First Year First Semester

Subject	Code	Lecture – Sessional – Credit	Marks
Thermodynamics & Heat Power	CE/5/ME/T/101	3 – 0 – 3	100

Units of heat and work, Laws of thermodynamics, Mechanical equivalent of heat

Laws of perfect gases and analysis of different processes, Carnot cycle, properties of saturated and superheated steam, Use of steam tables and charts.

Boilers and their types, Boiler mounting and accessories, Chimney drop, Artificial drop, Boiler performance

Rankine cycle, Modified Rankine cycle, steam turbine - its basic classification, function of basic parts, velocity diagram and blade efficiency of simple impulse turbines

Air standard cycles

Basic classification of IC engine, IC engine performance, Simple reciprocating air compressor, Mean effective pressure, Indicated and brake horse-power, Thermal efficiency

Subject	Code	Lecture – Sessional – Credit	Marks
Fluid Mechanics-II	CE/5/ME/T/213	3 – 0 – 3	100

Measurement: Measurement of flow in a closed conduits and open channels. Measurement of velocity

Momentum and energy principles: Principle of linear momentum, Momentum correction factor and its applications, Water Hammer, Thrusts in bends, principles of angular momentum and its applications. Energy equation, Energy correction factor and its applications

Dynamics of viscous fluids, Reynolds experiments - Characteristics of laminar and turbulent flows, Critical Reynolds number Viscous flow through conduits Hagen-Poiseuille equation, Stokes law.

Flow through closed conduits, Darchy- Weisbach equation, Moody's diagram, Flow through non circular ducts, Minor losses - head losses at sudden expansions, sudden contractions and also at bends. Head loss in pipes in series and parallel, pipe line problems, Uniform steady flow in open channels - Chezy's equation, Manning's equation, Economical cross section, specific energy, Hydraulic jump, Drag and Lift, Hydraulic Machines (Centrifugal Pump and Turbines).

Subject	Code	Lecture – Sessional – Credit	Marks
Engineering Geology	CE/5/Geo/T/103	3 – 0 – 3	100

Introduction to Geology - Different branches of geology, geological time scale and major events in the stratigraphic column.

Elementary concepts about earth's internal structure, major crustal features and plate tectonics, Mountain formation, Volcanoes, earthquakes and related hazards. Major rock forming processes and prime characteristics of Igneous, sedimentary and metamorphic rocks and their structures, Landform and land forming processes.

Elementary concept of mineralogy, petrology, structural geology of different types of building stones.

Engineering geological/geo-technical problems and relevance of geology to the civil engineering projects, geo technical properties of rocks, geo technical considerations of ground water, environment, natural resources and energy.

Geology of dam and reservoir sites, tunnels, Hill slope, weathering and erosion of rocks including rapid mass wasting movements and Landslides.

| **Fluid Mechanics Lab** | CE/5/ME/S/222 | $0 - 3 - 3$ | 100 |

To supplement the theoretical courses on "Hydraulics-I and II"

| **Engineering Geology Lab** | CE/5/Geo/S/101 | $0 - 3 - 3$ | 100 |

Megascopic identification of minerals and rocks.

Interpretation of Geological maps.

First Year Second Semester

Subject	Code	Lecture – Sessional – Credit	Marks
Computer Programming-I	CE/5/T/104	$3 - 0 - 3$	100

Basic computer system, use of computer, microcomputer, and Computer language: Statements, Numerical input/output; Transfer of control, Principles of flow charting, Subroutines, file handling and system-FORTRAN 77 and FORTRAN 90. Numerical analysis and Programming: Newton-Raphson Method, Secant method, Bisection method, Method of false positions, Solutions of a systems of linear and nonlinear simultaneous equations, Interpolation, Matrix operation, Solutions of ordinary differential equation , Runge-Kutta method, Predictor-Corrector method.

| **Structural Mechanics-II** | CE/5/T/105 | $3 - 0 - 3$ | 100 |

Strain energy principle: Castiglino's theorems, Deflection analysis of determinate beams, frames and trusses, Analysis of Indeterminate trusses. Analysis of propped cantilevers, fixed beams and continuous beams, portal frames. Slope and deflection analysis of beams: Double integration method, Area-Moment theorem and Conjugate beam theory. Three-hinged Arch. Deflection analysis of truss by graphical method-Williot-Mohr diagram. Analysis of Complex trusses-Heneberg's bar exchange method.

| **Surveying-II** | CE/5/T/106 | $3 - 0 - 3$ | 100 |

Theodolite: Instrument Specifications, Adjustments and Principles of Angle Measurement. Levelling: Trigonometric and Geodetic, Geodetic Survey: Triangulation Stations, Signals and Corrections. Tachometric Surveying: Spherical Trigonometry and Azimuth Determination. Engineering Survey: Setting out of Curves: Circular, Transition, Compound, Reverse and Vertical Curves. Tunnel Survey. Hydrographic Survey.

| **Computer Lab-I** | CE/5/S/103 | $0 - 3 - 3$ | 100 |

Introduction to computer system, Editing environment, Development of FORTRAN programme to solve matrix and other numerical problems. Solutions of Civil Engineering problems.

Structures Sessional	CE/5/S/104	0 – 3 – 3	100

Graphical solution of beams, plane frame and trusses. Plan, Elevation and Section of a small workshop building with steel trusses and columns.

Second Year First Semester

Subject	Code	Lecture – Sessional – Credit	Marks
Surveying-III	CE/5/T/201	3 – 0 – 3	100

Introduction to Photogrammetry: Terrestrial and Aerial. Principles of Aerial Photogrammetry, Stereoscopic pair, Map Projection, Co-ordinate System. Principles of EDM. Introduction to Remote Sensing. Energy Interaction, Satellite and Sensors, Image Correction, Enhancement and Interpretation. Indian Remote Sensing System. Application to Mapping

Valuation, Pricing & Contract	CE/5/T/202	3 – 0 – 3	100

Valuation: Value and cost of a property, Purposes of valuation, Capitalised value and year's purchase, Depreciation and obsolescence, Methods of finding depreciation, Reversionary value, Deferred value, Methods of valuation: rental method and land and building method. Belting method of valuation of land, Evaluation of lessor's and lessee's interest in lease hold property.

Pricing: Specifications of different items of works, statement of materials, rate analysis, and approximate estimate.

Contract: Legal and technical aspects of engineering works.

Computer Programming-II	CE/5/T/203	3 – 0 – 3	100

Introduction to C and C++ programming language: Constants, variables and data type, Operators and Expressions, Input and output, Decision making and branching, Decision making and looping, array, functions, structures and unions, pointers, file management, dynamic memory allocations, object oriented programming concepts. Finite difference technique, Eigen value problems, Numerical integration, Solutions of Civil Engineering software commercial packages.

Computer Lab-II	CE/5/S/201	0 – 3 – 3	100

Development of C and C++ programming: Solutions of problems using finite difference techniques, Small Eigen value problems, Solutions of Civil Engineering problems.

Second Year Second Semester

Subject	Code	Lecture – Sessional – Credit	Marks
Hydrology	CE/5/T/204	3 – 0 – 3	100

Introduction – Role of hydrology in Engineering; Hydrological and water cycle; Precipitation, Measurement, rain gauges, intensity, mass curves; Evaporation, Evapotranspiration and Infiltration Losses; Runoff measurements, stream discharge measurement, Hydrograph, Unit hydrograph, Baseflow separation, Rudiments of hydrology: standard coefficients of permeability, coefficient of transmissibility, equilibrium equations of flow of water into wells, steady state well

hydraulics, aquifer and aquifer parameters, specific yield, factors affecting ground water flow, field determination of co-efficient of permeability, measurement of drawdown. Floods: definition and estimation

| **Irrigation Engineering** | CE/5/T/205 | 3 − 0 − 3 | 100 |

Types of Irrigation systems and their detailed descriptions, soil water crop relationship, types of soil, water requirement of crops: Delta and Base Period, Duty. Classification of river; River regime theory, effects of dams on river regime, river training works. Irrigation canals: design principles of irrigation canals, drainage canals and navigation canals, canal linings, canal outlets. Water logging and salt efflorescence, land reclamation.

| **Theory of Structures-I** | CE/5/T/206 | 3 − 0 − 3 | 100 |

Theorem of Three moments: Fixed, Propped and Continuous beams. Influence line analysis for determinate beams, trusses and three hinged arches. Column and Struts: Buckling load: Euler's theory, Rankine's theory, empirical formulae, Column under eccentric load, Beam–Column. Buckling analysis by energy principle. Unsymmetrical bending; shear flow and shear centre problems.

| **Civil Engineering Lab-I (Conc./Struc.)** | CE/5/S/202 | 0 − 3 − 3 | 100 |

Testing of Cements, Fine aggregates, Coarse aggregates and Water, Fresh and Hardened concrete,

Steel bars and plates, Steel and RCC beams and columns. Steel truss. Testing of model structural systems.

| **Surveying Practice (Field Work)** | CE/5/S/203 | 0 − 3 − 3 | 100 |

Field Work on Surveying I and Surveying II

Third Year First Semester

Subject	Code	Lecture – Sessional – Credit	Marks
Design of Structures-I	CE/5/T/301	3 − 0 − 3	100

Introduction to Reinforced concrete structures. Properties of concrete. Codes of practices. Working stress and limit state design of reinforced concrete structures: Single and Doubly reinforced rectangular, T, L, sections etc. against bending moment, shear forces and Torsion. Bond stress: Development length and Lap length. Design of One-way and Two-way Slabs. Staircase. Continuous beams. Axially loading columns. RCC members under combined bending and axial load. Isolated footing.

| **Soil Mechanics-I** | CE/5/T/302 | 3 − 0 − 3 | 100 |

Introduction to geotechnical engineering, formation and types of soil, Weight and volume relationships; consistency limits, particle size distribution; identification and classification of soil; soil structure and clay mineralogy. Soil water suction and capillary rise, effective and pore water pressure. Permeability and ground water flow–Darcy's law, factors affecting permeability; laboratory and field determination of permeability, permeability of stratified deposits. Seepage pressure; quick condition; Laplace's equation; construction and use of flow nets, piping and heaving. Compaction of soil–compaction phenomena, laboratory compaction test and field compaction control. Compressibility and consolidation of

soil–Terzaghi's theory of one-dimensional consolidation; consolidation test and evaluation of consolidation parameters. Shear strength of soil, Mohr-Coulomb theory, Determination of shear strength from laboratory and field tests.

Theory of Structures-II   CE/5/T/303   3 − 0 − 3   100

Slope-Deflection method and Moment distribution method. Beams and Portal frame problems. Two hinged and fixed Arches. Beams Curved in plan. Approximate analysis of Multi bay Multistoried Portal frames: Cantilever method, Portal method. Substitute frame analysis. Method of Elastic Centre. Column analogy technique.

Civil Engineering Lab-II (Conc./Soil)   CE/5/S/301   0 − 3 − 3   100

Concrete: Mix design of concrete, Non-destructive tests on concrete. Testing of different structural elements and systems.

Soil: Laboratory experiments in soil mechanics.

C.E. Design Sessional-I (Conc.)   CE/5/S/302   0 − 3 − 3   100

Design of a small RCC framed building using Limit State method of design including preparation of necessary working drawing and report in accordance with Design of Structures I.

Academic Tour   CE/5/S/303   0 − 3 − 3   100

Third Year Second Semester

Subject	Code	Lecture – Sessional – Credit	Marks
Transportation Engg.-I	CE/5/T/304	3 − 0 − 3	100

Highway Engineering-Introduction, Highway alignment, Traffic studies: speed, volume, delay and capacity of highways, Geometric design of highway: Cross Sectional elements, Curves: Horizontal and Vertical, Intersection Geometry, conflicts and Grade separation, Subgrade and pavement components, Types of pavements, Road drainage.

Railway Engineering-Elements of permanent way: track, rails, sleepers, ballast, rail fastenings; Tractive resistance's, Elements of geometric design-gradients and grade compensation on curves, cant, transition curves, vertical curves, Stress in railway tracks, Points and crossings, Signaling and interlocking, Maintenance of railway track.

Water Supply Engineering   CE/5/T/305   3 − 0 − 3   100

Water uses: Quantity, requirements, potable water quality; source of water, development of surface sources; reservoir volume; transmission of water. Water distribution system including typical flow sheet. Treatment of water: typical flow-sheets for surface and underground sources; sedimentation; coagulation and flocculation; filtration, disinfections, hardness and chemical softening; rudiment and ion-exchange; elements of rural water supply.

Theory of Structures-III   CE/5/T/306   3 − 0 − 3   100

Stiffness and flexibility methods: Matrix methods of structural analysis. Analysis of Suspension bridges, Influence line diagram for Three-hinged and Two-hinged stiffening girders. Influence line diagram for indeterminate structures: Muller-

Breslau principle. Plastic analysis of Structures: Beams and Portal frames. Model analysis and applications. Analysis of Space truss – Tension coefficient method.

Quantity Surveying CE/5/S/304 $0 - 3 - 3$ 100

Students will be required to prepare taking-off sheet, abstracts and bill of quantities on some assigned problems along with detailed specifications of materials and labour.

C.E. Lab-III (Survey/ Struc.) CE/5/S/305 $0 - 3 - 3$ 100

Structure: Solutions of Structural Engineering problems by commercial software packages.

Survey: Photogrammetry and Remote Sensing Image Analysis including field work for Ground Truth Verification

Seminar-I CE/5/S/306 $0 - 3 - 3$ 100

Fourth Year First Semester

Subject	Code	Lecture – Sessional – Credit	Marks
Transportation Engg.-II	CE/5/T/401	$3 - 0 - 3$	100

Introduction to traffic engineering; Traffic Studies–Origin and destination studies, parking studies, accident surveys; Traffic forecasting; Traffic flow characteristics; Capacity and Level of service and its applications–basic freeway segments and highway intersections; Traffic Controls–signs, markings and signals.

Wheel loads; Stresses in a flexible pavements-Two-layer system. Flexible pavement design-CBR method, Mcleod method, Burmister and triaxial method. Determination of stresses of rigid pavements at corners, centres and edges, Design by Westergaard, and IRC method. Design of joints, Highway Material and Testing; Construction of flexible pavement. Introduction to pavement evaluation, Benkelman beam tests.

Element of airport engineering, airport planning and layout; runway and taxiway; grading and drainage.

Waste Water Engineering CE/5/T/402 $3 - 0 - 3$ 100

Sanitary waste water and storm water runoff; quantity estimate; sewerage systems and their design principles; sewer construction materials; sewer appurtenances; characteristics of domestic waste water; typical flow sheet for primary and secondary treatment; design principles for screen; grit removal, sedimentation, bio-filter, activated sludge process and septic tank; elements of rural sanitation.

Soil Mechanics-II CE/5/T/403 $3 - 0 - 3$ 100

Stress distribution, Boussinesq's theory, Newark's chart, pressure bulb; Stability of earth slopes, finite and infinite slopes, stability analysis by Swedish method of slices; stability number; tension cracks. Lateral earth pressure; earth pressure at rest, active and passive conditions; Rankine and coulomb's theory; Earth pressure on retaining walls. Bearing capacity of soil; modes of failure; bearing capacity theories; factors affecting bearing capacity. Subsurface exploration, methods of boring and sampling; different types of samplers; ground water observations.

Design of Structures-II   CE/5/T/404   3 – 0 – 3   100

Introduction to Metal structures. Mechanical properties of metals and their specifications for structural use. Codes of practices. Design of Riveted, Bolted and Welded joints and connections. Working stress and limit state design of Tension and Compression members, Beams and Plated beams, Roof trusses, Purlins, Columns, Base connection and foundations. Compound columns with lacing and battens. Design of Steel structures using tubular, rectangular and square section

Civil Engg. Lab-IV (Soil/Env)   CE/5/S/401   0 – 3 – 3   100

Laboratory experiments in soil mechanics and environmental engineering. Students shall carryout experiments in small group and submit reports.

C.E. Design Sessional-II   CE/5/S/402   0 – 3 – 3   100

Design of a factory shed including preparation of necessary working drawings and report in accordance with Design of Structures II.

Fourth Year Second Semester

Subject	Code	Lecture – Sessional – Credit	Marks

Elective-I

Concrete Technology (Elective-I)   CE/5/T/405A   3 – 0 – 3   100

Cement-manufacturing process. Physical and Chemical properties. Different types of cement and their uses. Codes of practices, testing of cement: Physical and Chemical tests. Tests on fresh and hardened concrete. Chemical admixtures and Plasticizers. Durability of concrete. Mix design approaches. High Performance Concrete, Ready Mixed Concrete. Fibre Reinforced Concrete. Shotcrete. Pumped concrete. Fly ash concrete. Self-Compacting concrete. Polymer concrete etc. Grouting and grouting materials.

Advanced Solid Mechanics (Elective-I)   CE/5/T/405B   3 – 0 – 3   100

Two and three dimensional elasticity: Equations of equilibrium and compatibility, Plane stress and Plane strain problems, Stress functions, Constitutive relationship. Equations in Cartesian and Polar coordinate systems, Bending of beams, Torsion of shafts. Computer solutions.

Ground Water Hydrology and Water Conservation-(Elective-I) CE/5/T/405C   3 – 0 – 3   100

Estimation of aquifer parameters, Subsidence analysis due to withdrawal of ground water, Ground water flow equation, Laplace's equation, Different flow equation for two different water bodies with and without surcharge, Well water capacity and losses, Well hydraulics under unsteady flow condition, Contaminant flow and dynamics of flow, Water Conservation-basic principles and methods, Rainwater Harvesting, Rainwater and artificial recharge, Ground water quality.

Ecology and Environmental Management (Elective-I) CE/5/T/405D $\quad$ 3 − 0 − 3 $\qquad$ 100

Definition of Ecology, Ecosystem, Different Ecosystem Classification, Atmosphere, Definition of Environment, Biosphere, Biomass, Biogeochemical Cycle, Productivity, Biodiversity, Food Web, Food chain, Pond Ecosystem, Ecological pyramids, Preservation of Ecosystem, Wetland Ecosystem.

Environmental Management: Definition of Environment, Waste Minimization, Sustainable development, Carrying capacity, Environmental management system (EMS), ISO 140000, Cost-Benefit Analysis, Life cycle assessment, Risk assessment.

Environmental Impact Assessment (EIA): Screening, Scoping, Public consulting, Appraisal-EIA notification, Schedule.

Water Quality Monitoring and Modelling (Elective-I) CE/5/T/405E $\quad$ 3 − 0 − 3 $\qquad$ 100

Water quality in river, Need for monitoring, Objectives, Sampling systems, Techniques of water quality and monitoring, Mixing regime, Equation for mixing regime, Hydraulic and velocity regime, Water dispersion modelling in river, Lake water modelling, Plankton modelling, Eutrophication modelling.

Design of Structures-III $\qquad$ CE/5/T/406 $\qquad$ 3 − 0 − 3 $\qquad$ 100

Design of Multistoried RCC buildings considering wind and seismic forces. Combined and Strip footing. Raft foundation. Pile foundations. Retaining walls. Underground water tanks. Overhead water tank. RCC Culverts and bridges: IRC loading, design of deck slab and girder. Design of Prestressed concrete structures.

Theory of Structures-IV $\qquad$ CE/5/T/407 $\qquad$ 3 − 0 − 3 $\qquad$ 100

Theory of plate bending: Navier's solution, Levy's solution. Plate buckling problems. Membrane theory of domes and cylindrical shells. Elasticity problems using Airy's stress function. Introduction to Finite Element analysis. Failure theories for homogeneous isotropic materials-Von Mises criteria, Tresca's criteria etc.

Design of Foundation $\qquad$ CE/5/T/408 $\qquad$ 3 − 0 − 3 $\qquad$ 100

Foundations and their suitability; Foundation requirement and placement, types of foundations, choice of foundation; rigid and flexible footings; contact pressure. Evaluation of bearing capacity from plate load test, cone penetration, standard penetration test and other tests. Settlement of foundations; immediate and consolidation settlement; allowable settlement; differential settlement. Proportioning of footings for equal settlement in different types of soil. Combined footings; raft foundation; buoyant raft; analytical methods of design. Pile foundations; types of piles, pile capacity, static and dynamic formulae; design of piles groups; pile load test.

Civil Engg. Lab-V (Soil/Env) $\qquad$ CE/5/S/403 $\qquad$ 0 − 3 − 3 $\qquad$ 100

Laboratory experiments in soil mechanics and environmental engineering. Students shall carry out experiments in small groups and submit reports.

C.E. Design Sessional-III $\qquad$ CE/5/S/404 $\qquad$ 0 − 3 − 3 $\qquad$ 100

Design projects in accordance with Design of structures III including preparation of working drawings and report

Fifth Year First Semester

Subject	Code	Lecture – Sessional – Credit	Marks
Design of Structures-IV	CE/5/T/501	3 – 0 – 3	100

Gantry girders and Gantry columns including base and foundation. Steel Portal frames. Pressed steel water tanks-rectangular and circular tanks. Steel Towers. Steel Chimneys. Composite structures. Light gauge steel structures. Steel buildings and Steel bridges. Limit state method of design of steel structures.

Subject	Code	Lecture – Sessional – Credit	Marks
Hydraulic Structure	CE/5/T/502	3 – 0 – 3	100

Storage reservoirs; different types of dams; weirs and barrages and their design principles. Spill-ways; energy dissipation by hydraulic jump; different types of energy dissipators. Seepage through dams. Cut-off walls. Head works; cross drainage works, falls and regulators. Ports, docks and harbours.

Subject	Code	Lecture – Sessional – Credit	Marks
Environmental Pollution & Control	CE/5/T/503	3 – 0 – 3	100

Atmospheric pollution: Definition and Types of pollutants; natural and manmade sources. Effects of air pollution, unit systems, rudiments of control methods; elements of noise pollution.

Community Solid wastes: Sources, quantity and characteristics, collection and transfer methods, methods of disposal, reuse and recycling, Water quality management: Quality criteria for major uses of water, Applied steam sanitation. Streeter -Phelps equation.

Subject	Code	Lecture – Sessional – Credit	Marks
Civil Engg Lab-VI (Transport/Struc.)	CE/5/S/501	0 – 3 – 3	100

Transportation

Testing of road construction materials, different test on road and road surfaces.

Structure

Testing of steel and concrete structural systems under static and dynamic loads. Testing of Special concrete.

Subject	Code	Lecture – Sessional – Credit	Marks
C.E. Design Sessional-IV	CE/5/S/502	0 – 3 – 3	100

Design projects in accordance with Design of structures IV including preparation of working drawings and report.

Subject	Code	Lecture – Sessional – Credit	Marks
Seminar-II	CE/5/S/503	0 – 3 – 3	100

Supervising teachers shall assign topics to the students for their seminars. Each student is to prepare a report and give a presentation in front of teachers and students.

Fifth Year Second Semester

Subject	Code	Lecture – Sessional – Credit	Marks
Construction Management	CE/5/T/504	3 – 0 – 3	100

Principles of management, construction organization and superintendence, operations research; time measurement and scheduling, quantitative management applications, quality management and safety; resource management and inventory; management of accounts; cost and finance; contact and commercial laws; labour and industrial laws; Construction practices; earth work and super structure, Construction equipment and operation.

Elective-II

Structural Dynamics (Elective-II) G-I   CE/5/T/505A   3 – 0 – 3   100

Introduction to Structural dynamics, Free, Damped and Undamped vibration analysis of Single and Multiple degree of freedom systems: Beams and Portal frames. Plate vibration. Vibration control. Machine foundation. Introduction to Random vibration.

Wind and Earthquake Engineering (Elective-II) G-II   3 – 0 – 3   100

Concept of wind, wind mechanics, effect of wind on buildings, chimneys etc., code of practices on analysis and design of wind sensitive structures. Wind tunnel testing.

Characteristics of earthquake, Earthquake response of structures. Concept of earthquake resistant design. Code provision for design of buildings and liquid storage tanks.

Advanced Foundation Engineering (Elective-II) G-III   CE/5/T/505B   3 – 0 – 3   100

Foundations on expansive and collapsible soil; under reamed pile, uplift resistance of piles. Well foundation and its elements – size and depth; forces on well foundation; methods of sinking; scour depth; analysis of well foundation for bearing capacity and lateral stability. Braced excavation, types of bracing system; stability considerations, heave and uplift computation of earth pressure and strut load; Ground movement, Construction control. Dewatering - field pumping test, common dewatering methods. Effects of dewatering. Soil dynamics – theory of vibration, degrees of freedom, principles of machine foundation design.

Pavement Design Evaluation and Management (Elective-II) G –IV   CE/5/T/505D   3 – 0 – 3   100

Stress in pavements – multilayer theory; Deformation and strains in pavement layers; Pavement behavior under moving loads; Pavement design - AASHTO methods and mechanistic approach. Design of airport pavement. Pavement materials under repetitive loading. Pavement evaluation, maintenance management and quality control. Assessment of pavement quality, overlay design of flexible pavement and rigid pavement.

Advanced Water & Waste Water Treatment (Elective-II) G – V   CE/5/T/505C   3 – 0 – 3   100

Aeration, Sedimentation, Type-I and Type-II analysis (Discrete and Flocculent), Tube settler, Coagulation and Flocculation, Derivation of 'G' Values, Disinfection Methods and Kinetics, Application of Chick's Law, Filtration hydraulics, Bed preparation with runoff bank sands, Filter plant design, Design of Clariflocculator, Membrane filtration process, Application problem.

Structural design of buried sewer, Inverted siphon, Methods of determination of ultimate BOD and biochemical reaction rate constant, Wastewater treatment: screen, grit chamber, primary clarifier, kinetics of biological reactions and evaluation of reaction constants, design of activated sludge process, Two stage Trickling filter, Sludge treatment.

Hazardous Wastes and its Disposal (Elective-II) G-VI   3 – 0 – 3   100

Hazardous waste characteristics: ignitability, corrosivity, reactivity, carcinogenicity, mutagenesity; Risk assessment: Hazard identification, dose response assessment, explosive assessment, risk characterization and management; Hazardous waste rule; Physical, chemical and biological treatment of hazardous waste.

ELECTIVE III

Bridge Engineering (Elective-III) G-I   CE/5/T/506A   3 – 0 – 3   100

Different types of RCC and steel bridge: Principles and application, Site investigation, Bridge hydrology and hydraulics, RCC and steel bridge deck and girder; Different methods of analysis and design, details of bearing, joints, articulation, abutments, pier and well foundation. Cable stayed bridge. Construction technique.

Advanced Structural Analysis and Design (Elective-III) G-II   3 – 0 – 3   100

Finite element formulation for 2dimensional stress analysis and Axi-symmetric problems, Reliability analysis of structures, Solutions of structural instability problems. Use of commercial computer package.

Design of Silo, Bunker and their supporting structures, RCC Chimney, Flat slab.

Advanced Soil Mechanics (Elective-III) G-III   CE/5/T/506B   3 – 0 – 3   100

Theory of elasticity and plasticity, different failure envelops, Three dimensional consolidation and its application; secondary consolidation. Different types of triaxial shear tests and their practical use; choice of test; pore pressure parameters. Effective stress analysis for slope stability; flow through earth dam. Stress path and its applications. Ground improvement principles and techniques. Heavy tamping, compaction piles. Preloading with sand drains/sand wicks. Field control. Principles of stone column. Numerical methods in geotechnical engineering.

Traffic Planning & Management (Elective-III) G-IV   CE/5/T/506D   3 – 0 – 3   100

Theory of traffic flow - Analytical models, shock waves and bottlenecks; Queuing theory and its application; Highway capacity at signalized and unsignalized intersections including delay components; Trip Generation, Distribution, Modal split and Traffic Assignment and evaluation; Land-use transport models; Transportation economics; Urban transportation management.

Solids & Gaseous Waste Management (Elective-III) G-V   CE/5/T/506C   3 – 0 – 3   100

Definition, types and sources of solid waste, Solid waste collection, container collection system design, transfer and transport, physical and chemical composition, composting, microbial aspect; methodology, sanitary land fill methodology, area computation, equipment; incineration process: material and energy recovery. Gaseous waste: Green house effect; ozone deflection, acid rain, photochemical smog, air pollution indexing system, mobile sources, elements of air pollution meteorology; thermal inversion; plume patterns; monitoring and analysis of ambient air pollutants; dispersion; principles of point source control methods.

Industrial Water Pollution and Control (Elective-III) G – VI   3 – 0 – 3   100

Water requirements for different types of industries, Wastewater characteristics, Effects on Environment and stream, Sampling process, Grab and Composite sample, Process description of some major industries, Concept of Waste Minimization, Equalisation, Neutralisation, Physical and chemical treatment process, Biological treatment for high strength waste, Recovery of useful materials, Heavy metal removal method, Reuse of treated wastewater.

Case studies: Tannery, Electroplating, Power plant, Paper mill, Slaughter house, Petroleum oil refinery.

Special Projects (Elective-II and Elective-III)   CE/5/S/504   0 – 3 – 3   100

Students will be assigned problems in accordance with their chosen elective subjects. Students will have to submit a report and drawings.

General Viva-Voce   CE/5/S/505   0 – 3 – 3   100

Students will be asked questions by a panel of teachers in different subjects of Civil Engineering.