**Total Credits= 24**

| Semester-III (B.Tech Civil Engg.) | | Contact Hours | | | Max Marks | | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | | |
| BCIES1-321 | Surveying | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BCIES1-322 | Fluid Mechanics-I | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BCIES1-323 | Engineering & Solid Mechanics | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BCIES1-324 | Building Materials & Construction | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BMATH4-301 | Mathematics-III (Transform & Discrete Mathematics) | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| BHSMC0-022 | Civil Engineering- Societal & Global Impact | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| BCIES1-325 | Engineering & Solid Mechanics Lab | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| BCIES1-326 | Fluid Mechanics Lab | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| BCIES1-327 | Surveying Lab | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BCIES1-328 | Computer-aided Civil Engineering Drawing-I | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| BMNCC0-002 | Environmental Science (Mandatory Course) | 2 | 0 | 0 | --- | --- | --- | 0 |
| BCIES1-329 | Training-I* | 0 | 0 | 0 | 60 | 40 | 100 | 2 |
| **Total** | | **18** | **1** | **10** | **540** | **560** | **1100** | **24** |

*Training will be imparted in the institution at the end of 2nd semester for 4-6 week duration.

**Total Credits= 20**

| Semester-IV (B. Tech Civil Engg.) | | Contact Hours | | | Max Marks | | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|
| **Subject Code** | **Subject Name** | **L** | **T** | **P** | **Int.** | **Ext.** | | |
| BCIES1-421 | Structural Analysis-I | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BCIES1-422 | Design of Concrete Structures-I | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BCIES1-423 | Transportation Engineering-I | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BCIES1-424 | Environmental Engineering-I | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BCIES1-425 | Engineering Geology | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **Departmental Elective-I (Select any one)** | | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BCIED1-451 | Geomatics Engineering | | | | | | | |
| BCIED1-452 | Numerical Methods in Civil Engineering | | | | | | | |
| BCIED1-453 | Concrete Construction Technology | | | | | | | |
| BCIES1-426 | Concrete Technology Lab-I | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| BCIES1-427 | Structural Analysis Lab | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| BCIES1-428 | Transportation Engineering Lab | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **Total** | | **-** | **-** | **-** | **420** | **480** | **900** | **20** |

*There will be 4-weeks Internship as per AICTE Internship Policy after 4th semester.

| SURVEYING | | | | | |
|---|---|---|---|---|---|
| **Subject Code: BCIES1-321** | **L** | **T** | **P** | **C** | **Duration: 45 Hrs.** |
| | **3** | **0** | **0** | **0** | |

**Course Objective**

1. To understand the importance of surveying in the field of civil engineering
2. To learn the basic of linear/angular measurement methods.
3. To know the basics of levelling and Theodolite survey in elevation and angular measurements.
4. To understand Tacheometric surveying in distance and height measurements.
5. To get knowledge about the different types of curves used in highway and railway etc.

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

1. Carry out preliminary surveying in the field of civil engineering applications such as structural, highway engineering and geotechnical engineering plan a survey.
2. Taking accurate measurements, field booking, plotting and adjustment of traverse use various conventional instruments involved in surveying with respect to utility.
3. Precisely plan a survey for applications such as road alignment and height of the building undertake measurement and plotting in civil engineering.

**Unit–I (11 Hours)**

**1. Fundamental Concepts & Horizontal Measurement:** Definitions, Different types of surveys, Scale of map, Principles of Surveying. Distances with chain and tape, Direct & Indirect ranging, Offsets, Selection of stations and base line, Corrections for base line.

**2. Compass Surveying**: Definitions, Types of compass, Temporary adjustments of compass Designation of bearings, , included angles from bearing of lines and vice versa, Declination, Dip of magnetic needle, local attraction**.**

**Unit-II (10 Hours)**

**3. Theodolite**: Introduction, Definitions, Temporary and permanent Adjustments, Measurement of horizontal and vertical angle.

**4. Traversing:** Closed & Open traverse, Consecutive and independent co-ordinates, Latitudes and Departures, Closing error, balancing a traverse**:** Bowditch & Transit Rules**.**

**Unit–III (12 Hours)**

**5. Measurement of Vertical Distance:** Introduction, Definitions, Temporary and permanent Adjustments of level, Principle of levelling, Booking and reducing the levels by Rise & Fall method and Height of instrument method. Corrections due to Curvature and Refraction.

**6**. **Tachometry:** Determine tachometer constants, Measurement of horizontal & vertical distances with tachometer.

**7. Plane Table Surveying:** Principle of plane table survey, setting up the plane table and Methods of plane tabling.

**Unit–IV (12 Hours)**

**8. Contouring:** Definition**,** Characteristics of Contours and Methods of Contouring and Uses of Contour maps.

**9. Curves:** Elements of curves, Types of curves, Different methods of setting out of curves.

**10. Total Station Survey:** Features, Setting up and Orientation, characteristics and field procedure of Total Station.

**Recommended Books:**

1. B.C. Punmia, A. K. Jain, and Arun Kumar Jain, Surveying', Vol. I, II, Laxmi Publications.

2. S.K. Duggal, Tata McGraw Hill. Vol-I

3. R. Agor, Surveying, Khanna Publishers**.**

4. S.S. Bhavikatti, Surveying & Levelling Vol. I, II.

5. Narinder Singh, Surveying, Tata McGraw Hill.

6. N.N. Basak, Surveying and leveling', Tata McGraw Hill, New Delhi.

## FLUID MECHANICS-I

**Subject Code: BCIES1-322** | **L T P C** 3 0 0 3 | **Duration: 45 Hrs.**

**Course Objectives:**

The course should enable the students to:

1. The broad principles of fluid statics, kinematics and dynamics.
2. The definitions of the basic terms used in fluid mechanics.
3. The classifications of fluid flow.
4. To apply the continuity, momentum and energy principles.
5. Dimensional analysis.
6. Flow past immersed bodies.

**Course Outcomes**:

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

1. Understand the broad principles of fluid statics, kinematics and dynamics.
2. Understand definitions of the basic terms used in fluid mechanics.
3. Understand classifications of fluid flow.
4. Be able to apply the continuity, momentum and energy principles.
5. Understand dimensional analysis.
6. Understand flow past immersed bodies.

**UNIT-I (13 Hours)**

**1. Basic Concepts and Definitions** – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

**2. Fluid Statics** - Fluid Pressure: Pressure at a point, Pascal's law and its engineering hydrostatic paradox, pressure variation with temperature, density and altitude. Piezometer, U- Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro manometers. Pressure gauges, orifices, mouthpieces, notches (rectangular and V-notches) and weirs (sharp crested weirs).

**UNIT-II (13 Hours)**

**3. Hydrostatic pressure and force:** (horizontal, vertical and inclined) Submerged surfaces, force on a curved surface due to hydrostatic pressure. Buoyancy and floatation and stability of floating and submerged bodies. Meta-centric height and its determination.

**4. Fluid Kinematics-** Classification of fluid flow : steady and unsteady flow; Uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Velocity and acceleration of a fluid particle, local and convective acceleration. Streamline, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three-dimensional continuity equations in Cartesian coordinates.

**UNIT-III (13 Hours)**

**5. Fluid Dynamics**- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced.

**6. Dimensional Analysis and Dynamic Similitude:** Fundamental and derived units and dimensions, dimensional homogeneity, Rayleigh's and Buckingham's Pi method for dimensional analysis, dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies.

**UNIT-IV (06 Hours)**

**7. 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.

**Recommended Text Books / Reference Books:**

1. Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal.
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
3. Hydraulics and Fluid Mechanics, P. N. Modi and S. M. Seth, Standard Book House.
4. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
5. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

**ENGINEERING & SOLID MECHANICS**

| **Subject Code: BCIES1-323** | **L** | **T** | **P** | **C** | **Duration: 60 Hrs.** |
|---|---|---|---|---|---|
| | 3 | 1 | 0 | 4 | |

**Course Objectives:**

1. To introduce to continuum mechanics and material modeling of engineering materials based on first energy principles, deformation and strain, momentum balance, stress and stress states, elasticity and elasticity bounds, plasticity and yield design.
2. To develop the ability of the student to analyze the engineering objects subjected to different types of forces using the basic principles of statics.

3. To involve analytical methods for determining the strength, stiffness (deformation characteristics), and stability of the various members in a structural system.

**Course Outcomes:**

The student will be able to:

1. Describe the concepts and principles, understand the theory of elasticity including strain / displacement and Hooke's law relationships, and perform calculations, relative to the strength and stability of structures and mechanical components.
2. Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures, analyze solid mechanics problems using classical methods and energy methods.
3. Analyze various situations involving structural members subjected to combined stresses by application of Mohr's circle of stress, locate the shear centre of thin wall beams, and
4. Calculate the deflection at any point on a beam subjected to a combination of loads, solve for stresses and deflections of beams under unsymmetrical loading, apply various failure criteria for general stress states at points and solve torsion problems in bars and thin walled members.

**UNIT-I (15 Hours)**

**Module1: Simple Stresses and Strains:** Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic modulii and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience Gradual, sudden, impact and shock loadings – simple applications.

**Module 2: Compound Stresses and Strains**: Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain, Relationship between elastic constants.

**UNIT-II (15 Hours)**

**Module 3: Shear Force and Bending Moment Diagrams:** Shear force diagrams (SFD) and Bending moment diagrams (BMD). SFD and BMD for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum SF and BM and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

**Module 4: Flexural Stresses-Theory of Simple Bending:** Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

**UNIT-III (15 Hours)**

**Module 5: Shear Stresses:** Derivation of formula –Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

**Module 6: Slope and deflection:** Relationship between moment, slope and deflection, Double Integration method, Macaulay's method, Use of these methods to calculate slope and deflection for determinant beams.

**UNIT-IV (15 Hours)**

**Module 7: Torsion:** Derivation of torsion equation and its assumptions, Applications of the equation for hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stresses and maximum shear stresses under combined loading of bending and torsion, Analysis of closely-coiled-helical springs. [7]

**Module 8: Thin Cylinders and Spheres:** Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

**Recommended Text Books / Reference Books:**


1. Timoshenko, S. and Young, D. H.,–Elements of Strength of Materials, DVNC, New York, USA.
2. Kazmi, S. M. A., –Solid Mechanics‖ TMH, Delhi, India.
3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall.
4. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd edition New York, NY: McGraw Hill, 1979
5. Laboratory Manual of Testing Materials - William Kendrick Hall
6. Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf, TMH
7. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.


## BUILDING MATERIALS & CONSTRUCTION

| Subject Code: BCIES1-324 | L | T | P | C | Duration: 45 Hrs. |
|---|---|---|---|---|---|
| | 3 | 0 | 0 | 3 | |

**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. Obtain differentiate the fine aggregates and coarse aggregates under various views.
4. Explain various types of cements and their applications in construction. Various field and laboratory tests on cement

5. Analyze the importance of mineral and chemical admixtures, requirements of the concrete in construction
6. Explain the suitability of floors in buildings like mosaic flooring, terrazzo flooring, rubber flooring, asphalt flooring.
7. Explain the foundations and uses of different types of foundations.
8. Explain the classification of various types of woods. State the properties, seasoning of timber.

**UNIT-I (11 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

**Building Stones:** General terms, Uses of stones, qualities of a good building stone, deterioration of stones, preservation of stones, artificial stones, common building stones of India and their uses

**UNIT-II (12 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.

**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, tests for concrete.

**Miscellaneous Materials:** Admixtures, Paints, Plastics.

**UNIT-III (11 Hours)**

**Foundation and Walls:** Definition, types of foundations, 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 & disadvantage.

**UNIT-IV (11 Hours)**

**Damp Proofing: C**auses and bad effects of dampness, preventive measures for dampness in buildings.

**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.

**MATHEMATICS-III (Transform & Discrete Mathematics)**

| **Subject Code: BMATH4-301** | **L** | **T** | **P** | **C** | **Duration: 30 Hrs.** |
|---|---|---|---|---|---|
| | 2 | 0 | 0 | 2 | |

**Transform Calculus**

**Unit-I**

**Module 8a: *Transform Calculus* -1**

Polynomials – Orthogonal Polynomials – Lagrange's, Chebysev Polynomials; Trigonometric Polynomials, Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions, Finding inverse Laplace transform by different methods, convolution theorem, Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method. (6)

**Module 8b: *Transform Calculus*-2**

Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications. (4)

**Discrete Mathematics**

**Unit-II**

**Module 9a: *Sets, relations and functions*:**

Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. (4)

**Module 9b: *Propositional Logic:***

Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, Decision problems of propositional logic, Introduction to first order logic and first order theory. (3)

**Unit-III**

**Module 9c: *Partially ordered sets:***

Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices, Boolean and pseudo Boolean lattices. (3)

**Module 9d: *Algebraic Structures:***

Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations-ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only). (3)

**Unit-IV**

**Module 9e:** ***Introduction to Counting:***

Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions. (4)

**Module 9f:** ***Introduction to Graphs:***

Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees. (3)

**Recommended Text Books / Reference Books:**


1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
5. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
6. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.
7. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.
8. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.
9. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.
10. N. Deo, Graph Theory, Prentice Hall of India, 1974.
11. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.
12. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.


**CIVIL ENGINEERING- SOCIETAL & GLOBAL IMPACT**

| **Subject Code: BHSMC0-022** | **L** | **T** | **P** | **C** | **Duration: 30 Hrs.** |
|---|---|---|---|---|---|
| | 2 | 0 | 0 | 2 | |

**Course Objectives:**

The course should enable the students to:

1. Awareness of the importance of Civil Engineering and the impact it has on the Society and at global levels.
2. Awareness of the impact of Civil Engineering for the various specific fields of human endeavor
3. Need to think innovatively to ensure Sustainability.

**Course Outcomes:**

1. The impact which Civil Engineering projects have on the Society at large and on the global arena and using resources efficiently and effectively.

2. The extent of Infrastructure, its requirements for energy and how they are met: past, present and future.
3. The Sustainability of the Environment, including its Aesthetics.
4. The potentials of Civil Engineering for Employment creation & its Contribution to the GDP.
5. The Built Environment and factors impacting the Quality of Life
6. Applying professional and responsible judgment and take a leadership role;

**UNIT-I (07 Hours)**

**Module1**: Introduction to Course and Overview, Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature, Global warming, its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis.

**Module2**: Understanding the importance of Civil Engineering in shaping and impacting the world, The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering.

**UNIT-II (08 Hours)**

**Module 3: Infrastructure**- Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability in civil engineering.

**UNIT-III (07 Hours)**

**Module 4: Environment**- Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Environmental Metrics & Monitoring; Innovations and methodologies in civil engineering for ensuring Sustainability.

**UNIT-IV (08 Hours)**

**Module 5: Built Environment**- Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Intelligent/ Smart Buildings; Conservation, Repairs & Rehabilitation of Structures.

**Module 6:** Civil Engineering Projects – Environmental Impact Analysis procedures; Waste(materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment(projects, facilities management), Innovations and methodologies for ensuring Sustainability during Project development.

**Recommended Text Books / Reference Books:**

1. NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.
2. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
3. Ashley R M., Nowell R., Gersonius B., Walker L. (2011). Surface Water Management and Urban Green Infrastructure, Review of Current Knowledge, Foundation for Water Research
1. Blackmore J M., Plant R A J. (2008). Risk and resilience to enhance sustainability with application to urban water systems. J. Water Resources Planning and Management. ASCE.
2. http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx

## ENGINEERING & SOLID MECHANICS LAB

**Subject Code: BCIES1-325** | **L T P C** | **Duration: 30 Hrs.**

0 0 2 1

**Course Objectives:**

1. To deal with an experimental determination and evaluation of material behavior in order to explain the deformation and fracture behavior of structural materials.
2. To determine the mechanical and structural properties of materials from the laboratory.
3. To test the materials under accurately known forces or loads.
4. To study the material behavior by careful observations and measurements.
5. To provide students with all information concerning principle, way of measurement, as well as practical application of mechanical behavior of materials.

**Course Outcomes:**

1. Students will be able to operate the laboratory equipment, interpret the laboratory data including conversion of measurements into engineering values.
2. They will be able to find the deviation of material properties (strength and stiffness) from the engineering values,
3. They will be able to observe various modes of failure in compression, tension, and shear.
4. They will be able to observe various types of material behavior under similar loading conditions.
5. They will be able to observe material behavior under repeated loading.

**Laboratory Experiments:**

1. To determine Impact Strength of Mild Steel.
2. To determine the spring constant / stiffness of the given spring.
3. To determine Brinell and Vicker's Hardness numbers of mild steel.
4. To determine the Rockwell Hardness number of metals.
5. To determine the Fatigue Strength of mild steel.
6. To determine Torsional Strength of mild steel and cast iron.

7. To determine Tensile Strength of mild steel.
8. Determination of shear forces in beams.
9. Determination of bending moments in beams.
10. Measurement of deflections in statically determinate beams.

**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. Analysis of Structures, Volume – I, by V. N. Vazirani & Ratwani.

## FLUID MECHANICS LAB

| Subject Code: BCIES1-326 | L | T | P | C | Duration: 30 Hrs. |
|---|---|---|---|---|---|
| | 0 | 0 | 2 | 1 | |

**Course Objectives:**

The course should enable the students to:

1. To determine the various parameters related to fluid flow in Pipe and in open channels.
2. The Fluid Mechanics laboratory is used to examine the properties of fluids and to conduct experiments involving both in incompressible and compressible flow.
3. Facilities are available for investigating the fundamentals of fluid statics as well as kinematics & Kinetics of fluid flow to enhance the hands-on experience of our students.
4. The laboratory is also equipped to conduct experiments on open channel flow, centrifugal pumps and groundwater flow.

**Course Outcomes:**

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

1. Predict the met centric height of floating vessel and utility in vessel design.
2. Calibrate various flow measuring devices (venturimeter, orifice meter and notches).
3. Authenticate the Bernoulli's theorem experimentally.
4. Assess the discharge of fluid over broad crested weir.
5. Compute various losses and velocity in pipe flow in field.
6. Predict the coefficient of discharge for Broad Crested Weir.
7. Determine the hydraulic coefficients for flow through an orifice.
8. Determine the friction coefficient for pipes of different diameter.

**Laboratory Experiments:**

1. To determine the metacentric height of a floating vessel under loaded and unloaded conditions.
2. To study the flow through a variable area duct and verify Bernoulli's energy equation.
3. To determine the coefficient of discharge for an obstruction flow meter (venturimeter /orifice meter).
4. To determine the discharge coefficient for a V-notch or rectangular notch.

5. To determine the coefficient of discharge for Broad crested weir.
6. To determine the hydraulic coefficients for flow through an orifice.
7. To determine the friction coefficient for pipes of different diameter.
8. To determine the head loss in a pipe line due to sudden expansion / sudden contraction/ bend.
9. To determine the velocity distribution for pipe line flow with a pitot static probe.
10. To study the transition from laminar to turbulent flow and to ascertain the lower critical Reynolds number.

**Recommended Books / Manuals:**

1. Practical Fluid Mechanics for Engineering Applications (Mechanical Engineering (Marcell Dekker) By John J. Bloomer
2. Fluid Mechanics Practical Manual by S. Sarabjit Singh

## SURVEYING LAB

| **Subject Code: BCIES1-327** | **L** | **T** | **P** | **C** | **Duration: 60 Hrs.** |
|---|---|---|---|---|---|
| | 0 | 0 | 4 | 2 | |

**Course Objectives:**

To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

**Course Outcomes:**

At the end of the course, the student will practically be able to draw plans & maps to determine the areas before taking up any civil engineering works.

1. Surveying of an area by chain survey (closed traverse) & plotting.
2. Survey of a given area by prismatic compass and surveyor compass and plotting after adjustment.
3. Radiation method, intersection methods by plane table survey.
4. Two point and three point problems in plane table survey.
5. Levelling – Longitudinal and cross-section and plotting
6. Trigonometric levelling using Theodolite
7. Height and distances using principles of tacheometric surveying
8. (a) Measurement of Horizontal angle & vertical angle
   (b) Distance between inaccessible points by theodolite.

**Laboratory Experiments:**

1. Measurement of distance, ranging a line.
2. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
3. To find the level of different points by height of instrument, rise & fall methods.

4. Measurement of horizontal and vertical angle by Theodolite.
5. Determination of tachometric constants and determination of reduced levels by tachometric observations.
6. Plane table survey, different methods of plotting, two point & three point problem.
7. Determination of height of an inaccessible object.
8. Setting out of circular curves, transition curve in the field using different methods.
9. Working of Total Station.

**Recommended Books / Manuals:**


1. B.C. Punmia, A. K. Jain, and Arun Kumar Jain, Surveying, Vol. I, II, Laxmi Publications
2. S.K. Duggal, Tata McGraw Hill. Vol.-I
3. R. Agor, Surveying', Khanna Publishers**.**
4. S.S. Bhavikatti, Surveying & Levelling Vol. I, II.
5. Narinder Singh, Surveying, Tata McGraw Hill.
6. N.N. Basak, Surveying and leveling, Tata McGraw Hill, New Delhi.


## COMPUTER-AIDED CIVIL ENGINEERING DRAWING-I

| Subject Code: BCIES1-328 | L | T | P | C | Duration: 30 Hrs. |
|---|---|---|---|---|---|
| | 0 | 0 | 2 | 1 | |

**Course Objectives:**

The students will be able to:

1. Develop structural designs.
2. Understand design procedures and ways- The student learn to interpret drawings, and to produce designs using Civil Engineering software.

**Course Outcomes:**

1. Design and draw working structural drawings of various concrete structures and their members.
2. Understand and interoperate design aids and handbooks.
3. Use of relevant Indian Standard specifications applicable to Reinforced concrete structures.

**Laboratory Drawing Works:**

1. Basic Structural Drawings of concrete & steel elements such as plan, Elevation, side plans of beams, columns, slabs, Connections, Tension Members, Compression Members, steel Beams, Foundations, Roof Trusses, etc.

## ENVIRONMENTAL SCIENCE

| Subject Code: BMNCC0-002 | L | T | P | C | Duration: 30 Hrs. |
|---|---|---|---|---|---|
| | 2 | 0 | 0 | 0 | |

**Course Objectives:**

1. To identify and understand the importance and related problem of natural resources.

2. To realize the importance of ecosystem and biodiversity for maintaining ecological balance.

3. To identify the major pollutants and abatement devices for environmental & waste management and sustainable development.

4. To understand the conceptual process related with the social issues, various climatologically associated problems, and their possible solutions.

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

1. Technologies based on ecological principles and environmental regulations, which in turn helps in sustainable development.
2. Conceptualize the processes and various factors involved in the formation of environment.
3. Recognize the importance of environment and the sustainable natural resources.
4. Use scientific reasoning to identify and understand environment problems and evaluate potential solution.
5. Identify the impacts of human activities on environment and role of society in these impacts.

**UNIT-I (07 Hours)**

**Natural Resources:** Renewable and Non-renewable Resources: Natural resources and associated problems. (a) Forest resources: Use and over-exploitation, deforestation. Timber extraction and their effects on forests, tribal people and case studies. (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits & problems and case studies. (c) Mineral resources: Use and over-utilization, environmental effects of extracting and using mineral resources.

**UNIT-II (08 Hours)**

**Ecosystems:** (a) Concept of an ecosystem. (b) Structure and function of an ecosystem. (c) Producers, consumers and decomposers. (d) Energy flow in the ecosystem. (e) Ecological succession. (f) Food chains, food webs and ecological pyramids.

**Biodiversity and its Conservation:** Introduction – Definition: genetic, species and ecosystem diversity (b) Bio-geographical classification of India (c) Value of biodiversity: consumptive use, productive use, social and ethical aesthetic.

**UNIT-III (08 Hours)**

**Environmental Pollution:** Definition (a) Causes, effects and control measures of: i) Air pollution ii) Water pollution iii) Soil pollution iv) Marine pollution v) Noise pollution vi) Thermal pollution vii) Nuclear pollution

(b) Solid Waste Management: Causes, effects and control measures of urban and industrial waste.

**UNIT-IV (07 Hours)**

**Social Issues and the Environment:** (a) From unsustainable to sustainable development (b) Urban problems and related to energy (c) Water conservation, rain water harvesting, Watershed Management (d) Resettlement and rehabilitation of people; its problems and concerns. (e) Environmental ethics: Issues and possible solutions (f) Climate change, global warming, acid rain,

| |
|---|
| ozone layer depletion, nuclear accidents and holocaust. |
| **Recommended Text Books / Reference Books:**<br><br>1. C.P. Kaushik, 'Environmental Science'.<br>2. J.G. Henry and G.W. Heinke, 'Environmental Sc. & Engineering', Pearson Education, 2004.<br>3. G.B. Masters, 'Introduction to Environmental Engg. & Science', Pearson Education, 2004.<br>4. ErachBharucha, 'Textbook for Environmental Studies', UGC, New Delhi. |

| STRUCTURAL ANALYSIS-I | | | | | |
|---|---|---|---|---|---|
| **Subject Code: BCIES1-421** | **L** | **T** | **P** | **C** | **Duration: 45 Hrs.** |
| | 3 | 0 | 0 | 3 | |

**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 (12 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 (11 Hours)**

**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 (11 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 (11 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'.

## DESIGN OF CONCRETE STRUCTURES-I

**Subject Code: BCIES1-422** | **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 (05 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 (12 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'.

## TRANSPORTATION ENGINEERING-I

**Subject Code: BCIES1-423** **L T P C** **Duration: 45 hrs.**

3 0 0 3

**Course Objectives:**

1. The objective of this course is to acquaint the students about highway planning and development in India.
2. The course will cover selection of highway alignment, design of geometric elements of highways, carry out traffic studies and implement traffic regulation and control measures and intersection design.
3. The characteristic properties of road construction materials and design of flexible and rigid pavements as per IRC guidelines shall also be covered in this course.

**Course Outcomes:**

1. The student will learn about essentials of highway planning and features of highway development in India.
2. The student will learn how to do selection of highway alignment and design the geometric elements of highways.
3. The student will learn how to carry out traffic studies and implement traffic regulation and control measures and intersection design.
4. The student will know about characteristic properties of road construction materials and design the flexible and rigid pavements as per IRC guidelines.

**UNIT-I (12 Hours)**

**Highway Development and Planning:** Classification of roads, road development in India, current road projects in India, highway alignment and project preparation.
**Geometric Design of Highways:** Highway cross section elements, sight distance, design of horizontal alignment, design of vertical alignment.

**UNIT-II (11 Hours)**

**Traffic Characteristics & Studies: R**oad user characteristics, driver characteristics, vehicular characteristics. Volume studies, speed studies, O-D survey, parking study.
**Traffic Safety and Control Measures: T**raffic signs, markings, islands, signals, cause and type of accidents, use of intelligent transport system.

**UNIT-III (11 Hours)**

**Pavement Materials:** Materials used in highway construction- soils, stone aggregates, bituminous binders, desirable properties, tests, requirements for different types of pavements.
**Paving Mixes:** Marshall method of bituminous mix design, Super pave and Concrete mix design for rigid pavements.

**UNIT-IV (11 Hours)**

**Design of Pavements:** Pavement types, factors affecting design and performance of pavements, flexible pavements- components and functions, stresses in flexible pavements, design of flexible pavements as per IRC.
**Rigid Pavements**- components and functions, stresses in rigid pavements, design of cement concrete pavements as per IRC.

**Recommended Text Books / Reference Books:**

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros., Roorkee.
2. Kadiyali, L.R., 'Traffic Engineering and Transport Planning', Khanna Publishers, Delhi.
3. Partha Chakraborty, ' Principles of Transportation Engineering, PHI Learning, New Delhi.
4. S.K. Sharma, 'Principles, Practice & Design of Highway Engineering', S. Chand & Company Ltd., New Delhi.
5. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski, 'Principles of Highway Engineering and Traffic Analysis', John Wiley& Sons, USA.
6. Paul H. Wright and Karen K. Dixon, 'Highway Engineering', Wiley Student Edition, USA.
7. C.A.O. Flaherty, 'Highway Engineering', Vol. 2, Edward Arnold, London.

## ENVIRONMENTAL ENGINEERING-I

| Subject Code: BCIES1-424 | L | T | P | C | Duration: 45 Hrs. |
|---|---|---|---|---|---|
| | 3 | 0 | 0 | 3 | |

**Course Objectives:**
The course should enable the students to:

1. Inculcate the basics of water demand, supply, source & future demand estimation.
2. The applicability of concepts of water quality & its examinations.
3. Inculcate the basic concepts of water treatment, its design and management.
4. Extensive knowledge of sources, conversion, distribution & maintenance of water supply system.
5. Modern low cost water treatment techniques for rural supply system.

**Course Outcomes:**

1. An ability to design a system, component, or process to meet desired needs.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, welfare, and environmental factors.
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data for future demand & supply.

**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 (12 Hours)**

**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, water desalination and demineralization, taste and odour removal.

**UNIT-IV (11 Hours)**

**Water Supply Systems:** 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.
**Rural water supply:** Principles, selection of source, rain water harvesting, quantitative requirements, low cost treatment techniques.

**Recommended Text Books / Reference Books:**

1. Water Supply Engineering- Environmental Engg. (Vol. – I) 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) by S.K. Garg, Khanna Publishers, Delhi
5. Water Supply and Sewerage by Steel EW and McGhee, Terence J.; McGraw Hill.

## ENGINEERING GEOLOGY

| Subject Code: BCIES1-425 | L | T | P | C | Duration: 30 Hrs. |
|---|---|---|---|---|---|
| | 2 | 0 | 0 | 2 | |

**Course Objectives:**

1. The principal objective of the engineering geologist is the protection of life and property against damage caused by various geological conditions.
2. Engineering geologists provide geological and geotechnical recommendations, analysis, and design associated with human development and various types of structures.

**Course Outcomes:**

1. It will provide the students with basic knowledge and understanding in the most central part of engineering geology, rock and soil.
2. The course will give students an overview & an understanding of the engineering properties of rock and soil materials, debris generation and distribution, engineering geological investigations, slope stability, geological factors affecting the stability of a facility on and in the soil, engineering, stability and protection of underground facilities, etc.
3. Students will develop the ability to perform basic engineering geological assessments and analyses, and to understand the relevance of engineering geology in complex projects in and on solid rock.

**UNIT-I (07 Hours)**

**General Geology**: Scope of geology in Civil Engineering - the earth, its structure and environment - Standard geological time scale, unit & fossils, physiographic, stratigraphic and tectonic divisions of India - geomorphologic (surface) processes – weathering – types , weathered products, Fluvial processes, Glacial Deposits, wind action, and their significance in Civil Engineering.

**UNIT-II (08 Hours)**

**Mineralogy and Petrology**: Physical properties of minerals – classification - study of important rock forming minerals – Quartz family, feldspar family, Mica family, calcite, Iron oxide minerals, Clay minerals and their behaviour and significance in the field of Civil Engineering. Classification of rock - mode of formation - distinction between igneous, sedimentary and metamorphic rocks. Characteristic of rocks. Study of important rocks: granite, syenite, diorite, gabbro, pegmatite, dolerite, basalt, sand stone, limestone, shale, quartzite, marble, slate.

**UNIT-III (07 Hours)**

**Structural Geology and Geophysical Methods**: Attitude of beds - out crops, study of structures such as folds, faults, joints, unconformities, in-lier and out-lier - their brief classification and their bearing on engineering construction. Principles of geophysical methods, electrical resistivity method, seismic method and its applications in civil engineering.

**UNIT-IV (08 Hours)**

**Geology and Construction**: Role of geology in site investigation, Geotechnical classification of rock, geological considerations in open excavation, tunnels and dam site, reservoir site, buildings, road cuttings, landslides and land subsidence its causes, classification and preventive measures, groundwater- types of aquifers, properties of geological formations affecting groundwater and its role as a geological hazard.

**Recommended Text Books / Reference Books:**

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons
2. A Text Book of Engineering Geology, N. ChennaKesavulu, 2nd Edition (2009), Macmillan Publishers India.
3. Reddy D.," Engineering Geology for Civil Engineers", Oxford & IBH , 1995
4. Blyth, F.G.M., "A Geology for Engineers", Arnold, Londo, 2003.
5. Bell. F.G, "Fundamentals of Engineering Geology" Butterworth, 1983.

## GEOMATICS ENGINEERING

**Subject Code: BCIED1-451** **L T P C** **Duration: 45 Hrs.**

3 0 0 3

**Course Objectives:**

1. Have the basic math & science knowledge and technical skills of the Geomatics Engineering Technology discipline appropriate to enter careers in the geospatial community, for example, boundary surveying and legal principles, route and construction surveying, survey measurement analysis and adjustments, Global Positioning System (GPS), Photogrammetry, geodesy, land/Geographic Information Systems (GIS), and 3D scanning.
2. Have the ability to execute Geomatics project activities for delivery in response to the needs of private and public industry.
3. Have appropriate understanding of standards and specifications of Geomatics practices in analyzing positional accuracy of measurement systems and in preparing land records and plats by meeting legal requirements.
4. Have the knowledge to pass the national Fundamentals of Surveying and PS exams, and after gaining experience, be qualified to take the Professional Surveying License Exams with an understanding of continued lifelong learning.
5. Have an understanding of the professional, ethical and social issues with commitment to quality and dependability.

**Course Outcomes:**

1. An ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline.
2. An ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
3. An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.
4. An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and an ability to function effectively as a member as well as a leader on technical teams.

### UNIT-I (12 Hours)

**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.

### UNIT-II (11 Hours)

**Remote Sensing:** Introduction, Basic Principles, Electromagnetic Energy Spectrum, Interaction of EM Energy with Matter, Effect of Atmosphere on EMR, Interaction of EM radiations with Earth‘s Surface, Remote sensing Sensor systems, Remote Sensing Observation Platforms, Ideal and Real Remote Sensing Systems, Data Acquisition and Interpretation, Resolution Concept, Applications

of Remote Sensing. Methodology for Land Use /Land Cover Analysis and Mapping, Remote Sensing in India. Satellite Data products.

**UNIT-III (11 Hours)**

**Geographical Information System (GIS):** Introduction, Sub system of GIS, Hardware of GIS, Data and Data structure for GIS, Representation of features, Vector data & Raster data structure, Data format conversions, Capabilities/Functionalities of GIS, Neighborhood Functions, Map Overlay Analysis, Data Quality, Sources of Errors, Applications of GIS, GIS Software.

**UNIT-IV (11 Hours)**

**Global Positioning System (GPS):** Introduction, GLONASS system, GALILEO System, NAVIC system, GPS over view, Space Segment, Control segment, User segment, Principle of position determination, Determining Satellite-to-User Range, Calculation of user position, GPS system time, Carrier phase measurement techniques, Indian Coordinate system for using GPS, Uses and Applications of GPS.

**Recommended Text Books / Reference Books:**

1. Arora, K.R., 2007: Surveying Vol.-III, Standard Book House.
2. Duggal, S.K Higher.; Surveying Vol.-II, Tata McGraw Hill.
3. Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications.
4. Chang,T.K. 2002: Geographic Information Systems, Tata McGraw Hill.
5. Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press.
6. Punmia, B.C., Jain A.K., 2005: Higher Surveying, Luxmi Publications.

## NUMERICAL METHODS IN CIVIL ENGINEERING

| Subject Code: BCIED1-452 | L | T | P | C | Duration: 45 Hrs. |
|---|---|---|---|---|---|
| | 3 | 0 | 0 | 3 | |

**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 (12 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, Homogeneous and Eigen Value problem, Non-linear equations.

**UNIT-II (11 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 (11 Hours)**

**Numerical Integration:** Numerical Integration by trapezoidal and Simpson's rule.
**Statistical Methods:** Method of correlation and Regression analysis for fitting a polynomial equation by least square.

**UNIT-IV (11 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.
**Interpolation:** Newton's Backward, Forward and Lagrange's Interpolation 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.

## CONCRETE CONSTRUCTION TECHNOLOGY

**Subject Code: BCIED1-453** **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, Fibre reinforced concrete, light weight concrete, Heavy weight concrete, High performance Concrete.

**UNIT-III (12 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 (11 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.

## CONCRETE TECHNOLOGY LAB-I

**Subject Code: BCIES1-426** **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. The knowledge of these tests is very essential to choose appropriate construction material to 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 and fineness of cement.
2. Determine the specific gravity, soundness and compressive strength of cement
3. Determine the fineness modulus, grading, density & specific gravity of aggregates.
4. Determine the shape & size, compressive strength and water absorption of bricks.
5. Determine the compressive strength and water absorption of interlocking Pavers.
6. Determine the yield Stress, ultimate Stress, elongation of Steel bars.

**Laboratory Experiments:**

1. To Determine the Specific Gravity of cement.
2. To Determine the Soundness of cement.
3. To Determine the Standard Consistency, Setting Times (Initial and Final Setting Time) of Cement.
4. To Determine the Compressive Strength of Cement.
5. To Determine the Fineness Modulus & Grading of Fine and Coarse Aggregates.
6. To Determine the Bulk Density, Water Absorption and Specific gravity of Fine and Coarse Aggregates.
7. To Determine the Compressive strength, Efflorescence and Water absorption of Bricks as per IS standard.
8. To perform Shape and Size test on Bricks.
9. To Determine the Compressive strength and Water absorption of interlocking Pavers as per IS standard.
10. To Determine the Yield Stress, Ultimate Stress and Elongation of Steel bars.
11. To Perform Bend & Rebend test on Steel bars.

**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: BCIES1-427 | 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.

## TRANSPORTATION ENGINEERING LAB

| **Subject Code: BCIES1-428** | **L** | **T** | **P** | **C** | **Duration: 30 Hrs** |
|---|---|---|---|---|---|
| | 0 | 0 | 2 | 1 | |

**Course Objectives:**

1. The main objective of this course is to give practical exposure of laboratory testing of different kinds of highway construction materials such as Soil, Aggregate and Bitumen to check their suitability for their use in road construction.
2. The knowledge of these tests is very essential for a civil engineer to choose appropriate construction material to exercise better quality control in a road construction project.

**Course Outcomes:**

1. The student will learn the laboratory testing of different kinds of highway construction materials such as Soil, Aggregate and Bitumen.
2. The student will learn to check the suitability of highway construction material so as to exercise better quality control in a road construction project.

**Tests on Sub-Grade Soil:**

1. Proctor's Compaction Test
2. California Bearing Ratio Test

**Tests on Road Aggregates:**

1. Crushing Value Test
2. Los Angles Abrasion Value Test
3. Impact Value Test
4. Shape Test (Flakiness and Elongation Index)

**Tests on Bituminous Materials:**

1. Penetration Test
2. Ductility Test
3. Softening Point Test
4. Flash & Fire Point Test

**Recommended Books / Manuals:**

1. S.K. Khanna and C.E.G. Justo, 'Highway Material & Pavement Testing', Nem Chand and Brothers, Roorkee.
2. Ajay K. Duggal, Vijay P. Puri, 'Laboratory Manual in Highway Engineering', New Age Publications, New Delhi.