Total Credits= 25

Semester-V (B.Tech Civil Engg.)		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
BCIES1-501	Design of Concrete Structures-I	3	0	0	40	60	100	3
BCIES1-502	Structural Analysis-I	3	1	0	40	60	100	4
BCIES1-503	Geotechnical Engineering	3	1	0	40	60	100	4
BCIES1-504	Environmental Engineering	3	0	0	40	60	100	3
Departmental Elective-I (Select any one)		3	0	0	40	60	100	3
BCIED1-511	Fluid Mechanics-II							
BCIED1-512	Sustainable Construction Methods							
BCIED1-513	Concrete Construction Technology							
Departmental Elective-II (Select any one)		2	0	0	40	60	100	2
BCIED1-521	Building Materials & Construction							
BCIED1-522	Numerical Methods in Civil Engineering							
BCIED1-523	River Engineering							
BCIES1-505	Concrete Technology Lab	0	0	2	60	40	100	1
BCIES1-506	Structural Analysis Lab	0	0	2	60	40	100	1
BCIES1-507	Geotechnical Engineering Lab	0	0	2	60	40	100	1
BCIES1-508	Environmental Engineering Lab	0	0	2	60	40	100	1
BMNCC0-001	Constitution of India (Mandatory Course)	2	0	0	---	---	---	0
BCIES1-509	Training-II*	0	0	0	60	40	100	2
Total		**19**	**2**	**8**	**540**	**560**	**1100**	**25**

*Internship will be imparted at the end of 4th semester as per AICTE Internship Policy.

DESIGN OF CONCRETE STRUCTURES-I

Subject Code: BCIES1-501 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives:

1. Learn the behaviour of structural concrete components and Ability to perform analysis and design of concrete members.

Course Outcomes:

1. Identify the different failure modes and determine their design strengths.
2. Select the most suitable section shape and size for beams according to specific design criteria.

Note: 1. IS 456, Indian Standard. Plain and Reinforced Concrete -Code of practice is permitted in examination.
2. Examiner requested to provide requisite data for Mix Design Problems; if any.

UNIT-I (06 Hours)

Concrete Mix Design: Introduction, Selection of mix proportions, Durability of concrete, Quality Control of concrete, Introduction of various mix proportion methods, Proportioning of concrete mixes by BIS method of mix design.

UNIT-II (07 Hours)

RCC Design Philosophies: Introduction, Objectives & methods of analysis & Design, Properties of Concrete and Steel. Philosophies of Working Stress Methods (WSM) & Limit State Method (LSM) in RCC design.
Shear, Torsion & Bond (Only Theory/Concept): Types of shear & torsion, importance in RCC Design Structures, IS Provisions for Shear & Torsion, Bond-types of bonds, Anchorage Bond, Development length & its determination.

UNIT-III (21 Hours)

RCC Beams: Types of beams, Behaviour in Flexure-Singly reinforced beam, Doubly reinforced beam, Flanged beam, Cantilever beam, Neutral Axis, Neutral Axis Depth, Moment of Resistance, Design of beams- Singly reinforced beam, Doubly reinforced beam, Flanged beam, Cantilever beam.

UNIT-IV (11 Hours)

RCC Slabs: Types of slab systems, Guidelines for Design, Design of One Way and Two Way Slab.
Columns: Classifications (According to Shape, Length and Loading Conditions), Assumptions, Behaviour and Design of Axially Loaded Columns.

Recommended Text Books / Reference Books:

1. M.S. Shetty, 'Concrete Technology', S. Chand & Co.
2. A.M. Neville, 'Properties of Concrete', Prentice Hall.
3. M.L. Gambhir, 'Concrete Technology', Tata McGraw Hill Publishers, New Delhi.
4. Pillai & Menon, 'Reinforced Concrete Design', Tata McGraw Hill Education.
5. N. Krishna Raju, 'Advanced Design of Structures'.

STRUCTURAL ANALYSIS-I

Subject Code: BCIES1-502 | **L T P C** | **Duration: 60 Hrs.**

3 1 0 4

Course Objectives:

1. To provide students with a solid background on principles of structural analysis by exposing them to the theories and concepts of analyzing the civil engineering structures.
2. To cover the analysis of statically determinate structures.

Course Outcomes:

1. The students will possess the skills to solve statically determinate problems of structural analysis dealing with different loads.
2. They will be able to apply their knowledge of structural analysis to address structural design problems.

UNIT-I (15 Hours)

1. Slope & Deflection of Beams & Frames: Review of Double Integration Method and Macaulay's Method, Moment Area Method, Conjugate Beam Method, Strain Energy / Real Work Method, Virtual Work / Unit Load Method, Castigliano's Method & Maxwell's Reciprocal Theorem.

2. Structural Stability: Introduction, Stability of Columns, Axially loaded Columns, Euler's Theory of Long Columns and Euler's Formula, End Conditions & Effective Length Factor, Equivalent Length, limitations of Euler's Theory, Columns with Eccentric and Lateral Load, Rankine Gordon Formula.

UNIT-II (15Hours)

3. Analysis of Determinate Trusses: Introduction, determination of forces in member of trusses by method of joints, method of sections, Tension Coefficient Method, Deflection of Joints of plane frames by Castigliano's first theorem and unit load method, Effect of Lack of Fit & Temperature Change.

4. Analysis of Dams, Chimneys and Retaining Walls: Introduction, limit of eccentricity for no tension in the section, core of the section, middle third rule, wind pressure on chimneys.

UNIT-III (15 Hours)

5. Simple Cable & Arch Structures: Introduction, shape of a loaded cable, cable carrying point loads and UDL, cables with ends at different level, cable subjected to temperature stresses, Analysis of Cables, Analysis of three hinged (Parabolic and Circular) Arches for Horizontal Thrust, Bending Moment, Normal Thrust and Radial Shear.

6. Suspension Bridges: Introduction, Analysis of suspension bridges with two hinged and three hinged stiffening girders, Temperature Stresses in Three Hinged and Two Hinged Stiffening Girders.

UNIT-IV (15 Hours)

7. Rolling Loads: Introduction to rolling loads and influence lines, Determination of shear force, bending moment at a section and absolute shear force and bending moment due to single point load, uniformly distributed load, several point loads etc.

8. Influence Lines: Construction of Influence lines for reaction, shear forces and bending moment

for beams, influence lines for girders with floor beams, Influence lines for forces in members of frames. Influence lines for Three Hinged Arches & Stiffening Girders.

Recommended Text Books / Reference Books:

1. C.S. Reddy, 'Basic Structural Analysis'.
2. Vazirani & Ratwani, 'Analysis of Structures', Vol. - I, -II.
3. C.K. Wang, 'Intermediate Structural Analysis'.

GEOTECHNICAL ENGINEERING

Subject Code: BCIES1-503	L	T	P	C	Duration: 60 hrs.
	3	1	0	4	

Course Objectives:

1. To understand the various phase diagrams & derive various phase relationships of the soil.
2. To understand of index properties,
3. To understand the engineering properties of soil.
4. To understand of stability of slopes.

Course Outcomes:

1. The students will be able to apply their knowledge of various phase diagrams and derive various phase relationships of the soil.
2. The students will be able to apply their knowledge of index properties,
3. The students will be able to apply their knowledge of the engineering properties of soil.
4. The students will be able to apply their knowledge of stability of slopes.

UNIT-I (15 Hours)

Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, geotechnical engineering. Scope of soil engineering. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity and their relationships Determination of various parameters such as: Moisture content, oven dry method, Specific gravity by density bottle method, Unit weight by core-cutter method, sand-replacement method.

Plasticity Characteristics of Soil: Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits. Particle size classification, textural classification, Indian standard soil classification system.

UNIT-II (15 Hours)

Compaction: Compaction, Concept of O.M.C. and zero Air Void Line, Standard and Modified proctor test, Factors affecting compaction, Effect of compaction on engineering soil properties, Field compaction methods their comparison of performance and relative suitability, Field control of compaction by proctor needle.

Permeability of Soil: Concept of effective stress principle, Critical hydraulic gradient and quick sand condition, Capillary phenomenon in soil, Darcy's law and its validity, Co-efficient of

permeability and its determination by Constant Head Permeability test and Variable Head Permeability test, Average permeability of stratified soils, Factors affecting coefficient of permeability.

UNIT-III (15 Hours)

Consolidation: Consolidation, Difference between compaction and consolidation, Concept of various consolidation characteristics, Primary and secondary consolidation, Terzaghi's theory for one-dimensional consolidation, Consolidation test, Determination of coefficient of consolidation from curve fitting methods, Normally consolidated and over consolidated clays, Importance of consolidation settlement in the design of structures, e-logσ curve.

UNIT-IV (15 Hours)

Shear Strength: Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, tri-axial compression tests, test behavior of UU, CU and CD tests, pore-pressure parameters, computation of effective shear strength parameters, unconfined compression test, vane shear test

Stability of Slopes: Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts.

Recommended Text Books / Reference Books:

1. K.R. Arora, 'Soil Mech. & Foundation Engg', Standard Publishers Distributors
2. P. Purshotama Raj, 'Geotechnical Engineering', Tata McGraw Hill.
3. V.N.S. Murthy, 'Soil Mech. & Foundation Engg', CBS Publishers & Distributors.
4. B.M. Das, 'Principle of Geotechnical Engineering', Cengage Publisher.
5. Gopal Ranjan and A.S.R. Rao, 'Basic and Applied Soil Mechanics', New Age International Publishers.
6. Joseph E. Bowle 'Physical & Geotechnical Properties of Soil.

ENVIRONMENTAL ENGINEERING

Subject Code: BCIES1-504 | **L T P C** | **Duration: 45 Hrs.**

3 0 0 3

Course Objectives:

The course should enable the students to:

1. Extensive knowledge of sources, distribution & maintenance of sewerage system.
2. Emphasizes on design criteria, design equations, kinetics and hydraulic diagrams for the design of unit operations and processes for wastewater treatment systems.
3. Deals with biological sludge handling and treatment.
4. Analyse the importance of rural sanitation systems and natural and constructed wetlands.

Course Outcomes:

Upon successful completion of this course, student will be able to:

1. Estimate sewage generation and design sewer system including Sewage pumping stations.
2. Required understanding on the characteristics and composition of sewage, self Purification

of streams.

3. Perform basic design of the unit operations and processes for sewage treatment.
4. An ability to develop and conduct appropriate experimentation, analyze and interpret data for future sewage generation & handling.

UNIT-I (11 Hours)

Introduction: Beneficial uses of water, water demand, per capita demand, variations in demand, water demand for firefighting, population forecasting and water demand estimation.
Water sources and development: Surface and ground water sources; Selection and development of sources; intakes and transmission systems

UNIT-II (11 Hours)

Pumps and pumping stations: Types of pumps and their characteristics and efficiencies; Pump operating curves and selection of pumps; pumping stations.
Quality and Examination of Water: Impurities in water, sampling of water, physical, chemical and bacteriological water quality parameters, drinking water quality standards and criteria.

UNIT-III (11 Hours)

Introduction to Sewage: Terms & definitions, systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions.
Sewerage Systems: Generation and estimation of community Sewage, flow variations, storm water flow, types of sewers. Design of sewers and storm water sewers, construction & maintenance of sewers, sewer appurtenances, sewage pumping and pumping stations

UNIT-IV (12 Hours)

House Drainage: Principles of house drainage, traps, sanitary fittings, systems of plumbing, drainage lay out for residences.
Characteristics of Sewage: Composition of domestic and industrial sewage, sampling, physical, chemical and microbiological analysis of sewage, biological decomposition of sewage, BOD and BOD kinetics, effluent disposal limits.

Recommended Text Books / Reference Books:

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

FLUID MECHANICS-II

Subject Code: BCIED1-511	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives:

The students should be able:

1. To have understanding of Laminar and turbulent flows.
2. To understand concepts of boundary layer theory.
3. To understand concepts of open channel flows, hydraulic jump, surges, Momentum principles, specific energy and GVF.

Course Outcomes:

Upon successful completion of this course, student will be able to:

1. Understand laminar and turbulent flows.
2. Learn about concepts of boundary layer theory.
3. Design open channels for most economical sections.
4. Will be able to understand surges, momentum principles, specific energy and GVF profiles.

UNIT-I (12 Hours)

Laminar Flow: Navier-Stokes equations in Cartesian coordinates (no derivation), meaning of terms, Flow through circular section pipe, flow between parallel plates, stokes law. Flow through porous media, Transition from laminar to turbulent flow, Critical velocity and critical Reynold number.

Turbulent Flow: Turbulent flows and flow losses in pipes, Darcy equation minor head losses in pipe fitting, Hydraulic and energy gradient lines. Definition of turbulence, scale and intensity, Effects of turbulent flow in pipes. Equation for velocity distribution in smooth and rough pipes (no derivation), Resistance diagram.

UNIT-II (13 Hours)

Boundary Layer Analysis: Assumption and concept of boundary layer theory. Boundary- layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

Uniform flow in open Channels: Flow classifications, basic resistance Equation, Chezy, Manning, Bazin and Kutter formulae. Variation of roughness coefficient, conveyance & normal depth. Velocity Distribution. Most efficient flow sections; rectangular, trapezoidal & circular.

UNIT-III (13 Hours)

Energy and Momentum principles and critical flow: Energy and specific Energy in an open channel; critical depth for rectangular and trapezoidal channels. Alternate depths, applications of specific energy to transitions and Broads crested weirs. Momentum and specific force in open channel flow, sequent depths.

Gradually varied Flow: Different Equation of water surface profile; limitation, properties and classification of water and surface profiles with examples, computation of water surface profile by graphical, numerical and analytical approaches.

UNIT-IV (07 Hours)

Hydraulic Jump and Surges: Theory of Jump, Elements of jump in a rectangular Channel, length and height of jump, location of jump, Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges.

Recommended Text Books / Reference Books:

1. Fluid Mechanics: Dr. R.K. Bansal
2. Fluid Mechanics: Dr. Modi & Dr. Seth.

3. Fluid Mechanics: Dr. Jagdish Lal
4. Flow in open channels by S. Subraminayam, Tata McGraw Hill.

SUSTAINABLE CONSTRUCTION METHODS

Subject Code: BCIED1-512 | **L T P C** 3 0 0 3 | **Duration: 45 Hrs.**

Course Objectives:

1. Sustainable building materials and construction technologies are being introduced in the building industry every day. It is important to understand the materials used in civil engineering, their physical and chemical properties, characteristics, durability, usability and performance specifications of the building systems.
2. To study and understand the properties of sustainable building materials used in construction and understand the importance of bio materials and green building materials.

Course Outcomes:

Upon successful completion of this course, student will be able to:

1. Understand the concepts related to Sustainable Development and its three pillars – economic, environment, and society.
2. Understand of the 'modern' building material developed using advanced technologies and testing methods.
3. Application of recycled/reconstructed building materials in the construction of green buildings.
4. Describe the basic provisions of the Bureau of Indian standards related to select building material.

UNIT-I (11 Hours)

Natural /Conventional Building Materials: 1. Bamboo: (a) Traditional Methods (b) Rope joints and split bamboo construction (c) Bamboo as roofing, wall, and floor material (d) Insulation material and bamboo mats
2. Stone: (a) Traditional construction technology (b) Contemporary construction technology

UNIT-II (11 Hours)

Manmade /Synthetic Building Materials: 1. Hi-Tech Glass: (a) Electrochemical glass (b) Nano-glass (c) Dye-sensitive glass (d) Low-e-glass
2. Polymers: (a) Polyurethane (b) Styrene (c) Teflon (d) Epoxy floorings (e) Different vinyl

UNIT-III (11 Hours)

Alternate Building Materials and Construction Technologies: (1) CLC Blocks (Cellular Light Weight Concrete) (2) Fly ash Bricks (3) AAC blocks (4) Cement Fibre boards, life cycle of construction material

UNIT-IV (12 Hours)

Sustainable Building Practices: Sustainable building systems and environmental impacts - 5Es of sustainability - Scales and program diversity of buildings – Stages of environmental assessment and intervention - Whole life costing and Life cycle analysis – Carbon foot print – Integrated design approach — Sustainable materials, old and new - Cultural context, holistic building traditions and invention - Cradle to Cradle – Bio mimicry – Resource abundance by design -

Recycling and reuse

Recommended Text Books / Reference Books:

1. Bureau of Indian Standards – relevant codes.
2. National Building Code of India
3. CPWD Construction manuals
4. Sustainability of Construction Materials, A volume in Woodhead Publishing Series in Civil and Structural Engineering Edited by J. Khatib
5. Martin Evans – Housing, Climate and Comfort, Architectural Press, London, 1980

CONCRETE CONSTRUCTION TECHNOLOGY

Subject Code: BCIED1-513 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives:

1. Understand properties of concrete and types of concrete
2. Know the procedure to determine the properties of fresh and hardened of concrete.
3. Understand properties of cement and aggregate and types of cement.
4. Gives ideas on the construction and inspection requirements the buildings

Course Outcomes:

Based on this course, the students will understand/evaluate/develop:

1. To understand the behaviour of fresh and hardened concrete.
2. To make aware the recent developments in concrete technology.
3. To understand factors affecting the strength, workability and durability of concrete.
4. To impart the methods of proportioning of concrete mixtures.

UNIT-I (11 Hours)

Introduction of Concrete materials: Admixtures, Fly Ash, Polymers, Early Age Properties, Strength, Permeability & Durability. Principles of Concrete mix design, Concrete Mix Design procedure by: IS/ACI/British Standards.

UNIT-II (11 Hours)

Concreting Operations: Practices and Equipment, batching; Mixing; Transporting; Placing and Compacting; curing. Properties and technique of construction for concrete, Fiber reinforced concrete, light weight concrete, Heavy weight concrete, High performance Concretes.

UNIT-III (11 Hours)

Special Concrete Operations: Shot Crete, grouting, Grunting, under water concreting, hot and cold weather concrete, pump able concrete. Construction techniques for reinforced concrete elements, design and fabrication of form work for R.C.C. elements.

UNIT-IV (12 Hours)

Introduction to Pre-stressed concrete Construction: Principle, methods, materials, Tools and Equipment used in Pre-stressed construction.

Inspection and Quality Control of Concrete Construction: Stages, Principles, Checklist, Statistical Controls, procedures.

Recommended Text Books / Reference Books:

1. M.L. Gambhir, 'Concrete Technology', McGraw Hill Education.
2. M.S. Shetty, 'Concrete Technology', S. Chand
3. Neville and Brooks, 'Concrete Technology', Prentice Hall.

BUILDING MATERIALS & CONSTRUCTION

Subject Code: BCIED1-521 | **L T P C** | **Duration: 30 Hrs.**

2 0 0 2

Course Objectives:

The course should enable the students to:

1. Develop knowledge of material science and behaviour of various building materials used in construction.
2. Identify the construction materials required for the assigned work.
3. Provide procedural knowledge of the simple testing methods of brick, cement, lime and concrete etc.
4. Understanding of brick & stone masonry, damp proofing course, finishing, plastering, painting and building floor.

Course Outcomes:

1. Predict the properties of building stones and its classifications.
2. Understand the concept of various methods of manufacture of bricks.
3. Explain various types of cements and their applications in construction. Various field and laboratory tests on cement
4. Analyze the importance of mineral and chemical admixtures, requirements of the concrete in construction
5. Explain the suitability of floors in buildings like mosaic flooring, terrazzo flooring, rubber flooring, asphalt flooring.
6. Explain the foundations and uses of different types of foundations.
7. Classification of various types of woods and properties, seasoning of timber

UNIT-I (08 Hours)

Bricks: General terms, Composition of good brick earth, Harmful ingredients in brick earth, qualities of good bricks, tests for bricks, classification of bricks

Timber: Definition, classification of trees, structure of a tree, seasoning of timber, defects in timber, market forms of timber.

UNIT-II (08 Hours)

Lime: Introduction, definitions: calcination, Hydraulicity, setting, slacking, sources of lime, classification of limes & their uses, tests for lime stones.

Cement: Different types of cement, Constituents of cement, manufacturing of Portland cement, hydration of cement, tests for cement, uses of different types of cement.

UNIT-III (07 Hours)

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 & disadvantage

Damp Proofing: Causes and bad effects of dampness, preventive measures for dampness in buildings.

UNIT-IV (07 Hours)

Plastering and Pointing: Objectives, Methods of plastering, Materials and types, Defects in plastering, special material for plastered surface, distempering, white washing and colour washing.
Floors: Introduction, Types of floors used in building & and their suitability, factors for selecting suitable floor for building.

Recommended Text Books / Reference Books:

1. M.S. Shetty, 'Concrete Technology', S. Chand Publication.
2. S.P. Bindra, S.P. Arora, 'Building Construction', Dhanpat Rai Publication.
3. S.K. Duggal, 'Building Materials', New Age International Publishers.
4. Rangwala, 'Engineering Materials', Charotar Publication House.
5. B.C. Punmia, 'Building construction', Laxmi Publication.
6. Parbin Singh, 'Civil Engineering Materials', S K Kataria and Sons
7. Sushil Kumar, 'Building Construction', Standard Publishers Distributors.

NUMERICAL METHODS IN CIVIL ENGINEERING

Subject Code: BCIED1-522 | **L T P C** | **Duration: 30 Hrs.**

2 0 0 2

Course Objectives:

The course should enable the students to:

1. Provide the numerical methods of solving the linear, non-linear & transcendental equations, interpolation, integration and differential equations.
2. Improve the student's skills in numerical methods by using the numerical analysis facilities.
3. Help in solving complex mathematical problems using only simple arithmetic operations.
4. Approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations.
5. Approach for fitting the polynomials using raw data.
6. Ability to implement the basic principles of numerical techniques in day to day application of Civil Engineering.

Course Outcomes:

Upon successful completion of this course, student will be able to:

1. Identify the application potential of numerical methods
2. Solve Civil engineering problems using numerical methods
3. Demonstrate application of numerical methods to civil engineering problems
4. Apply differential equations and integration to solve civil engineering problems
5. Outline and Propose the finite difference techniques
6. Apply the concept of partial differential equations and Solve practical problems

UNIT-I (08 Hours)

Equation: Roots of algebraic transcendental equations using bisection, Regula-Falsi, Secant &

Newton's method, Solution of linear simultaneous equations by different methods using Elimination, Iteration (Gauss Seidal & Gauss Jacobi), Gauss-Jordan method, Non-linear equations.

UNIT-II (07 Hours)

Finite Difference Technique: Initial and Boundary value problems of ordinary and partial differential equations, Solution of Various types of plates and other civil engineering related problems.

UNIT-III (07 Hours)

Statistical Methods: Method of correlation and Regression analysis for fitting a polynomial equation by least square, regression coefficient.

UNIT-IV (08 Hours)

Initial Value problem: Galerkin's method of least square, Initial Value problem by collocation points, Runge-Kutta Method for first and higher order differential equations for all methods.

Recommended Text Books / Reference Books:

1. Numerical Methods by B.S. Grewal, Khanna Publishers.
2. Numerical Mathematical Analysis: James B. Scarborough Oxford and IBH Publishing
3. Introductory Methods of Numerical Analysis: S.S. Sastry, PHI Learning (2012).
4. Introduction to Computer Programming and Numerical Methods by Xundong Jia and Shu Liu, Dubuque, Iowa: Kendall/Hunt Publishing Corporation.
5. Numerical Methods, J.B Dixit, USP Laxmi publication.
6. Numerical Methods by C.P. Gandhi.

RIVER ENGINEERING

Subject Code: BCIED1-523 | **L T P C** 2 0 0 2 | **Duration: 30 Hrs.**

Course Objectives:

The course should enable the students to:

1. Mechanics of river flow, aggradations and degradation measurements in rivers,
2. Physical river models
3. River training works.
4. Design of river training and flood protection structures.

Course Outcomes:

At the end of the course, the student will be able to:

1. Mechanics of river flow, aggradations and degradation, measurements in rivers.
2. Physical river models.
3. River training works.
4. Design of river training and flood protection structures.

UNIT-I (08 Hours)

River Morphology: Bars; Bends and Meanders, Thalweg; Braiding; Bifurcations etc.

Sediment Transport Mechanics: Incipient Motion of Sediment Particles, Critical tractive force,

Ripple and dune regime, anti-dune regime, importance of regimes of flow, Bed forms, Bed Load transport, Transport of suspended sediment, Critical Shear stress, Sediment Transport Equations.

UNIT-II (07 Hours)

Aggradation and Degradation: Local Scour at Bridge Piers and other Hydraulic Structures.
Measurements in Rivers: Stage measurements, Channel geometry, Discharge, Sediment samplers and suspended and bed load measurement.

UNIT-III (08 Hours)

Physical River Models: fixed and movable bed models; sectional models, distorted Models, Mathematical models for aggradations, degradation and local scour.
River Protection and Training Works: Revetments, Dikes, Gabions, Spurs, Bank Protective measures and Bed control structures.

UNIT-IV (07 Hours)

Design of river training and flood protection structures: Diversion and Cofferdams; River regulations systems; Dredging and Disposal, River restoration.

Recommended Text Books / Reference Books:

1. Irrigation & Water Power Engg. B.C. Punmia, Pande B.B. Lal.
2. Mechanics of Sediment Transportation and Alluvial Stream Problems, R.J. Garde, K.G. Ranga Raju.
3. Irrigation Engg. And Hydraulic Structures, SK Garg, Khanna Publishers.

CONCRETE TECHNOLOGY LAB

Subject Code: BCIES1-505 | **L T P C** | **Duration: 30 Hrs.**

0 0 2 1

Course Objectives:

The course should enable the students to:

1. Give practical exposure of laboratory testing of different kinds of building construction materials such as brick, cement, lime, aggregate, etc.
2. Check the suitability for different materials used in civil construction works.
3. Determine the engineering properties in terms of strength, strain, fatigue, creep, elasticity, stiffness, durability and workability.
4. Give practical exposure of laboratory testing & mix design of different kinds of concrete.
5. Use of different chemical admixtures with concrete to enhance its properties.
6. Exercise better quality control in a civil construction project.

Course Outcomes:

Upon successful completion of this course, student will be able to:

1. Determine the consistency, setting time, fineness, specific gravity, compressive strength, etc. of cement.
2. Determine the fineness modulus, grading, density & specific gravity of aggregates.
3. Determine the shape & size, compressive strength and water absorption of bricks & pavers.
4. Describe the properties of concrete & knowledge of concrete mix design philosophy.
5. Determine the optimum dose of admixtures for concrete.

6. Give practical exposure of laboratory testing for manhole covers.

Laboratory Experiments:

1. To Determine the Specific Gravity and Soundness of cement.
2. To Determine the Standard Consistency, Setting Time (Initial & Final Setting Time) of cement.
3. To Determine the Compressive Strength of Cement.
4. To Determine the Fineness Modulus, Bulk Density, Water Absorption and Specific gravity of Fine and Coarse Aggregates.
5. To Determine the workability of Concrete using:
   (a) Slump Cone Method, (b) Compaction Factor and (c) Vee-Bee Time of Concrete.
6. Mix Design of Concrete by IS methods.
7. To Determine the Compressive Strength of Concrete by Cube and Cylinder methods.
8. To carry out the Split Tensile strength of Concrete.
9. To carry out the Flexural strength of Concrete.
10. To Determine the Compressive strength of Bricks, Interlocking Pavers as per IS standard.

Recommended Books / Manuals:

1. M.L. Gambhir, 'Building and Construction Materials: Testing and Quality Control', TMH.
2. Concrete Lab Manual by NITTTR Chandigarh.
3. Concrete Technology, Theory and Practice by M.S. Shetty, S. Chand & Company.

STRUCTURAL ANALYSIS LAB

Subject Code: BCIES1-506 **L T P C** **Duration: 30 Hrs.**

0 0 2 1

Course Objectives:

1. To introduce engineering students to the theory and experimental techniques of structural mechanics.
2. To experimentally illustrate, in a comprehensive way, the basic principles of structural analysis and their applications.
3. To prepare the students learn best by doing.
4. To familiarize them, through the laboratory exercises, with the model behavior and practical limitations of each set-up and to get opportunity to critically examine and developing various skills in them for structural analysis of theoretical concepts, data handling and decision making.

Course Outcomes:

1. Students will be able to effectively link the theory / analytical concepts.
2. They will be able to demonstrate the background of the theoretical aspects, with practice and application.
3. They will be able to generate and analyze data using experiments and develop observational skill by the exposure to equipment and machines.

4. They will be able to use computing tools in analyzing and presentation of the experimental data.

Laboratory Experiments:

1. To study the behavior of different types of struts.
2. Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
3. To determine the Flexural Rigidity of a given beam.
4. To verify Moment- Area Theorems for slope and deflection of a given beam.
5. To determine the Carry over Factor (C.O.F.) for beams with rigid connections.
6. Experiment on three-hinged arch and influence line diagram for horizontal thrust.
7. Experiment on two-hinged arch.
8. To determine the deflection of a Pin-connected truss.
9. Forces in members of a redundant frame.
10. Experiment on curved beams.
11. Unsymmetrical bending of a cantilever beam.
12. Influence line diagrams for BM of a beam with one end hinged and the other fixed.

Recommended Books / Manuals:

1. Experimental methods in Structural Mechanics by C.B. Kukreja and V.V. Sastry, Standard Publishers Distributors, Delhi.
2. Laboratory Manual of Testing Materials - William Kendrick Hall
3. Laboratory Manual on Structural Mechanics by Harvinder Singh.

GEOTECHNICAL ENGINEERING LAB

Subject Code: BCIES1-507	**L**	**T**	**P**	**C**	**Duration: 30 Hrs.**
	0	0	2	1	

Course Objectives:

1. To understand the laboratory tests used for determination of physical, index and Engineering properties of soil.
2. Expose the students to different types of soils
3. Experience the concepts of soil mass, soil solids, and soil structure.
4. Make the students to relate theoretical concepts in doing lab tests

Course Outcomes:

1. Have thorough knowledge about the procedures of laboratory tests used for determination of physical, index and engineering properties of soils
2. Have the capability to classify soils based on test results and interpret engineering behaviour based on test results
3. Be able to evaluate the permeability and shear strength of soils
4. Be able to evaluate settlement characteristics of soils
5. Be able to evaluate compaction characteristics required for field application

Laboratory Experiments:

1. Determination of natural moisture content by oven drying method.
2. Determination of field dry unit weight using core cutter method.
3. Determination of field dry unit weight using sand replacement method.
4. Determination of specific gravity of Soils.
5. Grain size distribution analysis by sieve analysis.
6. Grain size distribution by hydrometer analysis.
7. Determination of liquid limit by Casagrande apparatus.
8. Determination of plastic limit
9. Determination of shrinkage limit.
10. Determination of coefficient of permeability using Constant-head test method.
11. Determination of coefficient of permeability using Falling-head method.
12. Compaction of soil by standard proctor test.
13. Compaction of soil by modified proctor test.
14. Determination of relative density of soil.
15. Consolidation Test.
16. Unconfined Compression Strength Test.
17. Direct Shear Test
18. Tri-axial Test (UU)

Recommended Text Books / Reference Books:

1. Soil Mechanics by Craig R.F., Chapman & Hall
2. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall,
4. Principles of Geotechnical Engineering, by Braja M. Das, Cengage
5. Learning Principles of Foundation Engineering, by Braja M. Das, Cengage Learning.

ENVIRONMENTAL ENGINEERING LAB

Subject Code: BCIES1-508	L	T	P	C	Duration: 30 Hrs.
	0	0	2	1	

Course Objectives:

1. To make the students good aware about water and its importance to human survival.
2. Understand how to classify and analyse various quality parameters of raw water & waste water.
3. To make the students to prepare water quality & sewage quality assessment report.

4. To make the students as to suggest required type of treatment to purify raw water.
5. To make the students as to suggest required type of treatment for waste water.
6. To make the students as analysts to differ quality requirements for industrial waters and domestic waters.

Course Outcomes:

Upon successful completion of this course, student will be able to:

1. Discuss about importance of water and its quality analysis.
2. Analyse various physico-chemical and biological parameters of water in case of quality requirements.
3. Assess complete water quality assessment for EIA and domestic supplies.
4. Suggest various types of treatment methods required to purify raw water with different contaminants.
5. Assess complete waste water quality assessment for their disposal.

Laboratory Experiments:

1. To measure the pH value of a water and waste water samples.
2. To determine optimum Alum dose for Coagulation.
3. To find MPN for the bacteriological examination of water.
4. To find the turbidity of a given waste water and water samples.
5. To find B.O.D. of a given waste water sample.
6. To measure D.O. of a given sample of water.
7. Determination of Hardness of a given water sample.
8. Determination of total solids, dissolved solids, suspended solids of a given water sample.
9. To find chlorides in given samples of water and waste water.
10. To find acidity and alkalinity of water samples.
11. To determine the COD of a wastewater sample.

Recommended Books / Manuals:

1. Chemistry for Environmental Engg. & Science by Sawyer & McCarty, TMH, New Delhi
2. Water & Waste Water Testing by Mathur, Nem Chand & Bros.
3. Manual on Sewage and Sewerage treatment by Central Public Health and Environmental Engineering Organisation (CPHEEO), GOI.
4. IS 10500: 2012, Code for Drinking Water by Bureau of Indian Standards (BIS), GOI
5. Environmental Engineering (Vol. I & II) by S.K. Garg, Khanna Publishers, Delhi.

CONSTITUTION OF INDIA

Subject Code: BMNCC0-001 **L T P C** **Duration: 30 Hrs.**

2 0 0 0

Course Objectives:

The objective of this non-credit but mandatory course is:

1. To apprise the students about the Constitution of India which provides the framework for the structure, procedure, power and duties of the government, judiciary, institutions and agencies involved in all spheres of public life in India.
2. To Enable the student to understand the importance of constitution.
3. To understand the structure of executive, legislature and judiciary.
4. To understand philosophy of fundamental rights and duties.
5. To understand the central and state relation, financial and administrative relations.

Course Outcomes:

1. Able to understand historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administrations.
2. Able to apply the knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
3. Able to analyze the History, features of Indian constitution, the role Governor and Chief Minister, role of state election commission, the decentralization of power between central, state and local self-government.
4. Able to evaluate Preamble, Fundamental Rights and Duties, Zilla Panchayat, block level organization, various commissions like SC/ST/OBC and women.

UNIT-I (06 Hours)

Part I – Union and its Territory
Part II – Citizenship
Part III – Fundamental Rights
Part IV – Directive Principles of State Policy
Part IVA – Fundamental Duties
Part V – The Union

UNIT-II (06 Hours)

Part VI – The States
Part VII – States in the B part of the First schedule (repealed)
Part VIII – The Union Territories
Part IX – The Panchayats
Part IXA – The Municipalities
Part IXB – The Co-operative Societies

UNIT-III (06 Hours)

Part X – The scheduled and Tribal Areas
Part XI – Relations between the Union and the States

Part XII – Finance, Property, Contracts and Suits
Part XIII – Trade and Commerce within the territory of India
Part XIV – Services under the Union, the States
Part XIVA – Tribunals
Part XV – Elections

UNIT-IV (06 Hours)

Part XVI – Special Provisions Relating to certain Classes
Part XVII – Languages
Part XVIII – Emergency Provisions
Part XIX – Miscellaneous
Part XX – Amendment of the Constitution
Part XXI – Temporary, Transitional and Special Provisions
Part XXII – Short title, date of commencement, Authoritative text in Hindi and Repeals.

Recommended Text Books / Reference Books:

1. Our Constitution by Subhash C. Kashyap
2. An Introduction to the Constitution of India by M.V. Pylee
3. An Introduction to the Constitution of India by Dr. Durga Das Basu
4. The Indian Constitution: Cornerstone of a Nation by Granville Austin