Third Semester

Third Semester **Contact Hours: 33 Hrs.**

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTAM-301	Engineering Mathematics-III*	4	1	-	40	60	100	5
BTCE-301	Fluid Mechanics-I	3	1	-	40	60	100	4
BTCE-302	Rock Mechanics & Engg .Geology	3	1	-	40	60	100	4
BTCE-303	Strength of Materials	3	2	-	40	60	100	5
BTCE-304	Surveying	3	1	-	40	60	100	4
BTCE-305	Building Materials & Construction	4	0	-	40	60	100	4
BTCE-306	Fluid Mechanics-I Lab	-	-	2	30	20	50	1
BTCE-307	Strength of Materials Lab	-	-	2	30	20	50	1
BTCE-308	Surveying Lab	-	-	3	30	20	50	2
BTCE-309	Workshop Training of 4 weeks duration after 2nd semester Carpentry, Electrical, Plumbing, Masonry, CAD				30	20	50	1
	Total	**20**	**06**	**07**	**360**	**440**	**800**	**31**

Fluid Mechanics-I

BTCE - 301

Course Objectives

1. To train undergraduate students about the basic concepts of Fluid Mechanics and fluid measurement techniques (concepts of fluid statics, fluid kinematics and fluid dynamics) for understanding the complex fluid engineering problems related to particularly open channel flow (Irrigation Engineering) and pipe flow (Environmental Engineering).
2. To prepare students for the versatility of "Fluid Mechanics system(s)" applications in safe, economical and sustainable design as well as construction of better infrastructure to meet societal needs related to irrigation and domestic water management (for sustainable growth) of the society and in particular to the country.
3. To extend the students ability to apply the design and analysis principles (used for cost effective and hydraulically efficient designing) to handle different types of hydraulic forces to evaluate the structural safety for different parts of hydraulic structures, irrigation structures, and environmental projects/systems.
4. To train students to think critically, behave ethically, and consider the technical and social consequences of their work, especially as it affects the health, safety and living environment of human community.

Syllabus

Fluid and their properties : Concept of fluid, difference between solids, liquids and gases; ideal and real fluids; Continuum concept of fluid: density, specific weight and relative density; viscosity and its dependence on temperature; surface tension and capillarity, vapor pressure and cavitation, compressibility band bulk modulus; Newtonian and non-Newtonian fluids.

Fluid Statics : Concept of pressure, Pascal's law and its engineering hydrostatic paradox. Action of fluid pressure on plane (horizontal, vertical and inclined) submerged surface, resultant force and center of pressure , force on a curved surface due to hydrostatic pressure. Buoyancy and flotation, stability of floating and submerged bodies, Meta centric height and its determination.

Fluid Kinematics: Classification of fluid flows, velocity and acceleration of fluid particle, local and convective acceleration, normal & tangential acceleration streamline, path line and streak line, flow rate and discharge mean velocity continuity equation in Cartesian co-ordinates. Rotational flows- Rotational velocity and circulation, stream & velocity potential functions.

Fluid Dynamics: - Euler's equation, Bernoulli's equation and steady flow energy equation, representation of energy changes in fluid system, impulse momentum equation, kinetic energy and momentum correction factors, flow along a curved streamline, free and forced vortex motions.

Dimensional Analysis and Similitude: Fundamental and derived units and dimensions, dimensional homogeneity, Rayleigh's and Buckingham's Pi method for dimensional analysis, dimension less number and their significance, geometric, kinematic and dynamic similarity, model studies.

Flow Past immersed bodies: Drag and lift deformation Drag and pressure drag. Drag on a sphere, cylinder and Airfoil: lift-Magnus Effect and circulation, lift on a circular cylinder.

Flow Measurement:- Manometers, Pitot tubes, venturimeter and orifice meters, orifices, mouth pieces, notches **(Rectangular and V-notches)** and weirs **(Sharp crested Weirs)**.

Reference Books:

- Fluid Mechanics & Hydraulic Machines : Dr. R.K. Bansal
- Hydraulic and Fluid Mechanic by P.N.Modi & S.M.Seth
- Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoker
- Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman
- Fluid Mechanics : Streetes VL & Wylie EB; Mcgraw Hill book company.
- Fluid Mechanics by White
- Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald
- Fluid Mechanics by Potter, Cengage Learning

Course Outcomes:

After studying the course the students of Civil Engineering will be competent:-

1. To apply the knowledge of the basic principles of fluid mechanics for analysis and design of type of flow regime in a given engineering system, to construct an appropriate (fixed, deforming, or moving) control volume for a given engineering system and apply the principles of conservation of mass, momentum, and energy to the control volume.
2. Ability to calculate the hydrostatic forces and moments on planar and curved submerged and floating surfaces to analyze fluid flow problems with the application of the momentum and energy equations.
3. Ability to present data or governing equations in non-dimensional form, design experiments, and perform model studies and to decide when appropriate to use ideal flow concepts and the Bernoulli equation.
4. Ability to solve for internal flow in pipes and channels through simple solutions of the Navier-Stokes equations, Moody chart and head-loss equations.
5. Ability to solve for external flow, evaluate lift and drag, know when there is possibility of flow separation, apply streamlining concepts for drag reduction by using experimental correlations.
6. An understanding of how fluid mechanics applies to mechanical, biological and environmental systems.

Rock Mechanics & Engineering Geology

BTCE-302

Course Objectives

1. To aware the students about the importance of Engg. Geology in Civil Engg. And Geologica; work by different weathering agencies such as River, Wind and Glaciers.
2. To gain knowledge of rock mass structure, discontinuities features and rock mass classification
3. To understand rock strength & deformability and in situ stress testing method and its effects on design in massive elastic rock and stratified rock, respectively.
4. To get knowledge about a consideration of Engineering Geological in the projects like Tunnels, Highways, dams and reservoirs.
5. To know about methods of determine Engineering Properties of Rocks and their measurement in the laboratory and at site.
6. To aware the students in improving the properties of rock mass with the help of various techniques such as Grouting, Rock Reinforcement and Rock Bolting.

Syllabus

General Geology : Importance of Engg. Geology applied to Civil Engg. Practices. Weathering, definition, types and effect. Geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition.

Rocks & Minerals : Minerals, their identification, igneous, sedimentary & metamorphic rocks. Classification of rocks for engineering purposes. Rock quality designation (RQD). **Structural Geology**: Brief idea about stratification, apparent dip, true dip, strike and in conformities. Folds, faults & joints : definition, classification relation to engineering operations.

Engineering Geology: Geological considerations in the Engg. Projects like tunnels, highways, foundation, dams, reservoirs. Earthquake : Definition, terminology, earthquake waves, intensity, recording of earthquake.

Engineering properties of **rocks and laboratory measurement** : Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact and fissured rocks, effect of anisotropy, effect of saturation and temperature

In-situ determination of Engg. Properties of Rock masses : Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses,bore hole test

Improvement in properties of Rock masses : Pressure grouting for dams and tunnels, rock reinforcement rock bolting.

Reference Books

- Introduction to Rock Mechanics : Richard E. Goodman.
- Engg. Behaviour of rocks : Farmar, I.W.
- Rock Mechanics and Engg. : Jaager C.
- Fundamentals of Rock Mechanics : Jaager and Cook
- Engineering Geology : D.S.Arora Engineering Geology : Parbin Singh
- Rock Mechanics for Engineering : B.P. Verma.

Course Outcomes

1. Students will be able to critically review the importance of Engg. Geology and their applications to Civil Engineering practices.
2. Students will be able to identify and classify common minerals and rocks using basic geological classification system.
3. Students will be able to know about Geological structures (Joint, veins, crack, faults, and fold), reasons of formation for each type and their side effects on the engineering projects.
4. Students will be able to know the characteristics of earthquake and measures taken to construct structures like tunnels, highways, dams etc. in rocks.
5. Students will be able to determine physical and mechanical properties of rock in term of density, porosity, permeability, and hardness.
6. Students will have knowledge of Field and laboratory test procedures and be able to interpret test results needed to estimate intact and rock mass properties.
7. Students will be to identify problems in rock mass and able to provide improvement in the properties of rock mass.
8. Students will be able to understand the role of Geology in the design and construction process of underground opening in Rock.
9. Students will be able to apply geological concepts and approaches on rock engineering projects.

Strength of Materials

BTCE-303

Course Objectives

1) To familiarize the students with concept of free body diagrams and equilibrium of structures.
2) To enable the students to calculate simple & complex stresses and strains in machines and structural components.
3) To familiarize the students to calculate shear forces and bending moments in beams.
4) To provide knowledge of bending and shear stresses in different beam sections.
5) To make the students understand about behavior of columns and struts.
6) To make the students understand the concept of torsion and failure theories.

Syllabus

1. **Concept of Equilibrium:** Load, reaction; General equilibrium equations; Equilibrium of a poin in space; Equilibrium of a member; Concept of free body diagrams; Displacements; Concept of displacement-constraints/ supports; Statical-determinacy of a problem.

2. **Simple Stress and Strains**: Introduction; Concept of stress and strain; Stress-strain curves forductile, brittle materials; Generalized Hooke's law, Stress-strain diagram of ductile and brittlematerial, statically determinate and indeterminate problems, compound and composite bars,thermal stresses. Elastic constants, relations between various elastic constants and its use;Lateral strain, volumetric strain, poisons ratio; Stress and strains in thin cylinders, sphericalshells; Thin vassals subjected to internal pressures.

3. **Complex stress and strains:** Introduction; Normal stress, tangential stress; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress; Concept of principal stress and its computation; Mohr circle; Principal strains, computation of principal stresses from the principal strains.

4. **Shear force and Bending moment diagrams:** Introduction to the concept of reaction diagrams—shear force and bending moment; Role of sign conventions; Types of load, beams, supports; Shear force and bending moment diagrams: simply supported, overhang and cantilever beams subjected to any combination of point loads, uniformly distributed and varying load, and moment; Relationship between load, shear force and bending moment; Different methods for plotting a bending moment and shear force diagrams.

5. **Bending and Shear Stresses:** Introduction; Assumptions and derivation of flexural formula forstraight beams; Centroid of simple and built up section, second moment of area; Bending stress calculation for beams of simple and built up section, composite sections (flitched sections); Shear stress; Variation of bending and shear stress along the depth of section.

6. **Columns and Struts:** Stability of Columns; Buckling load of an axially loaded columns withvarious end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load.

7. **Torsion of Circular shafts:** Torsion, basic assumptions, derivation of torsion equation; Power transmitted by shafts; analysis and design of solid and Hollow shafts based on strength and

Reference Books

- Strength of Material by S. Ramamrutham
- Mechanics of Material : E .Popov
- Strength of Material : Rajput
- Strength of Materials : Sadhu Singh
- Strength of Materials by Gere, Cengage Learning

Course Outcomes

Students should understand and be able to implement:

1. Concepts of free body diagrams of structures and to check stability (Beams and frames)
2. Concepts of stress and strain of axially loaded members, mechanical and thermal properties.
3. Concepts of shear force and bending moment diagrams of different beams with different loading conditions and relation between loads, shear force and bending moment.
4. Concepts of straight beams, bending stress of beams, flitched beams, shear stress formula for beams and shear stress distribution in beams.
5. Concepts of crippling load of an axially loaded column under different end conditions.
6. Concepts of torsion and failure theories.

Surveying

BTCE-304

Course Objectives

1. To introduce the students to the surveying and its different types.
2. To make students conversant with the various horizontal distance measuring equipments.
3. To make students conversant with direction and elevation measuring equipments.
4. To make students able to do closed traverse calculations.
5. To extend the students ability to do earth work, reservoir capacity calculations.
6. To extend students ability to understand different types of curves.
7. To develop students skill to plot different features of earth's surface.

Syllabus

Introduction: Definition, principles of surveying, different types of surveys, topographical map, scale of map.

Chain and Compass Surveying: Measurement of distances with chain and tape, direct & indirect ranging, offsets, bearing and its measurement with prismatic compass, calculation of angles from bearings.

Plane Table Surveying: Setting up the plane table and methods of plane tabling.

Levelling & Contouring: Setting up a dumpy level, booking and reducing the levels by rise & fall method and height of instrument method, correction due to curvature and refraction, characteristics of contours, methods of contouring, uses of contour maps.

Theodolite Traversing: Temporary and permanent adjustments, measurement of horizontal and vertical angles, adjustment of closing error by Bowditch & Transit rules.

Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations.

Triangulation: Selection of stations and base line, corrections for base line, satellite station and reduction to centre.

Curves: Elements of a simple curve, different methods of setting out of simple circular curve.

Reference Books

- Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill (2006)
- Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I and II, Laxmi Publications (2005)
- Agor, R., Surveying, Khanna Publishers (1982)
- Bhavikatti,S.S. Surveying & Levelling Volume I&II (2009)

Course Outcomes

Students will be able to:

1. Understand the principles and objective of surveying.
2. Calculate the horizontal distance on plane and sloping surface.
3. Do angular and elevation measurements with different types of equipments.
4. Analyse the closed traverse and will be able to balance it.
5. Design simple circular curves for horizontal and vertical alignments.
6. Plot the topographical map of an area.

Building Materials and Construction

BTCE-305

Course Objectives

1. To familiarize the students with the conventional materials of construction.
2. To make the students aware about the new materials in construction
3. To update the students about the concrete mix design, quality assurance &Control
4. To familiarize the students about national policy of "Shelter for all"

Syllabus

Building Stones & Bricks: General , Characteristics of a good building stone, Deterioration and preservation of stones, Artificial Stones , Composition of good brick earth, Qualities of good bricks, Classification of bricks, Tests on bricks, Varieties of fire bricks.

Cement: Composition of cement, Raw Materials, Manufacturing process, Varieties of cement, Hydration of cement, Properties, testing of cement.

Concrete: Introduction, Constituents of concrete, Batching of materials, Manufacturing process of cement concrete, workability and factors affecting it, Methods to determine workability, segregation and bleeding of concrete, Strength of concrete and factors affecting it.

Timber: Structure of a tree, classification of trees, Defects in timber, Qualities of good a timber, Seasoning of timber, Decay of timber, Preservation of timber.

Miscellaneous materials: Paints, Distempering, Glass, Plastics.

Foundation and Walls: Definition, types of foundations, causes of failures of foundation and remedial measures, Types of walls and thickness considerations.

Brick and stone masonry: Terms used, Types of bonds & their merits and demerits, rubble and ashlar joints in stone masonry, cement concrete hollow blocks and their advantages and disadvantage.

Damp Proofing:

Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

Roofs: Terms used, Classification of roofs and roof trusses, Different roof covering materials**.**

Plastering and pointing: Objects ,Methods of plastering , Materials and types, Defects in plastering, Special material for plastered surface, Distempering white washing and colour washing**.**

Floors: General, Types of floors used in building & and their suitability, factors for selecting suitable floor for building**.**

Miscellaneous Topics: Building Services – Plumbing service, Electrical services, Air conditioning, Accoustics and sound insulation, Fire protection measures, Lift.

Reference Books

- Rangwala – Building materials
- Bindra SP, Arora KR Building construction
- Shetty MS , Concrete Technology
- Punmia BC, Building construction
- Singh, Parbin , Building materials
- Sushil Kumar , Building Construction

Course Outcomes

On completion of the course, the students will be able to:

1. Students will have sufficient knowledge of materials in construction
2. Students will be able to design the concrete mixes according to the situations
3. Students will have sufficient knowledge to think critically in terms of achieving the goals of “Shelter for all”.
4. Students will have knowledge of the revolutionary materials in constructions

4th SEMESTER

Fourth Semester **Contact Hours: 30 Hrs.**

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-401	Geomatics Engineering	3	1	-	40	60	100	4
BTCE-402	Construction Machinery & Works Management	3	1	-	40	60	100	4
BTCE-403	Design of Concrete Structures-I	4	1	-	40	60	100	5
BTCE-404	Fluid Mechanics-II	3	1	-	40	60	100	4
BTCE-405	Irrigation Engineering-I	3	1	-	40	60	100	4
BTCE-406	Structural Analysis-I	3	2	-	40	60	100	5
BTCE-407	Concrete Technology Lab	-	-	2	30	20	50	1
BTCE-408	Structural Analysis Lab	-	-	2	30	20	50	1
BTCE-409	General Fitness				100	-	100	
Total		**19**	**07**	**04**	**400**	**400**	**800**	**28**

Geomatics Engineering

BTCE-401

COURSE OBJECTIVES:

1. To expose students about the need of the advancement in Surveying.
2. To introduce students to different techniques of Photogrammetry
3. To extend the students ability to measure the distance using EDM.
4. To expose students to the different aspects of Remote Sensing.
5. To introduce students to different types of new instruments such as GPS, Total Station etc.

Syllabus

1. Photogrammetry Introduction, Basic Principles, Photo-Theodolite, Elevation of a Point by Photographic Measurement, Aerial Camera, Vertical Photograph, Tilted Photograph, Scale, Crab and Drift, Flight Planning for Aerial Photography, Ground Control for Photogrammetry, Photomaps and Mosaics, Stereoscopic Vision, Stereoscopic parallax, Stereoscopic Plotting Instruments, Applications.
2. Electromagnetic Distance Measurement (EDM) Electromagnetic Waves, Carrier Waves, Black body radiation, Laws of radiation Modulation, Types of EDM Instruments, Electro-optical, Infrared, and Microwave EDM Instruments, Effect of Atmospheric Conditions, The Geodimeter, The Tellurometer, Wild Distomats, Electronic Total Station.
3. Remote Sensing Introduction, Basic Principles, Electromagnetic (EM) Energy Spectrum, EM Radiations and the Atmosphere, Interaction of EM radiations with Earth's Surface, Types of remote sensing systems, Remote Sensing Observation Platforms, Satellites and their characteristics – Geostationary and sun-synchronous, Earth Resources Satellites, Meteorological satellites, Sensors, Types and their characteristics, Across track and Along track scanning, Applications of Remote Sensing.
4. Geographical Information System (GIS) Definition, GIS Objectives, Hardware and software requirements for GIS, Components of GIS, Coordinate System and Projections in GIS, Data structure and formats, Spatial data models – Raster and Vector, Data inputting in GIS, Data base design - editing and topology creation in GIS, Linkage between spatial and non spatial data, Spatial data analysis – significance and type, Attribute Query, Spatial Query, Vector based spatial data analysis, Raster based spatial data analysis, Errors in GIS, Integration of RS and GIS data, Digital Elevation Model, Network Analysis in GIS, GIS Software Packages.
5. Global Positioning System (GPS) Introduction, Fundamental concepts, GPS system elements and signals, GPS measurements and accuracy of GPS, Satellite Movement, GPS Satellites, Co-ordinate systems - Geoids, Ellipsoid and Datum, Spheroid, Customised Local Reference Ellipsoids, National Reference Systems, Worldwide Reference Ellipsoid, WGS 84, Differential-GPS, Classification of GPS receivers, GPS Applications.

Reference Books

- Arora, K.R., 2007: Surveying Vol-III, Standard Book House.
- Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications.
- Chang.T.K. 2002: Geographic Information Systems, Tata McGrawHill.
- Heywood.I, Cornelius S, CrverSteve. 2003: An Introduction to Geographical Information Systems, Pearson Education.
- Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press.
- Punmia, B.C., Jain A.K., 2005: Higher Surveying, Luxmi Publications
- Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H.Freeman and company.
- Kaplan, E.D., Understanding GPS : Principles and Application; Artec House; 2 Edition

Course Outcomes

Students must be able to:

1. Get a brief idea about history of Photogrammetry and its advancement in the field of surveying
2. To aware students the different methods of survey measurements using EDM
3. To aware students to different types of Total station and make them able to use it in field.
4. To aware students the different components, uses, and operations involved in Remote Sensing
5. To introduce the concept of GIS, Its different Components and application in the field of Civil Engineering field.
6. To aware students to different types of GPS Recivers.

Construction Machinery and Works Management

BTCE 402

Course Objectives

1. Students able to understand the various civil engineering projects and identify the activities & events in a project.
2. To develop and analyze the PERT and CPM networks for civil engineering projects.
3. To study the various construction machinery and their specifications for various civil engineering projects.

Syllabus

S.no	Topic details	Proposed number of lectures
1	**INTRODUCTION**: Need for project planning & management, time, activity & event, bar chart, Milestone chart, uses & draw backs	4
2	**PERT**: Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project, numerical problems.	7
3	**CPM**: Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance in project control, numerical problems.	6
4	**COST ANALYSIS AND CONTRACT**: Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, numerical problems. updating a project, when to update, time grid diagram, resource scheduling. planning of different components of civil engineering projects such as a house, workshop, dam, tunnel	6
5	**CONSTRUCTION EQUIPMENT AND MACHINERY:** Tractors, bull dozers, rippers, scrappers, power shovels, dragline, hoes. Line diagram of each, sizes, output, uses, factors affecting selection of each equipment, economic life of equipment,maintenance and repair cost. Hoisting & Transporting Equipments: Hosts, Winches, Cranes, Belt conveyors, Ropeways, trucks & Wagons	10
6	Plants for grading, batching, mixing, types of mixers, concrete pumps, bitumen plants.	3
	Total	36

Reference Books

T/R	BOOK TITLE/ AUTHORS/ PUBLICATION
R1	Construction Planning and equipment – R.L Peurifoy – Tata McGraw Hill, New delhi
R2	PERT and CPM – L.S.Srinath, East West Press
T1	Construction Management, PERT and CPM – B.C.Punmia – CBS publications
R3	Management Guide to PERT & CPM – Wiest & levy; Prentice Hall
T2	Construction Equipment & Planning and Application – Mahesh Verma Artec Publication
T3	Construction Planning and Management by U.K.Shrivastava; Galgotia Publications Pvt.Ltd

Course Outcomes

On completion of the course, the students will be able to:

CO1. Design the bar charts and milestone charts for residential construction buildinigs.
CO2. Apply the PERT and CPM techniques to the various complex civil engineering projects
CO3. Solve the optimistic time and minimum cost for the various projects by applying various methods.
CO4. Design and use the different construction machinery in order to get the maximum output.
CO5. Understand the operations of concrete batching and bitumen plants.

DESIGN OF CONCRETE STRUCTURES -1

BTCE-403

Course Objectives

1. To introduce the students to classification, composition, properties and behavior of ingredients of concrete such as cement, aggregates, mineral and chemical admixtures.
2. To make students understand the properties of concrete and factors effecting them, in fresh and hardened state.
3. To make students learn the mix design procedure for concrete as per Indian standards.
4. To make students able to understand and distinguish between different philosophies of reinforced concrete structure analysis and design.
5. To develop students ability to calculate and analyse the strength of reinforced concrete members under flexure, shear and torsion as per limit state design concept.
6. To develop students skill to design reinforced concrete beams and slabs using limit state design guidelines of Indian standards.
7. To make students able to evaluate the reinforced concrete members design with respect to strength, bond, anchorage, and development length requirements as per IS guidelines.

Syllabus

PART A: CONCRETE TECHNOLOGY

Chapter-1. Cement and Admixtures:

Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

Chapter-2. Aggregates:

Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap
graded aggregate – Maximum aggregate size.

Chapter-3. Concrete:

Properties of Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water, Abram's Law, Factors affecting strength; Characteristics strength of concrete, Target strength,
Modulus of elasticity, Modulus of rupture.

Chapter-4. Mix Design:

Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

Part B: DESIGN OF REINFORCED CONCRETE ELEMENTS

1. Objectives and Methods of Analysis and Design
2. Properties of Concrete and Steel 3. Design Philosophies of Working Stress Method and Limit State Method
4. Limit State of Collapse - Flexure
5. Computation of Parameters of Governing Equations
6. Determination of Neutral Axis Depth and Computation of Moment of Resistance
7. Numerical Problems on Singly Reinforced Rectangular Beams
8. Doubly Reinforced Beams – Theory and Problems
9. Flanged Beams – Theory and Numerical Problems
10. Shear, Bond, Anchorage, Development Length and Torsion
11. Reinforced Concrete Slabs: One and Two way Slabs

Reference Books

- Properties of Concrete by A.M.Neville – Prentice Hall
- Concrete Technology by M.S.Shetty. – S.Chand & Co.
- Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
- Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi
- Advanced Design of Structures N. Krishna Raju
- Advanced RCC Design Pillai & Mennon; Tata MacGraw Hill
- Limit State Design by Ramachandra
- Limit State Design A.K. Jain
- Limit State Design of Reinforced Concrete P.C. Vergese

Course Outcomes

Students will be able to:

1. Identify and utilize the cement, steel, aggregates and admixtures to obtain the desired reinforced cement concrete.
2. Prepare concrete mixture having desired properties and assess its quality in fresh and hardened state using Indian standard methods.
3. Analyze a reinforced concrete member under flexure, shear and torsion using limit state design philosophy.
4. Design the reinforced concrete beams and slabs using limit state design guidelines of Indian standards.
5. Access the structural safety and serviceability of reinforced concrete beams and slabs as per Indian standards for Limit state design.

STRUCTURAL ANALYSIS-I

BTCE- 406

Course Objectives

1	To introduce the students with different types of determinate structural systems.
2	To prepare the students to compute slopes and deflection in determinate structural systems using various geometric and energy methods.
3	To aware the students with various causes of additional stresses in determinate structures.
4	To train the students to plot influence lines of various determinate structural systems.

Syllabus

Displacements: Concept; Governing differential equation for deflection of straight beams; Following methods for determination of structural displacements: 10. Geometric Methods: Double integration; Macaulay's method; Moment area method; Conjugate beam method. 11. Energy Methods: Strain energy in members, , Betti's and Maxwell's Laws of reciprocal deflections, Concept of Virtual work and its applications, Castigliano's theorems, unit load method, deflections of trusses and 2D-frames.

Determinate Structures: Concept of determinacy; Analysis of determinate structural elements—truss, arch, beam, frame, cables; Internal forces in determinate structures; Reaction diagram-- Bending moment, shear force, radial shear, normal thrust diagrams for the determinant structures. 12. Analysis of plane trusses, compound and complex trusses using method of joints, method of joints, tension coefficients. 13. Analysis of three-hinged arch of various shapes under different loading conditions. 14. Analysis of simple portal frame, cables under different loading conditions. 15. Analysis of cables under point load and UDL with ends at same or different levels.

Moving Loads and Influence Line Diagrams: Concept of influence line diagram, rolling loads; Bending moment and shear force diagrams due to single and multiple concentrated rolling loads, uniformly distributed moving loads; Equivalent UDL; Muller Breslau principle; Influence lines for beams, girders with floor beams and frames; calculation of the maximum and absolute maximum shear force and bending moment; Concept of envelopes; Influence line for displacements; Influence line for bar force in trusses.

Analysis of Cables and Suspension Bridges: General cable theorem, shape, elastic stretch of cable, maximum tension in cable and back-stays, pressure on supporting towers, suspension bridges, three hinged stiffening girders. Analysis of Dams, Chimneys and Retaining Walls: Introduction, loadings for the dames, chimneys, and retaining walls; limit of eccentricity for no-tension criteria; Concept of core; Middle-third rule; maximum/minimum base pressures.

Reference Books

- Basic structural Analysis C.S.Reddy; Tata McGraw-Hill Education
- Analysis of Structures Vol- I and Vol.-II Vazirani & Ratwani; Khanna Publishers
- Intermediate structural Analysis C.K.Wang; McGraw-Hill
- Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.
- Theory of Structures, Vol. I, S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi.

Course Outcomes

After the completion of the course the student will be able to

- Differentiate between determinate and indeterminate structures.
- Evaluate deflections in structures using various methods. (Beams, frames and trusses)
- Examine the causes for additional stresses in arches, trusses and cables.
- Draw ILD for various forces in determinate structural systems

Fifth Semester

Fifth Semester **Contact Hours: 30 Hrs.**

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-501	Design of Steel Structures-I	4	1	-	40	60	100	5
BTCE-502	Geotechnical Engineering	4	1	-	40	60	100	5
BTCE-503	Structural Analysis-II	3	2	-	40	60	100	5
BTCE-504	Transportation Engineering-I	3	1	-	40	60	100	4
BTCE-505	Environmental Engineering –I	3	1	-	40	60	100	4
BTCE-506	Transportation Engineering Lab	-	-	2	30	20	50	1
BTCE-507	Geotechnical Engineering Lab	-	-	2	30	20	50	1
BTCE-508	Computer Aided Structural Drawing I	-	-	3	30	20	50	2
BTCE-509	Survey Camp of 04 weeks duration after 4th Semester				100	50	150	2
	Total	**17**	**06**	**07**	**390**	**410**	**800**	**29**

DESIGN OF STEEL STRUCTURES -1

BTCE-501

Course Objectives

1. To introduce the students to the properties & permissible stresses in steel, use & advantages of steel in construction industry.
2. To make students conversant with the various Indian standards guidelines for limit state design of steel structures.
3. To make students understand the stress distribution and its calculation for different types of steel connections like riveting, welding & bolting.
4. To make students able to do stress analysis on various steel members and basic roof trusses.
5. To extend the students ability to design different members i.e. beams, columns, bases of a steel structure, trusses, etc.
6. To develop students skill to recognize different types of stresses and failures in steel structural members.
7. To equip students with ability to evaluate the structural safety of steel members under different loading conditions.

Syllabus

Chapter-1. Introduction:
Properties of structural steel, I.S. rolled sections, I.S. specifications.

Chapter-2. Connections:
Riveted, bolted and welded connections for axial and eccentric loads.

Chapter-3. Tension members:
Design of members subjected to axial tension.

Chapter-4. Compression members:

Design of axially loaded members, built-up columns, laced and Battened columns including the design of lacing and battens.

Chapter-5. Flexural members:
Design of laterally restrained and un-restrained rolled and built-up sections, encased beams.

Chapter-6. Column bases:
Design of slab base, gusseted base and grillage foundation.

Chapter-7. Roof truss:
Design loads, combination of loads, design of members (including purlins) and joints, detailed working drawings.

Reference Books

- Limit state design of steel structures: S K Duggal, Mc Graw Hill
- Design of steel structures: N Subramanian Oxford Higher Education
- Design of steel structures (Vol. 1): Ram Chandra Standard Book House – Rajsons
- Design of steel structures (by limit state method as per IS: 800-2007): S S Bhavikatti I K International Publishing House
- IS 800: 2007 (General construction in steel-Code of practice)*
- SP: 6(1) (Handbook for structural engineers-Structural steel sections)*

Course Outcomes

Students will be able to:

1. Recognize the properties of structural steel and permissible stresses under different types of loading conditions as per Indian standards for limit state design.
2. Estimate safe load carrying capacity and efficiency of different steel fasteners like rivets, bolts & welds.
3. Select safe and economical steel sections for different structural members under various loading/stress conditions.
4. Analyse forces and stresses in tension, compression, flexural members and roof truss members of structural steel.
5. Design steel structural members i.e. ties, struts, beams, columns, bases, roof trusses, other associated components and connections under different conditions of limit states.
6. Evaluate structural safety, stability and economy of various steel structural members to achieve sustainability.

Geotechnical Engineering

BTCE - 502

Course Objectives

1 To Provide the students with basic understanding of physical and mechanical properties of soil, together with knowledge of base engineering procedures to identify factors controlling the soil behavior.
2. Students will acquire basic knowledge in engineering design of geotechnical systems through permeability, total and effective stresses.
3. Become familiar with engineering properties to classify and to characterize consolidation characteristics.
4. Understand various factors affecting soil strength and stress-strain behavior; deformation and settlement characteristics of soils.

Syllabus

Basic Concepts: Definition of soil and soil mechanics, common soil mechanics problems in Civil Engineering. Principal types of soils. Important properties of very fine soil. Characteristics of main Clay mineral groups. Weight volume relationship and determination of specific gravity from pycnometer test. Field density from sand replacement method and other methods.

Index Properties: Grain size analysis. Stokes's law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterbeg Limits, Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse and fine grained soils as per Indian Standard

Compaction: Definition and object of compaction and concept of O.M.C. and zero Air Void Line.Modified proctor Test. Factors affecting compaction Effect of compaction on soil properties and their discussion. Field compaction methods- their comparison of performance and relativesuitability. Field compacative effort, Field control of compaction by proctor.

Consolidation: Definition and object of consolidation, Difference between compaction and consolidation. Concept of various consolidation characteristics i.e. av, mv and cv, primary and secondary consolidation. Terzaghi's Differential equation and its derivation. Boundary conditions for Terzaghi's solution for one dimensional consolidation concept of cv, tv & U. consolidation test determination of cv from curve fitting methods, consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect of disturbance on e-Logσ curves of normally consolidated clays, importance of consolidation settlement in the design of structures.

Permeability and Seepage: Concept of effective stress principal, seepage pressure, critical hydraulic gradient and quick sand condition. Capillary phenomenon in soil. Darcy's Law and its validity, seepage velocity, co-efficient of permeability (k) and its determination in the laboratory. Average permeability of startified soil mass, factors affecting 'k' and brief discussion.

Shear Strength: Stress analysis of a two dimensional stress system by Mohr circle. Concept of pole. Coulomb's law of shear strength coulomb - Mohr strength theory. Relation between principal stesses at failure. Direct, triaxial and unconfined shear strength tests. Triaxial shear tests based on drainage conditions typical strength envelopes for clay obtained from these tests. Derivation of skempton's pore pressure parameters. Stress strain and volume change characteristics of sands

Stability of Slopes: slope failure, base failure and toe failure - Swedish circle method - $\varphi=0$ analysis and $c=0$ analysis - friction circle method - Taylor's stability number - stability charts - sliding block analysis

Reference Books

- Soil Mech. & Foundation Engg, by K.R.Arora Standard Publishers Distributors
- Geotechnical Engineering, by P. Purshotama Raj Tata Mcgraw Hill
- Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS Publishers & Distributors.
- Principle of Geotechnical Engineering by B.M.Das Cengage Publisher
- Basic and applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao New Age International Publishers
- Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill 7. Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers.

Course Outcomes

On completion of the course, the students will be able to:

1. Comprehend the various geotechnical field challenges and understand their fundamental properties and then use (apply) the soil as an engineering material.
2. Apply the various specifications of compaction of soils in the construction of highways and earthen dams.
3. Able to apply the knowledge of consolidation, soil deformation parameters, and calculate settlement magnitude and rate of settlement.
4. Investigate and write the laboratory reports for soil design properties and parameters by apply the concept of total and effective stress approaches in soil strength determination
5. Design the embankment slopes and check the stability of finite slopes.

STRUCTURAL ANALYSIS-II

BTCE-503

Course Objectives

1. To introduce the students about determinate and indeterminate structures
2. To impart the knowledge of different classical methods to evaluate the response of indeterminate structures.
3. To enable the students to implement conventional & approximate methods of structural analysis.
4. To introduce them about various causes of additional stresses in the structures and provide knowledge to calculate those stresses and drawing of their ILDs
5. To introduce them about various causes of additional stresses in the structures and provide knowledge to calculate those stresses and drawing of their ILDs

Syllabus

Indeterminate Structures: Concept of indeterminate /redundant structures; Static and kinematic indeterminacies; stability of structures; internal forces; Conditions of stress-strain relationships, equilibrium and compatibility of displacements; Solution of simultaneous algebraic equations.

Indeterminate Structural Systems: Pin-jointed and rigid-jointed structural systems; Deformation of redundant structures-sway and non-sway frames, elastic curve; Static equilibrium and deformation compatibility checks; Effects of support settlement and lack of fit; Fixed-end moments—member loading, sinking of supports, temperature; Analysis of redundant beams, frames, trusses, arches using following methods:

a) Conventional Methods: Slope deflection method; Moment distribution method; Rotation contribution method (Kani's Method).

b) Classical Methods: Methods of consistent deformation; Theorem of three moments.

c) Approximate Methods: Portal method; Cantilever method; Substitute frame method.

Influence Line Diagrams: Concept and application in the analysis of statically indeterminate structures; Influence line for bar forces in the statically indeterminate trusses, beams and frames.

Reference Books

- Basic structural analysis - C.S. Reddy Tata McGraw-Hill
- Intermediate structural analysis - C . K. Wang. McGraw Hill
- Indeterminate structural analysis - J. Sterling Kinney Addison-Wesley Educational Publishers
- Theory of structures - B.C. Punima, Laxmi Publications
- Structural Analysis, Devdas Menon, Narosa Publishers.

Course Outcomes

After the completion of the course the student will be able to:

1. Identify determinate and indeterminate structures and compute the indeterminacies of those structures.
2. Predict the response of structures ((Beams, frames and trusses) in terms of bending moments, shear forces and displacements using classical methods.
3. Apply methods for analysis to indeterminate structures i.e. conventional methods and approximate methods to various structures.
4. Understand the causes of additional stresses in beams, arches, trusses & frames and draw the ILD of various force quantities.
5. Suggest suitable method for analysis of different types of multi-storeyed frames.

Environment Engineering-I

BTCE-505

Course Objectives

1. To introduce the students to the Different types of Water demands and its estimation and forecasting.
2. To make students able to understand sources of water and their development.
3. To make students conversant with water quality parameters and their examination.
4. To make students able to understand different types water treatment processes and their design aspects.
5. To extend students ability to understand and design water conveyance system.
6. To develop students skill to design drinking water system for rural areas.

Syllabus

1. Introduction: Beneficial uses of water, water demand, per capita demand, variations in demand, and water demand for fire fighting, population forecasting and water demand estimation.

2. Water sources and development: Surface and ground water sources; Selection and development of sources; Assessment of potential; Flow measurement in closed pipes, intakes and transmission systems.

3. Pumps and pumping stations: Types of pumps and their characteristics and efficiencies; Pump operating curves and selection of pumps; pumping stations.

4. Quality and Examination of Water: Impurities in water, sampling of water, physical, chemical and bacteriological water quality parameters, drinking water quality standards and criteria.

5. Water treatment: Water treatment schemes; Basic principles of water treatment; Design of plain sedimentation, coagulation and flocculation, filtration – slow, rapid and pressure; Disinfection units; Fundamentals of water softening, fluoridation and deflouridation, and water desalination and demineralization, taste and odour removal.

6. Transportation of Water: Pipes for transporting water and their design, water distribution systems and appurtenances; Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems.

7. Rural water supply: Principles, selection of source, rain water harvesting, quantitative requirements, low cost treatment techniques.

Reference Books

- Water Supply Engineering- Environmental Engg. (Vol. – I) by B.C. Punmia, Ashok Jain, Arun Jain, Laxmi Publications, New Delhi.
- Environmental Engg. - A design Approach by Arcadio P. Sincero and Gregoria P. Sincero, Prentice Hall of India, New Delhi.
- "Environmental Engg." By Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, McGraw Hill, International Edition
- Water Supply Engineering- Environmental Engg. (Vol. – I) by S.K. Garg, Khanna Publishers, Delhi.
- Water Supply and Sewerage by Steel EW and McGhee, Terence J.; McGraw Hill.

Course Outcomes

Students will be able to:

1. Understand the different water demands their estimation and forecasting.
2. Understand sources of water and their development.
3. Analyze water quality parameters.
4. Understand and design water treatment processes.
5. Design Water conveyance systems.
6. Develop and design drinking water system for rural areas

Sixth Semester

Sixth Semester **Contact Hours: 34 Hrs**

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-601	Design of Concrete Structures-II	4	1	-	40	60	100	5
BTCE-602	Elements of Earthquake Engineering	3	2	-	40	60	100	5
BTCE-603	Foundation Engineering	4	1	-	40	60	100	5
BTCE-604	Numerical Methods in Civil Engineering	4	1	-	40	60	100	5
BTCE-605	Professional Practice	3	2	-	40	60	100	5
BTCE-606	Environment Engineering –II	3	1	-	40	60	100	4
BTCE-607	Environmental Engineering Lab	-	-	2	30	20	50	1
BTCE-608	Computer Aided Structural Drawing II	-	-	3	30	20	50	2
BTCE-609	General Fitness				100	-	100	
Total		**21**	**08**	**5**	**400**	**400**	**800**	**32**

Design of Concrete Structures-2

BTCE 601

Course Objectives

a) To develop students ability to analyze and design different R.C.C structural elements like Stairs, Foundations, Compression members, Domes, Retaining walls and Water Tanks.

Syllabus

1. Stairs : Types and Design of Stairs
2. Foundations - Theory and Design: Isolated Footing (Square, Rectangular), Combined Footing(Rectangular, Trapezoidal, Strap), Raft Footing
3. Compression Members: Definitions, Classifications, Guidelines and Assumptions, Design of Short Axially Loaded Compression Members, Design of Short Compression Members under Axial Load with Uniaxial and biaxial Bending, Preparation of Design Charts, Design of Slender Columns
4. Design of Continuous beams and curved beam.
5. Design of Domes.
6. Design of Retaining walls: Cantilever type retaining wall, Counterfort type retaining wall.
7. Introduction to water retaining structures. Design of circular and rectangular water tanks resting on ground.

Reference Books

- Reinforced Concrete Design; Pillai & Menon; Tata McGraw-Hill Education
- Limit state Design of Reinforced Concrete; Varghese P C; Prentice-Hall of India Pvt. Ltd".
- Reinforced Cement Concrete, Mallick and Rangasamy; Oxford-IBH.

BIS Codes of practice and Design Handbooks:

- *IS 456-2000*- Indian Standard. Plain and Reinforced concrete -Code of practice
- *IS 3370- Code of practice for concrete structures for storage of liquids
- *Design Aid SP 16
- Explanatory hand book SP24.
- Detailing of Reinforcement SP 34

Course Outcomes:

Students will be able to:

1. Analyze and Design different types of R.C.C Stair Case.
2. Analyze and Design different types of R.C.C Foundation Systems.
3. Analyze and Design different types of R.C.C Compression Members.
4. Analyze and Design different types of R.C.C Continuous and Curved Beams.
5. Analyze and Design different types of R.C.C Domes.
6. Analyze and Design different types of Water Tanks.

Elements of Earthquake Engineering

BTCE 602

Course Objectives:

Earthquake disaster is of global concern as it threatens the world's population, economy, and sustainable development. It is responsibility of civil engineers to design and build earthquake-resistant structures, in order to minimize the risks generated due to earthquakes. This course provides the:

1. Fundamental knowledge of basic science of earthquakes and its effects on the natural and built environment.
2. Basic theory of structural dynamics will be covered.
3. Concepts and techniques of seismic analysis and design will be introduced.
4. Students will further analyze, design and detail the structures subjected to seismic loading as per IS codes.

Syllabus

1. Introduction to Earthquakes, Causes of Earthquakes, Basic Terminology, Magnitude, Intensity, Peak ground motion parameters.
2. Past Earthquakes and Lessons learnt, Various Types of Damages to Buildings.
3. Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, Spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.
4. Lateral Force analysis, Floor Diaphragm action, moment resisting frames, shear walls.
5. Concepts of seismic design, Lateral Strength, Stiffness, ductility and structural configuration.
6. Introduction to provisions of IS 1893-2002 Part-I for buildings. Estimation of lateral forces due to earthquake.
7. Introduction to provisions of IS 4326.
8. Introduction to provision of IS 13920.

Reference Books

- Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
- Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra, Prentice Hall
- Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
- Structural Dynamics by Mario & Paz, Springer.
- Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt Ltd
- Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.
- IS 1893-2002 Indian Standard Criteria for Earthquake Resistant Design of Structures.
- IS 4326-1993 2002 Indian Standard for Earthquake Resistant Design and Construction of Buildings. 9. IS 13920-1993 2002 Ductile detailing of Reinforced Concrete Structures subjected to Seismic Forces.

Course Outcomes

After the completion of the course the student will be able to:

CO1. Understand the phenomenon of occurrence and history of earthquakes and classify their kinds and effects.

CO2. Recognize source and types of structural vibrations.

CO3. Evaluate and analyze Degree of Freedom, Spring action, Damping, Equations of motions, Lateral Force analysis, Floor Diaphragm action, Moment resisting frames and Shear walls.

CO4. Design structure for seismic forces having adequate Lateral Strength, Stiffness, ductility.

CO5. Appraise and implement provisions of IS 13920 and IS 4326.

FOUNDATION ENGINEERING

BTCE-603

Course Objectives

The objective of the course is to introduce the theory and applications of soil exploration for the analysis of the different stresses in soils related to shallow and deep foundations. The course focuses on the understanding the behavior of shallow & deep foundations and pile foundations of the structures subjected to static loads. The main objectives of the course are:

1. To develop an understanding to perform site investigations and to determine the soil parameters needed to carry out foundation design.
2. To learn the subsurface exploration techniques and apply them to design the foundations.
3. To understand and be able to apply the modelling and analysis techniques used in design of foundation:
(a) Coulomb's and Rankine's theory for earth retaining structure;
(b) Terzaghi's and Skempton's analysis for bearing capacity;
(c) Engineering News and Hiley's formula for load carrying capacity of pile.
4. To apply the principles of soil mechanics to design of shallow and deep foundations including bearing capacity and settlement calculations.
5. To compute the lateral earth pressure, select size of retaining walls and ensure safety against external forces and moments.
6. To enable students to prepare professional reports for design projects and data presentation skill and to use computers and some computer graphics.

Syllabus

S. No	Topic details	Proposed number of lectures
1	**Soil Investigation**: Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples-Open Drive samples, Stationery piston sampler,. Rotary sampler, Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T.	7
2	**Earth Pressure:** Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium, Ka and Kp for horizontal backfills. Rankine's theory both for active and passive earth pressure for Cohesion less back fill with surcharge and fully submerged case. Cohesive backfill condition. Coulomb's method for cohesion less backfill. Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load).	8
3	**Shallow Foundation**: Type of shallow foundations, Depth and factors affecting it. Definition of ultimate bearing capacity, safe bearing capacity and allowable bearing capacity. Rankine' sanalysis and Terzaghi's analysis.	10

	Types of failures. Factors affecting bearing capacity. Skemptons equation. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration Test. Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams. New marks chart and its construction. 2:1 method of load distribution. Comparison of Bosussinesq and Wester guard analysis for a point load. Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code. Situation most suitable for provision of rafts, Proportioning of rafts, Methods of designing raft, Floating foundation.3.	
4	**Pile Foundations**: Necessity and uses of piles, Classification of piles, Merits and demerits of different types based on composition. Types of pile driving hammers & their comparison. Effect of pile driving on adjacent ground. Use of Engineering News Formula and Hiley's Formula for determination of allowable load. Limitations of pile driving formulae. Cyclic Pile Load Test, Separation of skin friction and point resistance using cyclic pile load test. Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay, Safe load on a Friction and point Bearing pile. Pile in sand, Spacing of piles in a group, Factors affecting capacity of a pile group, Efficiency of pile group by converse – Lab are formula and feeds formulas. Bearing capacity of a pile group in clay by block failure and individual action approach. Calculation of settlement of friction pile group in clay. Related Numerical problems. Settlement of pile groups in sand, Negative skin friction. Related numerical Problem	10
5	**Caissons and Wells**: Major areas of use of caissons, advantages and disadvantages of open box and pneumatic caissons. Essential part of a pneumatic caisson. Components of a well foundation. Calculation of allowable bearing pressure. Conditions for stability of a well, Forces acting on a well foundation. Computation of scour depth	8

Reference Books

- Soil Mech. & Foundation Engg, by K.R.Arora, Standard Publishers Distributors
- Geotechnical Engineering, by P. Purshotama Raj
- Soil Mech. & Foundation Engg., by V.N.S.Murthy
- Principle of Foundation Engineering by B.M.Das, CL Engineering
- Basic and applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao, New Age International
- Soil Mech. & Foundations by Muni Budhu Wiley, John Wiley & Sons
- Geotechnical Engineering by Gulhati and Datta, Tata McGraw - Hill Education 8. Foundation Engineering by Varghese P.C, PHI Learning.
- Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publication.
- Foundation Analysis and Design by Bowles J.E, Tata McGraw - Hill Education

Course Outcomes

Upon successful completion of this course, it is expected that students will be able to:

1. Apply fundamental concept of mathematics, statics and mechanics to understand the essentials of the methods of soil exploration stability analysis.
2. Analyse and design a variety of geotechnical engineering structures including foundations, piles, retaining walls, slopes and interpret data.
3. Recognize behavior of soils in slopes, behind retaining structures and phenomena affecting foundation capacity and settlement.
4. Determine allowable bearing pressures and load carrying capabilities of different foundation systems.
5. Evaluate appropriate bearing capacity correction factors and apply related equations in design. Evaluate effects of water and layered soil systems on foundation performance.
6. Identify the appropriate deep foundation type for different soil profiles.
7. Specify pile material types for various applications and calculate side/tip capacity of driven piles in clay.

Professional Practice
BTCE 605

Course Objectives

1. To comprehend and familiar about the different types of estimates of buildings, roads and different structures and prepare the abstract cost estimation from manual & AutoCAD drawings.
2. To prepare the bill of quantities and apply the rate analysis for concrete, earth work, steel and other construction materials in various projects.
3. To develop the specifications writing of different items of the work and understand the valuation of land and buildings.

Syllabus

S.no	Topic details	Proposed number of lectures
1	**Estimates**-Method of building estimates, types, site plan index plan, layout plan, plinth area, floor area, Technical sanction, administrative approval, estimate of buildings, roads, earthwork, R.C.C. works, sloped roof, roof truss, masonry platform, complete set of estimate	14
2	**Schedule of Rates, analysis of rates**- For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork	8
3	**Specifications**- For different classes of building and Civil engineering	3
4	Rules and measurements for different types of Civil engineering works	2
5	**Types of contracts**- Tenders, tender form, submission and opening of tenders, measurement book, muster roll , piecework agreement and work order	3
6	**Accounts**-Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure	3
7	**Arbitration**: Acts and legal decision making process	3
	Total	36

Reference Books

T/R	BOOK TITLE/ AUTHORS/ PUBLICATION
R1	Estimating and Costing by G.S. Birdie, Dhanpat Rai Publication New Delhi
R2	Estimating and Costing by V.N.Chakravorty, Calcutta
T1	Estimating and Costing by B.N.Dutta, UBSPD, New delhi
R3	Civil Engg. Contracts & Estimates by B.S.Patil, Orient – Longman Ltd., New Delhi

Course Outcomes

On completion of the course, the students will be able to:
CO1. Apply different types of estimates in order to estimate any type of structure.
CO2. Calculate unit cost per cubic meter of a reinforced concrete structure, earthen embankment and unit cost per square meter for a given highway project.
CO3. Carry out the analysis of rates and bill preparation for different materials and components of the project.
CO4. Develop a detailed quantity survey reports and abstract summary of the project.
CO5. Prepare a bid analysis and invite contractors through tender notices.