.
PERT and CPM: Introduction: Origin of PERT and CPM, Planning, Scheduling and controlling Bar charts, Milestone charts, weaknesses in Bar charts, PERT and CPM networks – Comparison, Event, Activity, Rules for drawing networks, Numbering the events (Fulkerson’s law: Dummy activities, Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack, project duration, probability of completion, Start and Finish time estimates, Floats, Project scheduling, Critical and sub-critical path.


Management – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personnel Department.


References:
1) PERT and CPM – L. S. Srinath.
2) PERT and CPM – Punmia.
4) Construction Management and Planning – Guna and Sen Gupta, B.
Storage Works: Classification of dams, Factors governing selection of types of dam, Selection of site, Preliminary investigation.


Earth Dams: Types, Foundation for earth dams, design of earth dams, Causes for failure of earth dams, Criteria for safe design, Phreatic line, Seepage analysis – Seepage control through body and foundation.

Spillways: Essential requirements, Spillway capacity, Components, Types of spillways and their working, Design of ogee spillway, Energy dissipation below spill way, Scour protection, Use of hydraulic jump as energy dissipater – Design of stilling basins – USBR and IS standard basins; Spillway crest gates – Different types.

Diversion Head Works: Types, Location and components, effects of construction of weirs on permeable foundation, Bligh’s, Lanes and Khosla’s theories, Method of independent variables, Design principles of weirs and barrages, Design of weirs on permeable foundations, Design of vertical drop weir, Silt control devices.

Regulation Works: Canal falls – Definition, Necessity and location, Classification of falls, Design principles of syphon well drop, Notch fall, Sarada fall, Straight glacis fall; Offtake alignment; Cross regulator and Distributary head regulator – Design of cross regulator and Distributor head regulator.

Cross Drainage Works: Types, Factors affecting the suitability of each types, Classification of aqueducts, Design principles of different types of aqueducts.

River Training Works: River Training and its objectives, Classification of river training works, Marginal embankment, Guide banks, Groynes, cutoffs, Bank pitching, Launching aprons, Miscellaneous types of river training works.

Water Power engineering: Development of hydro power in India, Assessment of available power, Utilisation factor, Load factor, Diversity factor, Storage and Pondage; Types of hydro power schemes; Components of hydel schemes – Fore bay, Intake structure, Trash racks, Surge tanks; Water hammer pressure, Substructure and Superstructure of power house.

References:
PE-III: CE4105A /4205A: MULTI STORIED STRUCTURES

Analysis of one bay one storey Portal Frames with and without sway by Moment Distribution Method. Analysis of continuous beams and one bay one storey Portal Frames with and without sway by Kani’s method.

Introduction to Matrix methods: Analysis of continuous beams and one bay one storey portal frames by Flexibility matrix method.

Analysis of continuous beams and one bay one storey portal frames by stiffness matrix method.

Analysis of Multistoreyed frames by substitute frame method.

Analysis of Multistoreyed frames for wind loads by portal, cantilever and Girder Factor methods.

1. Analysis of Ineterminate structures – C.K Wang
2. Matrix Analysis of framed Structures- Weaver & Gere

PE-III: CE4105B /4205B: EARTH RETAINING STRUCTURES

Earth Pressure: Basic concepts, Rankine and Coulomb earth pressure theories, Determination of active and passive pressures: Culmann’s Graphical method, logarithmic spiral methods, friction circle method. Consideration of surcharge, seepage, earth quack, wave effect, stratification, type of backfill, wall friction and adhesion.


Reference books:
1. Foundation design by W. C. Teng, Prentice Hall
2. Terzaghi. K. theoretical soil mechanics, John Willey 1965
5. Embankment dams by Bharat Shing and S. D. Sharma
6. Earth and rock fill dams by Shearard, John wiley
7. Design of small dams by U. S. B. R.
8. Earth manual by U. S. B. R.
PE-III: CE4105C /4205C: HYDRAULIC STRUCTURES

Types of Dam, merits and demerits, dam site selection, selection of dam, Forces acting on gravity Dam, Methods of analysis of gravity Dam, Modes of failure and stability requirements, Design criteria and factor of safety.

Elementary profile of a gravity dam, Low and high gravity dams, Zoning of dams, Galleries in dams, Temperature control in mass concrete; Foundation treatment for concrete dams; gravity dams subjected to earthquakes.

Buttress and Arch dams, Types, selection, merits and demerits, Elementary design Principles of Arch and Buttress dams.

Earth Dams, their components and functions, causes of failure, Factors influencing the design of an earth dam. Design criteria for Earth Dam.

Spillways, Types of spillways and their design principles, Energy dissipation below spillways, Use of hydraulic jump as energy dissipater and design of stilling basins, Types of spillway gates.

Principal components of hydro power station: Intakes and trash racks, water conductor system, tunnels, surge tanks, penstocks, draft tubes, scroll casing, anchor blocks, water hammer analysis.

**Text Books / References:**

Characteristics of waste water of specific industries, characteristics of treatment plant effluents, Effect of waste water on self purification capacity of streams, Primary treatment of waste water.


Biological treatment facilities: Process designs of the following units w.r.t. Industrial Wastes; Activated sludge process; trickling filter; sludge degestion units; Aerated lagoons; Stabilization ponds (oxidation ponds); oxidation ditches (Paveer ditches); Rotating Biological contactor; Anaerobic filter.

Principles of Industrial waste Treatment: Waste reduction pretreatment of wastes, collection and segregation of wastes, reduction in volume and strength neutralisation; equalisation; proportioning.

Manufacturing processes, flowsheets; Characteristics and treatment of wastes and disposal methods of the following industries – Sugar, Dairy, Distillery, Paper, Tannery, Textile, Sheet, Fertiliser, Oil refinery and Petrochemicals.

References:
PE-III: CE4105E /4205E INDUSTRIAL STRUCTURES

Light gauge steel structures: Local buckling of thin sections, Post packing of thin elements, Light gauge steel columns and compression members, Form factor for columns and compression members, Stiffened compression elements, Multiple stiffened compression elements, Unstiffened compression elements effective length of light gauge steel compression members, Basic design stress, Allowable design stress, Light gauge steel beams, Laterally supported light gauge steel beams web crippling. Allowable design stress in beams, Beams subjected to combined axial end bending stress, connections.

Analysis of Communication Towers

Analysis of Transmission line Towers: Loads on towers, Sag (dip) and Tension in uniformly loaded conductors, Analysis of towers (analysis as coplanar assembly), Design of members in towers, Design of foundation of towers.

Design of Steel Chimneys for wind and gravity loads.

Design of gantry girder

References:
2. “Comprehensive Design of Steel Structures”, B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P) Ltd


Traffic Management – Transportation system Management, Travel Demand Management Techniques, Traffic management measures.

Reference books:
1. Highway Engineering By S.K. Khanna & C.E.G.Justo
2. Traffic Engineering and Transport Planning By L.R. Kadiyali.

Prestressing losses, Elastic shortening, loss due to shrinkage, loss due to creep, loss due to friction, loss due to curvature etc. I.S. code provisions.

Analysis of prestress members, assumptions, pressure, or thrust line concept of load balancing, cable profile, kern distance, stress in tendons as per IS 1343, cracking moment.

Limit state design of flexural members, stress, I.S. code provisions, design of symmetrical beams, design of prestressed concrete poles, design for shear, I.S. code provisions.


Anchorage zone in post tensioned members, stress distribution in end block, Guyon’s method of approach of analysis of end block (Not more than 2 cables).

Text Book :

1) Prestressed Concrete by N.Krishna Raju.

References :

1) Prestressed Concrete by N.Rajagopalan.
2) Prestressed Concrete by P. Dayaratnam.
PE-IV: CE4106B /4206B: AIRPORT PLANNING AND DESIGN

Air transport: History of Air transport, structure and organisation of air transport, National Airports Authority, Airports Authority Of India, International Civil Aviation Organisation. Airport characteristics: Requirements of aircraft types, weight components, Aeroplane component parts, classification of flying activity, Aircraft characteristics.

Airport planning: Airport master plan, Regional planning, Airport site selection, Estimation of future airtraffic needs. Airport obstructions: Zoning laws, classification of obstructions.

Runway design: Runway orientation, Basic runway length, Corrections, Airport classification, Runway Geometry Design. Airport Capacity & Configuration, Runway intersection design,

Taxiway design: Geometric design standards, Exit taxiways, Holding aprons. Terminal area & airport layout: Building area, Terminal area, Apron, Hangar, Typical Airport Layouts. Visual aids: Airport marking, Airport lighting

Air traffic control : Need of air traffic control Air traffic control network, Air traffic control Aids – Enroute Aids & Landing Aids, Instrumental Landing System

Reference books:
Airport planning and design by S.K. Khanna, M.G. Arora, S.S. Jain
Principles of Watershed Management: Basics concepts, Hydrology and water availability, Surface water, Groundwater, Conjunctive use, Human influences in the water resources system, Water demand, Integrated water resources system

River basins Watershed Management Practices in Arid and Semi-arid Regions, Watershed management through wells, Management of water supply - Case studies, short term and long term strategic planning

Conservation of Water: Perspective on recycle and reuse, Waste water reclamation
Social Aspects of Watershed Management: Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies

Sustainable Watershed Approach: Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation

Water Harvesting: Rainwater management - conservation, storage and effective utilisation of rainwater, Structures for rainwater harvesting, roof catchment system, check dams, aquifer storage


Text Book:

References:
PE-IV: CE4106D /4206D AIR POLLUTION CONTROL

Air Pollution and its definition – Factors influencing air pollution – Classification of pollutants particulates – Gases-Sources of pollution – Air qualities standards – effects – Location of Industries.


Air Pollution effects on human beings, animals, plants and materials – Air Pollution Episodes in India and abroad.

Ambient air quality monitoring and stack monitoring.

Control of air pollution – Removal of pollutants – particulate and gaseous – Air pollution control equipments (units) such as setting chamber, cyclones, wet scrubbers/collectors, scrubbers, centrifugal scrubbers spary towers, packed beds, electrostatic precipitators, after burners-absorption – adsorption – Diffusion.

References:
1 Air Pollution Control Technology by T. Painter.
2 Elements of Air Pollution Control by Prof. T. Shivaji Rao.
3 Air Pollution Control by K.V.S.G. Murali Krishna.
4 Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H.
PE-IV: CE4106E /4206E: GEO-ENVIRONMENTAL ENGINEERING

Wastes: source, production and classification of wastes, soil pollution processes, waste characterization, physical characterization, problems due to improper disposal of wastes, Waste management strategies.

Soil pollution, sources of soil pollution, control of soil pollution.

Waste disposal facilities such as landfills, configuration or types of landfill, components of landfill, layout of a landfill site, stages of decomposition of waste in a landfill, landfill planning and design. Barrier systems – Active Systems, Passive Systems, Vertical barriers and their types, bottom barriers, Reuse of waste materials, contaminated site remediation.

References:


Box culvert : General aspects, Design loads, Design of Box culvert subjected to IRC loading.
Solid slab Bridges: Introduction-Method of Analysis and Design of solid slab bridge subjected to IRC loading.

Beam & Slab Bridge(T-Beam Girder Bridge): General features – Design of interior panel of slab – Pigeaud’s method – Analysis and design of T-beam longitudinal girder subjected to IRC loading – Analysis and design of Cross Girder.


Text books:
Characteristics of waste water of specific industries, characteristics of treatment plant effluents
Effect of waste water on self purification capacity of streams, Primary treatment of waste water.


Biological treatment facilities: Process designs of the following units w.r.t. Industrial Wastes; Activated sludge process; trickling filter; sludge digestion units; Aerated lagoons; Stabilization ponds (oxidation ponds); oxidation ditches (Paveer ditches); Rotating Biological contactor; Anaerobic filter.

Principles of Industrial waste Treatment: Waste reduction pretreatment of wastes, collection and segregation of wastes, reduction in volume and strength neutralisation; equalisation; proportioning.

Manufacturing processes, flowsheets; Characteristics and treatment of wastes and disposal methods of the following industries – Sugar, Dairy, Distillery, Paper, Tannery, Textile, Sheet, Fertiliser, Oil refinery and Petrochemicals.

References:
Occupational health- definition, Occupational hazards---types, physical hazards:- heat, noise, vibration, radiation, pressure. Occupational Health hazards --in construction industry, in mining, in quarrying.

First aid-definition, First aid for wounds, burns, shocks, fractures and artificial respiration

Chemical hazards- dusts and gases, Industrial poisons; modes of exposure, Biological hazards, Ergonomic hazards, Mechanical hazards

Industrial hygiene, Ventilation, Illumination, Air conditioning, Housekeeping, Personal protective equipment

Reference
1. Environmental and Health and safety management by Nicholas P. Cheremisinoff and Madelyn L. Graffia, William Andrew Inc. NY, 1995
Air Pollution and its definition – Factors influencing air pollution – Classification of pollutants particulates – Gases-Sources of pollution – Air qualities standards – effects – Location of Industries.


Air Pollution effects on human beings, animals, plants and materials – Air Pollution Episodes in India and abroad.

Ambient air quality monitoring and stack monitoring.

Control of air pollution – Removal of pollutants – particulate and gaseous – Air pollution control equipments (units) such as settling chamber, cyclones, wet scrubbers/collectors, scrubbers, centrifugal scrubbers spary towers, packed beds, electrostatic precipitators, after burners-absorption – adsorption – Diffusion.

References:
1. Air Pollution Control Technology by T. Painter.
2. Elements of Air Pollution Control by Prof. T. Shivaji Rao.
3. Air Pollution Control by K.V.S.G. Murali Krishna.
4. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H.
Concept of Environment – Definition of EIA and EIS – Elements of EIA – Guidelines for the preparation of EIS – Governmental policies for environmental protection.

Environmental setting – Environmental attributes – air, water, soil, noise, ecological, social, economical, cultural, human and aesthetic aspects – Environmental indices.

Methodology for the identification of Impacts – Criteria for the selection of methods – Methodologies- Adhoc, checklist, Overlaying, Matrix and Network methods.

Prediction and Assessment of Impacts on – air, water, soil, noise, ecological, social, economical, cultural, human environments and aesthetic aspects.


References
3. Environmental Impact Assessment Methodologies by Y Anjaneyulu, and Valli Manikkam, BSP Books PVT Ltd
CE4107 / CE4207  TRANSPORTATION ENGINEERING LABORATORY


Testing of bituminous material: Specific gravity – Penetration value – Viscosity value – Softening point – Ductility value – Flash and Fire point.


Testing on Bituminous Mixes: Bitumen Extraction Test, Marshal Stability Test (Demonstration)

References: Highway material testing by Khanna & Justo.

CE4108 / CE4208  COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB

Determination of Bending moment, deflection for different loading conditions for a simply supported beam and cantilever beam. Determination of fixed end moments for different loading conditions of a fixed beam.

Estimation of Run off for a catchment. Estimation of friction factor for laminar and turbulent flows, minor losses in pipe flow. Conversion of angles from WCB to RB.

Classification of soils determination of coefficient of permeability, degree of consolidation and shear strength.


Basic AUTO CAD commands application of drafting tools and modifying tools creation of 3 Dimensional solids. Application of STAAD Pro for the analysis and design of various structural components of Civil Engineering and Building Frames.

Text Book:
CE4109 / CE4209 IRRIGATION STRUCTURE DESIGN DRAWING

1. Tank Surplus weir
2. Barrage
3. Glacis type of canal drop
4. Notch fall
5. Siphon Aqueduct- type III
6. Cross regulator and head regulator

Text books :
1. Water resources Engineering, by C.Satyanarayana Murty
2. Water resources engineering, by SK Garg
3. Type designs of Irrigation Structures by RSN Murthy
The Department of Civil Engineering (CE) at East West University offers four-year Bachelor of Science (B.Sc.) degree program in Civil Engineering (CE) with an ambition of developing competent work force for the continuous demands in this sector at both home and abroad. The curriculum of the degree is prepared with the intension to groom up the students to effectively contribute in all aspects of Civil Engineering. Therefore, the curriculum of the B.Sc. in Civil Engineering (CE) program focuses on (i) Structural Engineering, which Dr. Mohamed Hussein has joined the Department of Civil Engineering as of July 1, 2018 as an Assistant Professor focusing in Transportation Engineering. Dr. Hussein completed his Ph.D. at the University of British Columbia, and both his M.Sc. and B.Sc. at Ain Shams University in Cairo, Egypt. Dr. Hussein's research focuses on promoting active modes of travel and enhancing road safety to support the sustainability of the transportation system. Civil Engineering Admissions Frequently Asked Questions (FAQs). Appointment with Faculty Member. Visiting Graduate Students and Visiting Graduate Student Scholars.Â However, through her growing collaboration with JHUâ€™s Department of Civil Engineering, thatâ€™s precisely whatâ€™s happening. Get the Story. Assistant Professor Thomas Gernay discusses what materials would be best to rebuild the Notre Dame Cathedral in order to preserve its historical architecture. Hear More. Climate Change, Superstorms, and Civil Engineering. Prof. Ben Schafer & Prof. Sauleh Siddiqui speak on how the field is changing to adapt to growing global concerns. Get the Story. Tell Me More About Civil Engineering. Whether you realize it or not, the work of civil engineers affects you.