

## B.TECH CURRICULUM CIVIL ENGINEERING

<b><u>I SEMESTER (B1)</u></b>				
<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>Contact Hours</b>	<b>Credits</b>
1.	10B11PD111	PRESENTATION AND COMMUNICATION SKILLS	3	3
2.	10B11PD199	ENGLISH	2	0
3.	10B11MA111	MATHEMATICS-I	4	4
4.	10B11PH111	PHYSICS-I	4	4
5.	10B11EC111	ELECTRICAL CIRCUIT ANALYSIS	4	4
6.	10B11CI111	INTRODUCTION TO COMPUTERS AND PROGRAMMING	4	4
7.	10B17PH171	PHYSICS LAB-I	2	1
8.	10B17EC171	ELECTRICAL CIRCUITS LAB	2	1
9.	10B17CI171	COMPUTER PROGRAMMING LAB	4	2
<b>Total</b>			<b>30</b>	<b>23</b>

<b><u>II SEMESTER (B2)</u></b>				
<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>Contact Hours</b>	<b>Credits</b>
1.	10B11PD211	GROUP AND CO-OPERATIVE PROCESSES	3	3
2.	10B11MA201	MATHEMATICS – II	4	4
3.	11B11CE211	BUILDING MATERIALS and CONSTRUCTION	4	4
4.	10B11CE211	ENGINEERING MECHANICS	4	4
5.	10B11CL212	CHEMISTRY	4	4
6.	11B17CE271	ENGINEERING GRAPHICS and CAD LAB	4	2
7.	10B17CE271	WORKSHOP PRACTICES	2	1
8.	10B17CL271	CHEMISTRY LAB	2	1
<b>Total</b>			<b>29</b>	<b>23</b>

<b><u>III SEMESTER (B3)</u></b>				
<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>Contact</b>	<b>Credits</b>

			<b>Hours</b>	
1.	10B11PD311	MANAGERIAL ECONOMICS	3	3
2.	10B11MA312	NUMERICAL METHODS	4	4
3.	10B11EC311	ELECTRICAL MACHINES and INSTRUMENTS	4	4
4.	10B17EC371	ELECTRICAL MACHINES AND INSTRUMENTS LAB	2	1
5.	10B11CE311	MECHANICS OF SOLIDS	4	4
6.	10B11CE312	FLUID MECHANICS	4	4
7.	11B17CE371	GEOLOGY and MATERIAL TESTING LAB	4	2
8.	10B17CE372	FLUID MECHANICS LAB	2	1
<b>Total</b>			<b>27</b>	<b>23</b>

#### **IV SEMESTER (B4)**

<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>Contact Hours</b>	<b>Credits</b>
1.	10B11PD411	FINANCIAL MANAGEMENT	3	3
2.	10B11CE411	GEOTECHNICAL ENGINEERING	4	4
3.	10B11CE412	SURVEYING	4	4
4.	10B11CE413	STRUCTURAL ANALYSIS	4	4
5.	11B11CE411	CONCRETE TECHNOLOGY	4	4
6.	10B17CE471	GEOTECHNICAL LAB	4	2
7.	10B17CE472	SURVEYING LAB	4	2
8.	10B11GE411	ENVIRONMENTAL STUDIES	3	3
<b>Total</b>			<b>30</b>	<b>26</b>

#### **V SEMESTER (B5)**

<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>Contact Hours</b>	<b>Credits</b>
1.	10B11PD511	SOCIAL AND LEGAL ISSUES	3	3
2.	10B11CE511	HIGHWAY ENGINEERING	4	4
3.	10B11CE512	DESIGN OF CONCRETE STRUCTURES	4	4
4.	10B11CE513	WATER RESOURCES ENGINEERING	4	4
5.	10B11CE514	WATER SUPPLY ENGINEERING	4	4
6.	10B11CE515	CONSTRUCTION TECHNOLOGY and MANAGEMENT	4	4
7.	10B17CE571	HIGHWAY ENGINEERING LAB	2	1
8.	10B17CE572	CONCRETE LAB	2	1
9.	10B17CE573	COMPUTER AIDED PLANNING and COSTING	4	2
10.	10B17CE574	ENVIRONMENTAL ENGG. LAB-I	2	1

<b>Total</b>	<b>33</b>	<b>28</b>
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<b><u>VI SEMESTER (B6)</u></b>				
<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>Contact Hours</b>	<b>Credits</b>
1.	10B11PD611	PROJECT MANAGEMENT	3	3
2.	10B11CE611	DESIGN OF STEEL STRUCTURES	4	4
3.	10B11CE612	FOUNDATION ENGINEERING	4	4
4.	10B11CE613	SEWAGE TREATMENT AND DISPOSAL	4	4
5.	10B11CE614	TRANSPORTATION ENGINEERING	4	4
6.	10B11CE615	ADVANCED STRUCTURAL ANALYSIS	4	4
7.	10B17CE671	CIVIL ENGINEERING SOFTWARE LAB	2	1
8.	10B17CE672	FOUNDATION ENGINEERING LAB	2	1
9.	10B17CE673	ENVIRONMENTAL ENGG. LAB-II	4	2
10.	10B19CE691	SEMINAR	0	1
<b>Total</b>			<b>31</b>	<b>28</b>

\* Compulsory "Six-week Industrial Training" after the end of 6<sup>th</sup> Semester.

<b><u>VII SEMESTER (B7)</u></b>				
<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Title</b>	<b>Contact Hours</b>	<b>Credits</b>
1.	10B1GPD73*	ENTREPRENEURIAL DEVELOPMENT/ MANAGING MARKETING OF TECHNOLOGY	3	3
2.	10B13CE73*	ELECTIVE 1	3	3
3.	10B13CE73*	ELECTIVE 2	3	3
4.	10B13CE73*	ELECTIVE 3	3	3
5.	10B19CE791	PROJECT, PART-I	20	10
<b>Total</b>			<b>32</b>	<b>22</b>

<b>List of Electives</b>				
<b>Elective 1</b>				
1.	10B13CE737	ENVIRONMENTAL MANAGEMENT and IMPACT ASSESSMENT		
2.	10B13CE738	ENERGY RESOURCES and CONSERVATION		
3.	10B13CE733	TRAFFIC ENGINEERING		
4.	10B1WCE731	ADVANCED FOUNDATION ENGINEERING		
<b>Elective 2</b>				
5.	10B1WCE732	HYDROPOWER ENGINEERING		

6.	10B13CE735	DAM AND RESERVOIR DESIGN
7.	11B1WCE731	ANALYSIS AND DESIGN OF PAVEMENT SYSTEMS
<b>Elective 3</b>		
8.	10B13CE736	UNDERGROUND TECHNOLOGY
9.	10B1WCE734	ADVANCED CONCRETE TECHNOLOGY
10.	10B1WCE735	ADVANCED RCC DESIGN

<b>VIII SEMESTER (B8)</b>				
S.No.	Subject Code	Subject Title	Contact Hours	Credits
1.	11B1WPD83*	PD Elective	3	3
2.	1*B13CE83*	Elective 4	3	3
3.	1*B13CE83*	Elective 5	3	3
4.	1*B13CE83*	Elective 6	3	3
5.	10B19CE891	PROJECT, PART-II	20	10
<b>Total</b>			<b>32</b>	<b>22</b>
<b>List of Electives</b>				
<b>Elective 4</b>				
1.	10B13CE836	REMOTE SENSING AND GIS APPLICATIONS		
2.	10B13CE832	ADVANCED HYDROPOWER ENGINEERING		
3.	10B13CE833	ADVANCED CONCRETE TECHNOLOGY		
<b>Elective 5</b>				
4.	11B1WCE831	FEM AND ITS APPLICATIONS IN CE		
5.	10B13CE842	HIGHWAY CONSTRUCTION, MAINTENANCE and MANAGEMENT		
6.	10B13CE837	INDUSTRIAL WASTE TREATMENT		
<b>Elective 6</b>				
7.	11B1WCE833	EARTHQUAKE ENGINEERING		
8.	12B1WCE831	PRESTRESSED CONCRETE STRUCTURES		
9.	12B1WCE832	RIVER ENGINEERING		

<b>PD Electives</b>		
1.	11B1WPD834	TOTAL QUALITY MANAGEMENT
2.	10B14PD842	ACADEMIC WRITING
3.	11B1WPD831	LEADERSHIP IN ORGANIZATION
4.	11B1WPD832	STRATEGIC MANAGEMENT
5.	11B1WPD833	CONSUMER BEHAVIOUR
6.	11B1WPD836	INDIAN FINANCIAL SYSTEMS
7.	11B1WPD837	INTRODUCTION TO CONFLICT MANAGEMENT

### **Outline Syllabi for B.Tech Civil Engineering Program**

### **11B11CE211 BUILDING MATERIALS AND CONSTRUCTION**

Introduction: Building-Definition, types and components; Foundation: Definition and necessity of foundation; Types of foundations, Details of shallow foundations; Foundations in black cotton soil, causes of failure of foundations, Excavation for foundations, dewatering - necessity and methods. Loads on foundation, proportioning of foundation - elementary treatment only; Stone Masonry: Technical terms, stones, cutting and dressing, lifting of stones, joints in stone masonry, General principles in stone masonry construction, classification of stone masonry, selection of stone for masonry; Brick Masonry: Technical terms, Types of bonds, strength of brick masonry, Defects in brick masonry, Reinforced brickwork. Brief introduction to cavity wall construction and composite masonry construction; Floors: General principles, types and methods of construction of ground floor, upper floors and mezzanine floors. Floor finishes of different types; Damp proofing - Causes, effects, various methods of damp proofing, materials used for damp proofing; Roofs: Flat and pitched roof, types and construction features, ceilings - necessity and construction features; Arches and Lintels, Doors and Windows, Caissons and cofferdams, Cracks and prevention of cracks in the buildings, Stairs

### **10B11CE211 ENGINEERING MECHANICS**

Introduction and application of Equivalent force system and equations of equilibrium. Basic concept of force - couple system, planar force system, parallel force system, general force system  
Analysis of pin jointed frames.  
Friction and its application  
Kinematics of particle and rigid body, Dynamics of particle and rigid body, Virtual work, Impulse and Momentum, Centroid and center of gravity, Moment of inertia  
Mechanical Vibrations: Introduction, Equations of motion for single degree of freedom system, free and forced vibrations and damped vibrations. Compound springs with linear motion.

### **11B17CE271 ENGINEERING GRAPHICS AND CAD APPLICATIONS**

Introduction: Drawing Instruments and use, Letter writing, Geometrical configurations, Scales; Conic Sections; Orthographic Projections: Points, straight lines, planes, simple solids; Isometric Projections: Simple solids like cube, cylinder, prism, cone; Orthographic projections of simple machine elements like machine clamp, dovetail brackets and bearing block. Development of Surfaces.  
Applications Of AutoCAD Software: Basic terminology, Drawing commands and skills, Project Planning, 3-Dimensional drawing, Advance Tools: Template files, object snap in AutoCAD, line types, file formats, editing and modifying, Inquiry tools, X-Rays in CAD, System variables

### **10B17CE271 WORKSHOP PRACTICE**

Carpentry Shop, Wood Working tools, Fitting Shop, Welding Black Smithy Shop  
Introduction to forging and forging methods heating metals for forging. Foundry: Pattern Making Moulding.

### **10B11CE311 MECHANICS OF SOLIDS**

Simple stresses and strains: Stress-strain relationships, elastic constants and their relationships, temperature stresses. Analysis of axially loaded members: Bars of uniform, varying and tapering cross sections, composite bars.

Complex Stresses: Stresses on inclined planes, principal stresses and strains, Mohr's circle of stresses, theories of elastic failure.

Simple theory of bending, bending and shear stress distributions in beams

Bending moment and shear force diagrams, relationships between loads, shear force and bending moment.

Slope and deflection of beams: Differential equation of the deflection curve, double integration method, Macaulay's method, moment area method and conjugate beam method. Torsion in circular shafts.

### **10B11CE312 FLUID MECHANICS**

Introduction; Definition, Types of fluid, Properties of fluid, Fluid pressure on curved and plane surfaces, Pressure measurement, Stability of floating bodies.

Kinematics of fluid flow; steady and unsteady, uniform and non-uniform, rotational and irrotational, laminar and turbulent flow, Continuity equations for 1-D and 2-D flows, Flow-nets.

Dynamics of fluid flow; Euler's equation, Bernoulli's equation; Venturimeter, Pitot-tube, Orifice-meter, Notches and Weirs, Mouthpieces, Impulse-momentum equation, Dimensional analysis and modelling criteria.

Boundary Layer Theory; Elements of boundary layer theory. Drag and lift Airfoil theory.

Analysis of pipe flow; Laminar and Turbulent flow through pipes and velocity distribution, Darcy-Weisbach's equation, Losses in pipe sections, branching of pipes.

### **10B17CE372 FLUID MECHANICS LABORATORY**

#### **List of Experiments:**

1. Determination of metacentric height
2. Calibration of a venturi meter
3. Determination of frictional losses in pipes of different diameters.
4. Determination of minor losses in pipes
5. Calibration of pitot-tube
6. Calibration of a, v- notch and rectangular notch
7. Reynolds dye experiment for flow characterization
8. Determination of  $C_c$ ,  $C_v$  and  $C_d$  of an orifice
9. Verification of Bernoulli's theorem
10. Calibration of orifice meter
11. Verify the impulse momentum equation (impact of jet)
12. Performance characteristics of a centrifugal pump

### 13. Valve characteristic

#### **11B17CE371 GEOLOGY & MATERIAL TESTING LAB**

A brief introduction to geology: physical geology, historical geology, scope of engineering geology.

Engineering geology: the earth, earth materials, difference between rock and soil, minerals of the earth crust, physical properties of minerals.

Identification of minerals, Knowing properties of minerals.

The geologic cycle, igneous rocks, common Igneous rocks, weathering processes, Sedimentary rocks, Metamorphic rocks, Engineering considerations.

Structural geology: Outcrop, Bedding planes and schistosity, Folds, Fractures, Strike and dip. Determining various characteristics of rock samples.

Soil Formation, Transport, and Deposition.

Stratigraphy of India: Index fossils, geological time scale, Lithostratigraphic Classification, Physiographic Divisions of India,

#### **10B11CE411 GEOTECHNICAL ENGINEERING**

Introduction to Geo-technical problems in Civil Engineering

Soil types and formation, simple soil properties, grain size distribution, Atterberg's limits, soil identification and I.S. classification.

Total, effective and neutral stresses, Darcy's law, permeability and capillarity of soil, seepage, flow- nets, Piping, filters and filter design.

Laboratory compaction and field compaction of soils

Stress distribution in soils under surface loadings.

Compressibility, one-dimension consolidation, simple settlement analysis

Shear strength, total and effective strength parameters and their determination.

Earth pressure: Classical theories, graphical charts

Stability of slopes

#### **10B11CE412 SURVEYING**

Introduction: Classification of surveying, Principle of surveying. Error due to use of wrong scale.

Chain Surveying: Instruments for chaining, Errors due to incorrect chain, Chaining on sloping ground, Errors in chaining, Tape corrections, Chain triangulation, setting out right angles, Basic problems in chaining, Conventional symbols used in chaining..

Compass Surveying: Instruments (Prismatic and Surveyor compass), Bearing and angles, Magnetic declination, Local attractions, errors in compass survey

Leveling: Instruments, Optical defects in lenses, Temporary adjustment of a level, Direct leveling, Differential leveling, Reciprocal leveling, Curvature and Refraction corrections, Leveling problems, Errors in leveling, The level tube trigonometrical leveling .

Contouring: Contours, Contour interval, Contour gradient, Characteristics of contours, Methods of locating contours and their interpretation, Uses of contour maps. Calculation of areas and volumes. Planimeter, minor instruments.

Theodolite: Transit and Non-transit, Definition and terms, Measurement of horizontal and vertical angles, Fundamental lines of the theodolite and desired relationships, Sources of error.

Traverse Surveying: Methods of traversing, Traverse computations, closing errors, Balancing the traverse, Omitted measurements. Plane Table Surveying: Instruments, Principle and methods of plane tabling, Three-point problem, Two-point problem, Errors in plane tabling, Advantages and disadvantages.

Tachometric Surveying: Instruments and Tachometric methods.

Curves: Simple circular, Compound, Reverse and Transition curves, setting out of the curves. Photographic Surveying: Principles, Advantages of Aerial photography.

Setting Out Works: Buildings, Culverts, Bridges, Tunnels, Transferring levels underground.

Introduction to Remote Sensing, GPS, GIS and Map study

### **10B11CE413 STRUCTURAL ANALYSIS**

Introduction: Statically determinate and indeterminate structures.

Analysis of statically determinate structures: trusses, frames, and three hinged arches

Strain energy due to axial, bending, shear and torsion loads, Castigliano's theorem, Maxwell-Betti's theorem, Principal of virtual work, reciprocal theorem, and principle of superposition.

Analysis of plane redundant frames up to two degree of redundancy by energy method, slope deflection method and moment distribution method

Analysis of propped cantilever, fixed beam, continuous beam, and Clapeyron's three-moment theorem

Two hinge and fixed arches

Buckling of columns, critical loads, axially and eccentrically loaded columns

Rolling loads and Influence lines for beams

### **11B11CE411 CONCRETE TECHNOLOGY**

**Cements & admixtures:** portland cement, chemical composition, hydration, setting of cement, test on cement, admixtures – mineral and chemical admixtures.

**Aggregates:** classification of aggregate, mechanical properties of aggregate, bulking of sand – deleterious substances, soundness, alkali aggregate reaction, thermal properties, sieve analysis, grading of fine & coarse aggregates.

**Fresh concrete:** quality of mixing water, workability of concrete, factors affecting workability, measurement of workability, setting times of concrete, segregation and bleeding, mixing and vibration of concrete, steps in manufacture of concrete.

**Hardened concrete:** water / cement ratio, Abram's law, Gelspace ratio, curing. Testing of hardened concrete: compression and tension tests, factors affecting strength, relation between compression and tensile strengths, flexure test, splitting test, non-destructive testing methods, codal provisions for NDT.

**Elasticity, creep and shrinkage:** modulus of elasticity, dynamic modulus of elasticity, Poisson's ratio, creep of concrete, factors influencing creep, relation between creep and time, nature and effect of creep, shrinkage of concrete, types of shrinkage.

**Mix design:** factors considered in the choice of mix proportions, durability of concrete, quality control of concrete, proportioning of concrete mixes by various methods –IS code method of mix design.

**Special concretes:** light weight aggregate concrete, cellular concrete, no-fines concrete, high density concrete, fibre reinforced concrete and its properties and applications,



polymer concrete, types of polymer concrete, properties of polymer concrete, applications, high performance concrete, self consolidating concrete, SIFCON.

### **10B17CE471 GEOTECHNICAL LAB**

#### **List of Experiments:**

1. Field Identification Test
2. Specific Gravity of soil particles by Pycnometer bottle.
3. Specific Gravity of soil particles by Density bottle method
4. Particle size distribution of soils (Grain size analysis) by Sieve analysis for coarse-grained soils
5. Particle size distribution of soils (Grain size analysis) by Hydrometer analysis for fine grained soil
6. Determination of Atterberg's limits (Consistency limits) for Non Swelling type soils
  - a) Liquid Limit
  - b) Plastic Limit
  - c) Shrinkage limit
7. Determination of Atterberg's limits (Consistency limits) for Swelling type soils
  - a) Liquid Limit
  - b) Plastic Limit
  - c) Shrinkage limit
8. Determination of density of soils by Core cutter method
9. Determination of density of soils by Sand replacement method
10. Determination of density of soils by Water displacement method
11. Determination of permeability of soils by Variable head method
12. Determination of permeability of soils by Constant head method
13. Soil compaction test (Density moisture relations)
14. Determination of Moisture Content and its variation with drying duration
15. Determination of moisture content by rapid moisture meter

### **10B17CE472 SURVEYING LAB**

#### **List of experiments:**

1. Chain survey
2. Compass survey
3. Plane table survey
4. Simple leveling
5. Profile leveling
6. Longitudinal and Cross section
7. Contouring
8. Theodolite
9. Tachometry
10. Areas and Volumes
11. Traversing
12. Trigonometric leveling.
13. Total station

### **10B11GE411 ENVIRONMENTAL STUDIES**

The Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness, Types of Ecosystems, World Biomes,

Ecosystem functioning, Biogeochemical cycles.

Natural resources, their consumption and Protection: Water, Land Energy (Renewable, non-renewable, wind, solar, hydro, Biomass), Mineral, Forest, and Food resources, Role of an individual in conservation of natural resources, Equitable use of resources.

Pollution- a threat to environment: Air, Water and Land pollution, sources and causes, Space pollution, causes and effects, toxicity limits of pollutants. Critical issues concerning global Environment (Urbanization, population growth, global warming, climate change, acid rain, ozone depletion etc.) and the Roots in: Cultural, Social, Political, Commercial, industrial, territorial domains.

### **10B11CE511 HIGHWAY ENGINEERING**

Importance of transportation, different modes, characteristics & Scope of highway engineering in India,

Highway development in India, classification of roads, planning surveys, highway planning in India.

Highway alignment, engineering surveys, drawings and report, realignment.

Geometric design: Introduction cross section elements, sight distance, design of horizontal and vertical alignment of highways.

Traffic Engineering: Introduction, characteristics, traffic operation. , design of intersections, parking facilities, and lighting, traffic planning.

Highway materials: sub grade soil classification, evolution of soil strength, modulus of sub grade reaction, C.B.R test, tests for road aggregate, types of bituminous materials, tests on bitumen. Bituminous paving mixes, marshal method of mix design,

Pavement Design: types of pavements, design factors, design of flexible pavements by G.I method, C.B.R. method, Burmister's method, design of rigid pavements by using I.R.C.Recommendations.

Highway construction: construction of earth roads, gravel roads, W.B.M. roads, bituminous roads, and Cement concrete pavement, joints in concrete pavement.

Highway maintenance: Flexible &rigid Pavement failures, maintenance of bituminous surfaces,& cement concrete pavements, strengthening of existing pavements, overlay design by Benkelman beam deflection studies. Surface &sub surface Drainage of pavements.

### **10B11CE512 DESIGN OF CONCRETE STRUCTURES**

Introduction to the design of Concrete structures;

Working & Limit state concepts.

Limit state Analysis; Design of beams for flexure, bond, shear and torsion (singly & doubly reinforced, T-beams & L-beams);

Axially and eccentrically loaded Columns; One and two-way Slabs, Stair cases; Footings, isolated and combined; Retaining wall;

### **10B11CE513 WATER RESOURCES ENGINEERING**

Hydrology: Hydrological cycle, precipitation, snowfall and snowmelt, evaporation, transpiration, depression storage, infiltration, overland flow, stream flow measurements,

hydrograph, flood frequency analysis, flood estimation, flood routing through a reservoir, channel flow routing methods.

Ground water flow : Specific yield, storage coefficient, coefficient of permeability, confined and unconfined aquifers, aquitards, radial flow into a well under confined and unconfined conditions, tube wells, pumping and recuperation tests, ground water potential.

Water Resources : Ground and surface water resource, single and multipurpose projects, storage capacity of reservoirs, reservoir losses, reservoir sedimentation and economics of water resources projects.

Irrigation Engineering: Water requirements of crops, Moisture-crop relationship, Irrigation requirements, duty and delta, Irrigation efficiencies, Design of conventional and modern methods of irrigation, Irrigation of arid lands, Salinity of soil, Salinity control, Quality of irrigation water, Contaminants and their effects on various crop types, Rain water management, conjunctive use of water, Water logging causes and control, drainage system design.

Canals : Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributory canals, most efficient section, lined canals, their design, regime theory, critical shear stress, bed load, local and suspended load transport, cost analysis of lined and unlined canals, drainage behind lining.

River training: Objectives of river training, methods of river training, river training structures

## **10B11CE514 WATER SUPPLY ENGINEERING**

Introduction: Importance of planned water supplies; financing, planning and execution of modern water supply schemes.

Water demands: Various types of demands; the per capita demand: variations in demand; design periods; population forecasting by various methods.

Sources of water: Kinds of water sources and their characteristics; factors governing the selection of a source of water supply; storage capacity of impounded reservoir.

Quality of water: physical, chemical and biological characteristics of water, common water born diseases, standards of purified water for various purposes.

Treatment of water: screening and types; aeration units; sedimentation; sedimentation tanks and their types; sedimentation aided with coagulation; classifications of filters and their constructional and operational details.

Disinfection: Methods of disinfection; chlorination and its types.

Water softening: Importance of water softening; lime- soda process; Zeolite process.

Miscellaneous treatment methods: Removal of colour, odour and taste, iron and manganese; fluoridation and defluoridation.

Collection and Distribution of water: Intakes and their design for lakes, streams and rivers; methods of distribution; concept of service and balancing reservoirs; capacity of distribution reservoirs; Design of water distribution systems; analysis of pipe networks by Hardy Cross method, equivalent pipe method, method of sections and Newton-Raphson method; Layout of distribution system; the house water connection; construction and maintenance of distribution systems.

Pipes-Joints-Fittings: various types of conduits; testing and inspection; joints in pipes; valves in pipe line.

Pumps and pumping stations: Types of pumps and their choice; pumping stations; economical diameter of rising main; hand pumps; pump testing; Water hammer and its control measures.

Planning and preparing water supply projects.

### **10B11CE515 CONSTRUCTION TECHNOLOGY AND MANAGEMENT**

Introduction to various operations in construction, execution and management.

Standard and special construction equipments, heavy earthmoving equipments, shovels and cranes, crushing plant, batching plant, bitumen plant

Techniques and equipments for concreting, tunneling, road pavement, dewatering, drilling, blasting and grouting

Selection of construction equipment, cost of owning and operating, capacity and utilization, breakdown analysis, economic life, replacement of equipment and sinking fund

Form works, their design, fabrication and uses

Uses and design of scaffoldings

Steel constructions; fabrication and erection techniques

PERT and CPM Analysis

### **10B17CE571 HIGHWAY ENGINEERING LAB**

#### **List of experiments:**

1. Aggregate crushing strength test.
2. Los angeles abrasion test.
3. Aggregate impact test.
4. Flakiness index & elongation index test.
5. Penetration test.
6. Ductility test.
7. Viscosity test.
8. Softening point test.
9. Flash & fire point test.
10. Determination of bitumen content by centrifuge extractor.
11. Determination of marshal stability value.
12. Determination of rebound deflection of pavement by Benkelman beam.

### **10B17CE572 CONCRETE LAB**

#### **List of Experiments:**

1. To determine the quantity of water for cement paste for normal consistency
2. To determine initial and final setting time of cement
3. To determine the fineness, specific gravity and unit weight of cement
4. Determination of tensile and compressive strength of cement
5. To determine fineness modulus of fine and coarse aggregate
6. To determine compressive strength of nominal mix concrete of a given grade

7. To determine the modulus of rupture of concrete
8. Workability of concrete by various methods
9. To determine the split tensile strength of concrete of given mix proportions
10. To determine the percentage bulking of fine aggregate
11. To determine soundness of given cement by Le-Chatelier method
12. Effect of water cement ratio on strength of concrete

### **10B17CE573 COMPUTER AIDED PLANNING AND COSTING LAB**

Planning of Residential, Commercial, Educational and Hospital buildings by considering different aspects like site, climatic, utility, Vastu & architectural, financial etc, municipal town planning rules & regulations, The Units of measurements and payments for various items of works and materials Methods of estimating, estimating steps, estimating of buildings, different types of roofs, sanitary and water supply works, road works, culverts, bridges, wells, and irrigation works.

Types of estimates: preliminary and detailed estimates, contingencies, administrative approval,

Analysis of rates; factors affecting the rate analysis, material and labour requirements for different types of work, rates of materials & labour. Estimate the unit rate for different items.

Estimating of quantities of materials and transport, Specifications, rules and methods of measurement.

AutoCAD / 3D home: Draw the plan, elevation, section and views of different civil engineering structures by using 3D home/AutoCAD software and check the estimation done manually by using **Estimator**/MS-Excel.

Drawing work: **Plan, elevation, section and views of residential buildings, different types of roofs**, sanitary and water supply works, road works, **culverts**, bridges, wells, and irrigation works etc.

### **10B17CE574 ENVIRONMENTAL ENGINEERING LAB-I**

#### **List of experiments:**

1. To determine *pH*, *turbidity*, electrical *conductivity* of the given sample.
2. To determine the *acidity* and *alkalinity* of the given water sample.
3. To estimate the content of *chlorides* in the given water sample.
4. To determine the *total hardness*, calcium and magnesium in the given sample.
5. To find the amount of *Sulphates* in the given water sample.
6. To determine the *Fluoride* in the given water sample.
7. To find out *Nitrate nitrogen* present in a given water sample.
8. To determine the optimum *coagulant dose* quantity for given sample of raw water.
9. To determine chlorine demand and residual chlorine.
10. To determine *most probable number* (MPN) of coliforms of the given sample.

11. Field visit of water treatment plant.

### **10B11CE611 DESIGN OF STEEL STRUCTURES**

Structural steel and their properties, rolled steel sections  
Permissible stresses, working stresses, factor of safety, design loads  
Simple connections: Riveted, bolted and welded  
Design of tension members  
Design of axially loaded compression members and built-up columns  
Design of beams, plate girders.  
Estimation of Wind & Earthquake forces for towers

### **10B11CE612 FOUNDATION ENGINEERING**

Foundation requirement, types and selection, methods of determining bearing capacity of shallow foundations  
Settlement considerations; allowable, total and differential settlements, estimation of settlement of structures  
  
Eccentrically loaded footings  
Raft foundation; types, design principle of rigid raft foundation  
Pile foundation; types, pile load capacity, static and dynamic formulae, pile load test, pile groups; load capacity and settlement  
Well and Cassion foundation: stability analysis and bearing capacity  
Sheet Pile Walls & Bulk Heads: types and analysis  
Strutted Excavations and Bracing  
Ground Improvement Techniques: compaction, stabilization and soil reinforcement  
Site Investigation and Soil Exploration  
Machine Foundation: types of machine foundations design criteria and design of block foundation.

### **10B11CE613 SEWAGE TREATMENT AND DISPOSAL**

Collection of sewage: Importance of sanitation, Systems of sewerage – separate, combined and partially separate. Quantity of sanitary sewage and variations. Shapes of sewer – circular and egg shaped. Design of sewers, self-cleansing velocity and slopes, Construction and testing of sewer lines. Sewer materials. joints and appurtenances.

Sewage Characterization: Quality parameters- BOD, COD, Solids, D.O., Oil & Grease. Indian Standards for disposal of effluents into inland surface sources and on land.

Sewage Treatment: Objectives, sequence and efficiencies of conventional treatment units. Preliminary treatment, screening and grit removal units. Theory and design aspects of primary treatment, secondary treatment- activated sludge process & its modifications, Trickling filter, sludge digestion and drying beds.  
Stabilization pond, aerated lagoon, UASB process , septic tank and Imhoff tank. .

Disposal of Sewage: Disposal of sewage by dilution – self-purification of streams. Sewage disposal by irrigation (sewage treatment).

### **10B11CE614 TRANSPORTATION ENGINEERING**

**RAILWAYS:** History of railways in India, alignment and project reports, permanent way and track materials, geometric design, railway points and crossings and junction, track laying, track drainage, station yards, maintenance of track.

**AIR PORTS:** Development of air transport in India ,airport planning, air port design standards, terminal lay out & classification, Design of air port pavements, drainage, marking & lighting, heliports, air traffic control, air cargo, accidents in the air, maintenance of air ports .

**DOCKS, HARBOURS AND INLAND WATER WAYS:** Historical development in India , tides, winds & waves, docks, harbours, break waters, jetties, landing stages & wharves, dry docks, transit sheds, cargo handling, , inland water transport. Maintenance.

**MINOR MODES OF TRANSPORTATION:** Pipelines, elevators, belt conveyors, aerial rope ways, & under sea transportation.

### **10B11CE615 ADVANCED STRUCTURAL ANALYSIS**

Kani's method to analyze simple portal frames

Basic Principles of matrix method - Flexibility and Stiffness matrices and their generation.

Analysis of Fixed arches

Rolling loads and Influence lines for beams and arches.

Plastic Analysis of beams and frames.

Approximate Methods to analyze Portal frames: Portal method, cantilever method

Matrix Methods of Analysis for Discrete Structures

Flexibility and Stiffness matrices and their generation, Concept of stiffness method, types of skeletal structures, degree of freedom, Stiffness matrix for: Truss elements, Beams in 1-D, 2-D and 3-D,

Formation of the Global Analysis Equations, The General Assembly Procedure, Applying Boundary conditions and Calculating Support Reactions, Analysis of simple plane trusses and plane frames with stiffness matrix method

### **10B17CE671 CIVIL ENGINEERING SOFTWARE LAB**

1. AutoCAD: Plan, Elevation, Foundation, Column.
2. Spreadsheets: Problem based on civil related topics like structures, fluid mechanics.
3. STAADPro: Introduction, Modeling and Analysis of structures.
4. Ansys: Introduction, Analysis of 2-D structures, Plane frames.
5. MATLAB: Programming of Analysis of building.
6. Primavera: Introduction

### **10B17CE672 FOUNDATION ENGINEERING LAB**

#### **List of Experiments**

1. Consolidation test
2. Triaxial compression test (Undrained condition)
3. Direct shear box test
4. Vane shear test

5. Unconfined compression test
6. Swelling pressure test
7. CBR test (Unsoaked)
8. CBR test (Soaked)
9. SPT test (Demonstration)

### **10B17CE673 ENVIRONMENTAL ENGINEERING LAB-II**

#### **List of experiments:**

1. To determine the optimum *coagulant dose* quantity for given sample of raw water.
2. To determine chlorine demand and residual chlorine.
3. To find the quantity of *dissolved oxygen* and *biochemical oxygen demand* (BOD) present in the given water sample/sewage sample.
4. To find out *chemical oxygen demand* (COD) of the given wastewater sample.
5. To determine *most probable number* (MPN) of coliforms of the given sample.
6. To determine the *suspended particulate matter* (SPM) and *respirable particulate matter* (RPM) in ambient air.
7. To determine the  $SO_2$  concentration of the atmosphere.
8. To determine the  $NO_2$  concentration in ambient air.

### **10B13CE737 ENVIRONMENTAL MANAGEMENT & IMPACT ASSESSMENT**

#### Environmental management :

Environment; Definition and elements - Interaction between abiotic and biotic elements  
 Human interference with the environment -Resource exploitation and use of technology  
 Impact of man, technology on environment - Exploitation and destruction Environmental degradation - current environmental concerns.

Concept of environmental management - Conservation, preservation and sustainable development

#### Environmental impact assessment:

Introduction to environmental impact assessment - Frame work of Environmental Assessment, prediction and assessment of impact on the air, water, biological & socioeconomic environment – methodologies of EIA, Future Environmental impact assessment - Some specific studies on environmental impact assessment of certain projects: Hydropower project, highway project, cement manufacturing.

#### Environmental audit:

Introduction - Types of Audits - Features of Effective auditing - programme Planning - Definition - Organisation of Auditing Programme - pre visit data collection Audit Protocol - Onsite Audit - Data Sampling - Inspections - Evaluation and presentation Audit Report.

Various environmental management systems.

### **10B13CE738 ENERGY RESOURCES AND CONSERVATION**

Conventional energy source: Hydropower: Fossils fuels and thermal powers, nuclear powers.

Non-Conventional energy source: solar energy, Solar Insulation, types of solar collector, solar cell, energy from wind, theory of wind power, wind system design

Energy from biomass: Design of biogas Plant.



Ocean energy, geothermal energy, Economic potential and cost

Energy conservation-principles, technologies, waste heat utilization, heat regenerators, energy storage, devices, instruction and control.

### **10B13CE733 TRAFFIC ENGINEERING**

Traffic flow characteristics:

Introduction, nature of traffic flow, parameters, categories, traffic flow models, analysis of speed, flow and density relationship, trajectory diagrams.

Vehicular flow modelling (Papacostas)

Stream models, variables, equations and diagrams of vehicular stream, calibration of models, measurement of flow, shock waves in traffic.

Highway capacity

Introduction, highway capacity definition and level of service, basic free way capacity and studies, multilane highway capacity, two lane capacity and measurements.

Intersection control and design

Introduction, type of intersections, design consideration and objectives, traffic control devices, conflict areas of intersection, type of intersection control, traffic signals.

Local area traffic management:

Introduction, pedestrian and bicycling facilities, planning and management at local level traffic, parking and terminal facilities.

### **10B1WCE731 ADVANCED FOUNDATION ENGINEERING**

Mat Foundations: Bearing Capacity of mat foundations, Mat Settlement, Design of rigid and flexible mats.

Pile Foundations: Design of piles and pile groups, Design of pile caps, laterally loaded piles, Settlement of pile and pile groups.

Well and Caisson Foundation: Bearing capacity, Settlement, Lateral Stability analysis.

Foundations on Expansive Soils

Reinforced Earth: Design Principals, Methods of constructions and applications

Machine Foundations: Soil dynamics, Analysis of machine foundation, dynamic soil constants and their determination, Indian standards on design and construction of foundation for reciprocating and impact type of machines.

Introduction to soil-structure interaction

### **10B1WCE732 HYDROPOWER ENGINEERING**

Hydraulic Turbines: Classification ,Working principles and Design of Pelton wheel, Francis and Kaplan Turbine, Velocity Triangles , head and efficiency , Draft tube , Theory and types, Similarity laws ,specific speed, Operating characteristics . Turbines, Selection of Turbines, Model Studies.

Pumps

Classification, Centrifugal pump Components and working, Velocity triangles priming, Head Losses and Efficiencies, Minimum starting speed, performance curves, specific speed, Cavitation, selection of pumps.

Positive Displacement Pump

Reciprocating pump, types, Components and working , slip , Indicator diagram, Air

vessel.

Miscellaneous Pumps (Operating Principles Only)

Multistage pumps, submersible pumps, Jet pumps, Airlift pumps, Gear Oil pump, Hydraulic ram.

Principles of hydropower development: Types+, layouts and Component works. Surge tanks, Types and choice. Flow duration curves and dependable flow. Storage and pondage. Pumped storage plants. Special features of mini, micro, hydel plants

### **10B13CE735 DAMS AND RESERVOIR DESIGN**

Planning of project, Purpose of development, Project study, Ecological and environmental considerations, Flood studies, Economic considerations.

Selection of type of dam, Classification of types, Physical factor governing selection of type, legal, economic, aesthetic considerations.

Foundation and construction materials :

Investigation, Source of information, Surface exploration, sampling, Field and laboratory tests

Earthfill dam:

Origin , Selection of type, Design principles, Foundation design, Embankments, Embankment details

Rockfill dam :

Origin and usage, Definition and types , Foundation design, Embankment design, Membrane design

Concrete gravity dam:

Introduction, Origin and development, Forces acting on dam, Requirements for stability, Dams on pervious foundations

### **11B1WCE731 ANALYSIS AND DESIGN OF PAVEMENT SYSTEMS**

Advanced Pavement materials; Design of bituminous mixes by Marshal method, modified Hubbard –field method, Hveem method, etc.

Flexible pavement design: Basis of pavement design, Development of various design methods for Highway and Airport Pavements. Layered system concept, Classical methods, Mechanistic-Empirical Method and various damage models.

Rigid pavement design: Analysis and design parameters, design of slab, spacing of joints, dowel bars, tie bars and joint details.

Overlays: Types of overlays, Overlay design, Pavement Evaluation

Design software: FPAVE, MXRoads, etc.

### **10B13CE736 UNDERGROUND TECHNOLOGY**

Introduction to various underground structures

Underground construction methodology & equipments

Excavations, soil support methods, diaphragm walls

Management of groundwater, dewatering methods

Coffer dams, Caisson & wells

Methods of Basement construction

Grouting

In-situ Densification: Preloading, Compaction Grouting, Dynamic Compaction, Blast densification, Vibro-Compaction and Vibro-Replacement, Compaction piles, Reinforcement of embankments and foundations

Tunnels: Introduction, Tunnel stabilization and lining, Cut and Cover Tunnels, Bored Tunnels, Immersed Tube Tunnels, Water Conveyance Tunnels, Micro-tunnels

Underground Conduits: Ditch Conduits, Positive Projecting Conduits, Negative Projecting Conduits, Imperfect Ditch Conduits, Tunneled Conduits

### **10B1WCE735 ADVANCED RCC DESIGN**

Design of Bunker and Silo,

Design of Retaining walls

Design of water tank, culverts,

Design of Flat Slabs, Building Frames,

Design of Chimneys.

### **10B13CE836 REMOTE SENSING AND GIS APPLICATIONS**

Introduction, Basic physical principles, classifications of remote sensing, scanner platform characteristics. Remote sensing for highway engineering: Introduction., Reconnaissance study., Feasibility study, Special material survey, Remote sensing for inspection, maintenance and management, Recommendations for using in Highway study, Remote sensing in Water resources: Introduction, Water extent determination., penetration and depth measurement , Quality control using remote sensing., Ground water resource study.

### **10B13CE832 ADVANCED HYDROPOWER ENGINEERING**

Planning of hydropower development, site investigations, Hydrological investigations, assessment of Hydropower potential, water availability, installed capacity determination. Design of civil works: Diversion structures, water conductor systems, desilting tanks, cross drainage structures, forebay, Surge tanks and hydraulic transients, Penstocks and pressure shafts, Intakes, penstock, powerhouse, and tailrace.

Operation of power plants for peaking and base load, Characteristics of power market, Integration of various types of plants, Augmentation of power plants, Pump storage plants.

Reservoir operation for hydropower generation in multipurpose projects. Basin scale hydropower generation in a multipurpose project, Basin scale hydropower development.

### **11B1WCE831 FEM AND ITS APPLICATIONS TO CE**

Introduction to FEM (finite element method)

Matrix-Displacement Formulation

Element Shapes, Nodes, Nodal Unknowns and Co-ordinate Systems

Shape Functions, Strain-Displacement Matrix

Assembly Stiffness Equation – Direct Approach, Galerkin's Method, Virtual Work Method, Variational Method

Applications of FEM in Civil Engineering

1-D Static Problems: Rod, String, Beam, Shaft

One-dimensional Formulations; Boundary Conditions; Solution Algorithms; Descretization; Stress Deformation Analysis  
2-D Static Problems: Plane Stress, Plane Strain, Axisymmetric Problems, Stability of Columns and Thin Plates  
Two-dimensional Formulations; Boundary Conditions; Solution Algorithms; Descretization; Stress Deformation Analysis  
Introduction to Commercial Packages and Recent Developments

### **10B13CE842 HIGHWAY CONSTRUCTION, MAINTENANCE AND MANAGEMENT**

Highway construction: Introduction, history of road construction, equipments for the road construction, stages of construction, limitations in pavement construction due to weather.  
Earthwork: Clearing and grubbing, excavation, embankment construction, replacement of soils, soil stabilization.  
Bituminous pavement construction: Sub grade, granular sub base, sub base course, binder course, wearing coat, interlayer coats.  
Cement concrete pavement: Sub grade, base and sub base courses, concrete surfacing, joints for cement concrete pavement,  
Highway maintenance: General, distress in pavements (Cracking, patching, rutting, pot holes, stripping and swelling), evaluation of pavement, structural evaluation, pavement maintenance.  
Introduction to transport economics.  
Recycling of pavements: Introduction, selection of road for recycling, methods and equipments for recycling.  
Hill Roads: Alignment, geometrics, design and construction for hill roads, drainage design, maintenance problems in hill roads.

### **10B13CE837 INDUSTRIAL WASTE TREATMENT**

Source and character of wastes; design and operation of wastewater treatment facilities; ultimate disposal of wastewater residues and considerations of discharge criteria.  
Sludge characteristics and disposal methods -design and operation of sludge drying bed  
Introduction to industrial waste, types of wastes: solid, Liquid, and gaseous wastes; Toxic organics, Heavy metals, Hazardous waste etc. Effect of industrial waste on stream, land and air, Stream quality criteria and effluent standards, characterisation studies, Variation in wastewater flow-rates and constituents, Waste management techniques. Control of Volatile organic compounds by absorption, adsorption, combustion and biofiltration.  
Waste generation ,characterization and treatment of industrial waste, Flow diagram for waste treatment for certain industries : cement industry, construction industry, iron and steel industry , tannery industry, Fertilizer plant waste, sugar mill waste etc. Waste minimization as a tool for environmental protection.

### **11B1WCE833 EARTHQUAKE ENGINEERING**

Nature of Earthquakes: Plate Tectonics Theory, Faults and fault movements, Magnitude of earthquakes, Intensity scaling of earthquakes: subjective intensity and instrumental intensity, Characteristics of earthquake ground motions

Response of Simple Structures to Earthquake Ground Motions: Seismic response of linear elastic single degree of freedom (SDOF) systems, Seismic response of inelastic SDOF systems, Response spectra, Response of Multi Degree of Freedom Systems (MDOF) to Earthquake Ground Motions: Free vibration analysis, Equivalent Lateral Load Procedure, Mode Superposition Procedure, Seismic Design Principles: Earthquake design philosophy, Design spectrum, Earthquake resistance of building systems, Response modification factors, Seismic Code Procedures: Classification of building systems, Selection of analysis procedure, Capacity design principles for reinforced concrete buildings, Case study: analysis and design of a multistory R/C frame.

### **12B1WCE831 PRESTRESSED CONCRETE STRUCTURES**

Introduction to basic concept of prestressing, System of prestressing , Loss of prestress, Analysis for flexure, Design for flexure shear and torsion, Deflection and cracking consideration, Precast elements: poles, railway sleepers, beams, slab, wall panel and columns, use of relevant codes of practice.

### **12B1WCE832 RIVER ENGINEERING**

Elements of river geomorphology: Origin and properties of sediment, river problems control of vegetation an river morphology.

Soil Erosion and Sediment Yield: Types of erosion, Mechanism of soil erosion, Sediment delivery ratio, Process based modeling of soil erosion.

Hydraulics of Alluvial Streams: Incipient motion, Modes of Sediment transport, Bed-forms, Resistance to flow in alluvial rivers, Bed load transport, Suspended load transport

River Geometry and Plan Forms: Stable channels and their geometry, Flow around river bends, Braided river, Meandering river.

Gravel Bed Rivers : Hydraulic geometry of gravel bed rivers, Armouring, Bed forms and resistance to flow in gravel bed rivers.

Bed Level Variations in Streams : Degradation, Local scour, Aggradation, Reservoir sedimentation, Mathematical modeling for river bed variations.

Rivers and Environment: Environmental effects of hydraulic structures, River pollution, River action plans, Stream restoration.