School of Engineering & Technology

DEPARTMENT OF CIVIL ENGINEERING

B.Tech - Civil Engineering

Semester III

Sl.No	Course Code	Course Name	Hours per week			Credits
			L	T	P	
1.	BCE301T	Solid Mechanics	3	0	0	3
2.	BCE311P	Solid Mechanics	0	0	2	1
3.	BMA23113T	Mathematics to Civil Engineering	3	1	0	4
4.	BCE302T	Civil Engineering, Materials, Testing & Evaluation	1	0	0	1
5.	BCE302P	Civil Engineering, Materials, Testing & Evaluation	0	0	2	1
6.	BCE303T	Building Planning and Computer - Aided Civil Engineering Drawing	2	0	0	2
7.	BCE313P	Building Planning and Computer - Aided Civil Engineering Drawing	0	0	2	1
8.	BCE304T	Concrete Technology	2	0	0	2
9.	BCE314P	Concrete Technology	0	0	2	1
10.	BCE305T	Fluid Mechanics	3	0	0	3
11.	BCE315P	Fluid Mechanics	0	0	2	1
12.	IKS	https://iksindia.org/course-list.php https://www.ugc.gov.in/pdfnews/6436045_Guidelines-IKS-in-HE-Curricula.pdf	2	0	0	2
13.	MNCAC	Disability, Accessibility and Universal Design (pg:95/pg:128, AICTE Model Curriculum for Undergraduate degree in Civil)	3	0	0	0
		Total	**19**	**1**	**10**	**22**
14.		Minor/Honours/Value Added Courses (Optional)	3	0	0	3

BCE301T	SOLID MECHANICS	L	T	P	C
		3	0	0	3

Pre-requisite: Physics and Mathematics

Course Objectives:

1. To understand the stresses and strains in the members subjected to axial, bending and torsional loads
2. To apply basic concept to solve the bending moment and shear force of beam subjected to different loading.
3. To analyze the bending and shear stresses in beam; and to calculate deflection in beams at any point on a beam subjected to a combination of loads.
4. To evaluate and solve torsion problems in bars and thin-walled members.

Expected Course Outcome:

Upon completion of this course, the student will be able to

1. 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 center of thin wall beams
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; solve torsion problems in bars and thin-walled members.

Module:1 *Simple Stresses and Strains* — **6 hours**

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, Lateral strain, Poisson's ratio and volumetric strain, Elastic moduli and the relationship between them, Bars of varying section, composite bars, Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact and shock loadings.

Module:2 *Compound Stresses and Strains* — **4 hours**

Two-dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress and its applications. Relationship between elastic constants.

Module:3 *Bending moment and Shear Force Diagrams* — **6 hours**

Introduction to shear force and bending moment. Applications to simply supported beam, cantilever beam and overhanging beam for different loading conditions like Point load, uniformly distributed load, uniformly varying load, application of moment. Maximum BM and SF. Point of contra flexure. The loading diagrams from bending moments diagrams.

Module:4 *Flexural Stresses* — **4 hours**

Theory of simple bending – Assumptions – Derivation of bending equation – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections.

Module:5 *Shear Stresses* — **3 hours**

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

Module:6 *Slope and deflection* — **6 hours**

Computation of slope and deflection in Simply supported and cantilever beams by double integration, Moment Area method, Macaulay's method, Conjugate beam method, Applications to simply supported, overhang and cantilever beams.

Module:7 *Torsion*		**4 hours**
Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under torsion.		
Module:8 *Thin Cylinders*		**3 hours**
Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder subjected to internal pressures.		
Total Lecture hours		**36 hours**
Text Book(s)		
1.	Bansal, R. K. (1998). Engineering Mechanics and Strength of materials. Laxmi Publications.	
2.	D.S. Bedi, "Strength of Materials", Khanna Book Publishing Co.	
Reference Books		
1.	Bhavikatti, S. S. (2002). Strength of Materials. Vikas Publishing House.	
2.	Punmia, B. C. (2002). Mechanics of materials. Firewall Media.	
3.	Ramamrutham, S., & Narayan, R. (2008). Strength of Materials. Dhanpat Rai Pub Company.	
4.	Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004	
5.	Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.	
6.	Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.	
7.	Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.	

BMA23113T	MATHEMATICS TO CIVIL ENGINEERING	L	T	P	C
		3	1	0	4

Pre-requisite: Physics, Mathematics I and II

Course Objectives

- To enable the students to study Fourier Transforms of various functions.
- To enable the students to study the Laplace Transforms, properties of Laplace Transform, inverse Laplace Transform and some applications to solve the differential equations and integral equations.
- To find the solutions of second order PDEs by the technique of separation of variables determined by conditions at the boundary of the spatial domain and initial conditions at time zero.

Course Outcome

After successful completion of this course, the students will be able to

CO1: apply basic knowledge of Fourier series and develop Fourier series of periodic functions

CO2: evaluate Laplace Transform as well as Inverse Laplace Transform of function and solve the ordinary differential equations and their applications to engineering sciences.

CO3: apply the separation of variables method to solve well-posed initial and boundary value problems for PDEs

Module 1: *Fourier Series*	**14 hours**

Definition of Fourier series, Orthogonal and Orthonormal functions, Fourier series with arbitrary period, in particular periodic function with period 2, Fourier series of even and odd function, Half range Fourier series.

Module 2: *Laplace Transforms and Applications*	**20 hours**

Introduction, Definition of the Laplace transform, Useful properties of Laplace transform (without proof): Linearity, First shifting theorem, Multiplication and division by t, transforms of derivatives and integrals, Heaviside unit step function, Dirac's delta function, second shifting theorem, Laplace transform of Periodic function, Inverse Laplace transform using partial fraction and Convolution theorem (without proof), Application to solve initial and boundary value problem involving ordinary differential equations with one dependent and constant coefficient.

Module 3: *Partial Differential Equation*	**14 hours**

Second order PDE of mathematical physics (Heat, wave and Laplace equation, one dimensional with standard boundary conditions), Solution by separation of variable method using Fourier series.

Total Lecture hours	**48 hours**

Text Book(s)

1. AICTE's Prescribed Textbook: Mathematics-I (Calculus & Linear Algebra), Reena Garg, Khanna Book Publishing Co., New Delhi, 2023.
2. Bali, N. P., Goyal M., A text book of engineering Mathematics, Laxmi Publications, Reprint, 2014

Reference Book(s)

1. Kreyszig E, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Garg R., Engineering Mathematics, Khanna Book Publishing Company, 2022.
3. Wiley C. R., "Advanced Engineering Mathematics", McGraw Hill Inc., New York Ed., 1993
4. Ramana D. V., "Higher Engg. Mathematics", The MaGraw-Hill Inc., New Delhi, 2007.

BCE302T	CIVIL ENGINEERING MATERIALS, TESTING & EVALUATION	L	T	P	C
		1	0	0	1

Pre-requisite: Nil

Course Objectives:

1. To make measurements of behavior of various materials used in Civil Engineering.
2. To provide physical observations to complement concepts learnt
3. To provide students with all information concerning principle and way of measurement.

Expected Course Outcome:

Upon completion of this course, the student will be able to

- Different materials used in civil engineering applications.
- Planning an experimental program, selecting the test configuration, selecting the test specimens and collecting raw data.
- Documenting the experimental program including the test procedures, collected data, method of interpretation and final results.

Module:1 *Introduction*	**3 hours**

Introduction to Engineering Materials covering, Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes, Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses of these materials.

Module:2 *Introduction to Material Testing covering*	**3 hours**

What is the “Material Engineering”? -Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material (brittle, quasibrittle, elastic and so on) True stress – strain interpretation of tensile test; hardness tests;

Module:3 *Material Strength*	**3 hours**

Bending and torsion test; strength of ceramic; Internal friction, creep – fundaments and characteristics; Brittle fracture of steel – temperature transition approach; Background of fracture mechanics; Discussion of fracture toughness testing – different materials; concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics.

Module:4 *Standard Testing & Evaluation Procedures*	**3 hours**

Laboratory for mechanical testing; Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Creep.

Tutorial

Total Lecture hours	**12 hours**

Text Book(s)

1. Sharma S.K., Civil Engineering Construction Materials, Khanna Publishing House.
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing'.

Reference Books

1.	Kadiyali L.R., Highway Engineering, Khanna Book Publishing Co., New Delhi.
2.	Rajoria K.B, Case Studies in Construction Project Management, Khanna Publishing House.
3.	Nem Chand& Bros, Fifth Edition Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann.

BCE303T	BUILDING PLANNING AND COMPUTER - AIDED CIVIL ENGINEERING DRAWING	L	T	P	C
		2	0	0	2

Pre-requisite: Nil

Course Objectives:

1. Demonstrate the practical concept of building drawing and planning.
2. Understanding the different concept of planning of different types of building.
3. Gain sufficient skills for preparing water supply, drainage system and Solid Waste Collection and Disposal System.
4. Design and planning of staircase design.
5. Gain the basic concept of Electrical Services, Fire Protection System in a building.

Expected Course Outcome:

Upon completion of this course, the student will be able to
1. Implement principles of planning of buildings
2. Design and draw various constructional drawing of the buildings.
3. Plan various building services- water supply system, solid waste management, waste water management and fire protection.

Module:1 *Principles of Residential and Public Buildings* — **2 hours**

Recommendation of National building code, Types of Building- Residential and Public and Green building technology. Concept of built environment and its application in planning.

Module:2 *Principle of Building Planning* — **6 hours**

Introduction- Site selection and planning, Preparation of constructional details and drawings-plan, elevation, section, site plan, foundation plan, terrace plan and door-window.
Planning of building such as

- Residential building –Load bearing structure, RCC framed structure. Building for Education – school, college. Library
- Building for health –Dispensary, Hospital Industrial structure
- Building for entertainment-Theatre, club house, sports club.

Module:3 *Building's Water Supply and Drainage & Solid Waste Collection and Disposal System.* — **4 hours**

Design of water supply, waste water and storm water collection system for various types of buildings. Pumps and Pump House. Wet and dry solid waste segregation, Vermi-composting etc. Provision of Chutes. Accessibility in public Sanitation Systems.

Module:4 *Electrical Services* — **4 hours**

Domestic Supply and basic wiring systems.
Design and planning- - Lighting of staircase, corridors, etc.
Automatic Water Level controller, Closed Circuit Security Monitors with Intercom/ EPBX facility, Common Dish TV antenna, Use of Solar Panels as source of power.

Module:5 *Fire Protection System:* — **4 hours**

Introduction, Fire protection measures, Wet and dry risers, smoke alarm, Sprinkler system. Safety corridors in High- rise structures, emergency exit etc.

Module:6 *Elevators and stairs.* — **4 hours**

Introduction- types of elevators and stairs, design of staircase. Essential features of lifts- its size and requirement of minimum numbers, norms for safety doors and Operation and maintenance.

Total Lecture hours — **24 hours**

Text Book(s)

1. Bureau of Indian Standards, " HAND BOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41 & SP- 32)", BIS 1987 and 1989, (SP-41: ISBN: 8170610117)
2. Building Construction by B C Punmia

3.	SP-35 (1987): Handbook of Water supply & drainage-BIS, (SP- 35: ISBN: 8170610095
Reference Books	
1.	Gupta, O.P., Elements of Water Pollution Control Engineering, Khanna Publishing House, New Delhi (ISBN: 9789386173225)
2.	Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi (ISBN: 9789382609667)

BCE304T	CONCRETE TECHNOLOGY	L	T	P	C
		2	0	0	2

Pre-requisite: Nil

Course Objectives:

1. To understand the functional role of all ingredients of concrete and their use in all-purpose concrete.
2. To apply the principle of sustainability for the utilization of novel and innovative materials in concrete.
3. To create concrete mix for normal and special purpose concrete.
4. To classify between destructive testing and various non-destructive testing procedure.

Expected Course Outcome:

Upon completion of this course, the student will be able to

1. Define the functional role of all ingredients of concrete and their use for normal and special purpose concrete.
2. Apply the principle of sustainability for the utilization of waste, novel and innovative materials for use in concrete.
3. Formulate concrete mix for normal and special purpose concrete.
4. Use of various non-destructive testing procedure for evaluation of concrete properties.

Module:1 *Properties of ingredients*	**4 hours**

Properties of coarse and fine aggregates and their influence on concrete, types of cement and their use, Grades of ordinary Portland cement, Portland pozzolana cement, rapid hardening Portland cement, hydrophobic cement, low heat Portland cement and sulphate resisting Portland cement as per relevant I.S. codes. Types of aggregates and their properties. Testing of aggregates as per relevant IS Codes.

Module:2 *Properties of different types of concrete*	**4 hours**

Concrete for structural work, light weight concrete, high density concrete, biological concrete, ready mix concrete and its requirements, workability, durability and strength requirements, effect of w/c ratio on properties of fresh and hardened concrete, acceptability criteria, laboratory testing of fresh and hardened concrete, Fire resistant properties of hardened concrete.

Module:3 *Concreting methods*	**4 hours**

Process of manufacturing of concrete, transportation, placing, compaction and curing of concrete. Extreme weather concreting, special concreting methods, vacuum dewatering– underwater concrete, special form work. Self-Compacting Concrete.

Module:4 *Admixtures*	**4 hours**

Plasticizers, Retarders, Accelerators and other Admixtures, Test on Admixtures, Chemistry and Compatibility with concrete. GGBS fly Ash, Metakaolin, Silica Fumes, crush sand.

Module:5 *Concrete mix design*	**5 hours**

Mix Design for compressive strength by I.S. methods, road note method, British method, ACI Method, Mix design for flexural strength.

Module:6 *Introduction to Non-destructive testing of concrete*	**3 hours**

Non-Destructive testing, Methods & Principles of NDT. Rebound hammer, UPV, core-cutting and relevant provisions of I.S. codes.

Total Lecture hours	**24 hours**

Text Book(s)

1. M.L. Gambhir, Concrete Technology, McGraw Hill Book Company, Fifth Edition, 2017. (ISBN-1259062554, 978-1259062551)
2. M.S. Shetty, Concrete Technology, Theory and Practice, S. Chand Publication, Sixth Edition, 2018. (ISBN- 9788121900034,978-8121900034)

Reference Books

1.	B.L. Gupta and A. Gupta, Concrete Technology, Jain Book Agency, 2013. (ISBN-8180140407, 978-8180140402).
2.	IS 10262: 2019, Concrete Mix Proportioning
3.	IS 383: 2016, Specification for coarse and fine aggregates for concrete.

BCE305T	FLUID MECHANICS	L	T	P	C
		3	0	0	3

Pre-requisite: Nil

Course Objectives:

1. To know various physical properties of fluid.
2. To obtain knowledge on hydrostatics and hydrodynamic forces.
3. To study fluid in motion and analyse the flow rate using different flow measuring devices.
4. To understand the principles of dimensional analysis to design experiments.

Expected Course Outcome:

Upon completion of this course, the student will be able to

1. Understand the various physical properties of a fluid.
2. Evaluate the hydrostatic pressure and force on surfaces.
3. Identify how to derive basic equations of fluid and know the related assumptions.
4. Understand the importance of dimensional analysis and derive the dimensionless numbers.
5. Conceptualise the similitude concept and set up the relation between a model and a prototype.

Module:1 *Basic Concepts and Definitions* — **5 hours**

Definition of fluid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity, Newton law of viscosity; surface tension, capillarity, Bulk modulus of elasticity, compressibility of fluids.

Module:2 *Fluid Statics* — **5 hours**

Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

Module:3 *Fluid Kinematics* — **8 hours**

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; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates

Module:4 *Fluid Dynamics* — **12 hours**

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; Notches and weirs - rectangular, triangular and trapezoidal notches and weirs, suppressed weir, Cippoletti weir, submerged weir, narrow and broad crested weir, Franci's formula with end contraction. Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced.

Module:5 *Dimensional Analysis and Model Laws* — **6 hours**

Dimensional Analysis - Rayleigh's and Buckingham's π-Theorem method and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; application of dimensional analysis to fluid flow problems: geometric, kinematic and dynamic similarities; scale ratio, prototype, distorted model.

Total Lecture hours — **36 hours**

Text Book(s)

1. A Textbook of Fluid Mechanics and Hydraulic Machines- by R. K. Bansal.

Reference Books

1. Theory and Application of Fluid Mechanics - by K. Subramanya.
2. Fluid Mechanics through Problems - by R. J. Garde
3. Fluid Mechanics - by Frank M. White

MNC AU-03	Disability, Accessibility and Universal Design	L	T	P	C
		3	0	0	0

Pre-requisite: Nil

Course Objectives:

1. To sensitize about the basic concepts of disability, diversity and accessibility in built environments.
2. To introduce the key policy frameworks for legislative and technical perspectives of access.
3. To develop an insight into the understanding of universal design as an approach

Expected Course Outcome:

S.No.	LECTURE TITLES	BROAD CONTENTS
1.	Human Diversity and Inclusion: An Introductory Perspective	Understanding concepts of diversity (may please include all vulnerable groups), inclusion, need and significance, impacts
2	Understanding Disability: Definitions, Models and Prevalence	Theory of disability, Various concepts and models, Prevalence
3	Disability Types and Environmental Needs - I	Disability Classification, functional limitations and key coping strategies in the environment For eg. Physical, Movement disabilities, Vision Impairments
4	Disability Types and Environmental Needs - II	Hearing, Speech, Cognitive, Learning and other disabilities as per the RPWD Act 2016
Exercises: Role play, user interaction/interviews, observations, and engagement of user experts		
5	Environmental Barriers: Introduction & Classification	Physical, Social, Institutional Barriers in diverse National and International Contexts
6	Introduction to Harmonized Guidelines, NBC, and other exemplary international codes and guidelines	Basics of Accessibility Codes and their review
7	Legislative Policies and Programs	UNCRPD, RPWD Act, 2016, SDGs, and urban development programs in Indian context other international and national policies
Review Discussions / Presentations on Experiential understanding of barriers, legislative rights and technical		
8	Universal Design Theory – I	Evolution from Barrier Free Environment to Universal Design, Definitions, Associated Myths and Concepts, Terminologies and Perspectives
9	Universal Design Theory - II	Universal Design Principles (International, Indian, UD goals) and their criteria
10	Universal Design Principles (International, Indian, UD goals) and their criteria	Built Environment Case Studies from Urban Transportation and other contexts like peri urban, rural settings
Case Study Reviews or a Small Design Exercise on Universal Design reflecting the understanding of Universal Design		

BCE311P	SOLID MECHANICS LABORATORY	L	T	P	C
		0	0	2	1

Pre-requisite: Solid Mechanics Theory

Course Objectives:

1. To conduct Tension, Bending & Shear tests on UTM and evaluate material properties and investigate Hooke's Law.
2. To carry out Torsion & Impact tests and determine various moduli and impact energy

Expected Course Outcome:

Upon completion of this course, the student will be able to

1. Conduct Tension tests on UTM and evaluate material properties to verify Hooke's Law.
2. Conduct Bending & Shear tests on UTM and evaluate material properties.
3. Conduct Torsion and determine rigidity modulus.
4. Conduct Impact tests and determine impact energy.

List of experiments

1. **Tension Tests using Universal Testing Machine:** Tension test on the given specimens (at least 2 materials for comparison) and to plot the stress strain graphs.
2. **Bending and Shear Tests using Universal Testing Machine:** Bending test, Shear test on the given specimens and to plot the stress strain graphs.
3. **Torsion Test:** Torsion tests on the given specimens and evaluate the rigidity moduli.
4. **Impact Test:** Determining the impact strength of a given material using Charpy & IZOD tests.

BCE312P	CIVIL ENGINEERING MATERIALS, TESTING & EVALUATION LABORATORY	L	T	P	C
		0	0	2	1

Pre-requisite: Nil

Course Objectives:

1. To introduce experimental procedures and common measurement instruments, equipment, devices.
2. To give Exposure to a variety of established material testing procedures and techniques.
3. To introduce to different methods of evaluation and inferences drawn from observations.
4. To evaluate the mechanical and structural properties of material, as well as the knowledge necessary for a civil engineer.

Expected Course Outcome:

Upon completion of this course, the student will be able to

- Operating the laboratory equipment including the electronic instrumentation, the test apparatus and the data collection system.
- Measuring physical properties of common structural and geotechnical construction Materials.
- Interpreting the laboratory data including conversion of the measurements into engineering values and derivation of material properties (strength and stiffness) from the engineering values.
- Compute engineering values (e.g. stress or strain) from laboratory measures and prepare a technical report.

Lists of Practical to be conducted

1. Specific gravity and water absorption of fine aggregate
2. Specific gravity and water absorption of coarse aggregate
3. Making and curing test specimen in the Lab
4. Compressive strength of cylindrical concrete specimen
5. Moisture content of timber
6. Compressive strength of timber
7. Penetration of bituminous material
8. Flexural strength of concrete using a simple beam with center point loading.

BCE313P	Building Planning and Computer Aided Civil Engineering Drawings (Laboratory)	L	T	P	C
		0	0	2	1

Pre-requisite: Preliminary knowledge of geometry, graphics and building.

Course Objectives:

1. Gaining the knowledge of preparing
   a. the plan a residential building,
   b. Front elevation,
   c. detailed sectional view,
   d. site plan,
   e. foundation plan with typical door and window.
2. Design of emergency exits and emergency vehicle routes with fire protection symbols.

List of Experiment

1. Preparation of detailed constructional plan of a residential building.
2. Preparation of front elevation, detailed sectional view, site plan, foundation plan and typical door and window and staircase.
3. Fire Protection System: Design of emergency exits and emergency vehicle routes with fire protection symbols.

Text Book(s)

1.	A Textbook of Fluid Mechanics and Hydraulic Machines- by R. K. Bansal. Scott Onstott, AutoCAD 2018 and AutoCAD LT 2018 Essentials, Wiley (2017), (ISBN: 9788126569298)
2.	M.G.Shah, Kale, Patki, Building Drawing with an Integrated Approach to Built Environment, Tata McGraw-Hill Education India, 5th edition, 2011, (ISBN: 9780071077873, 0071077871).
3.	Building Services Environmental and Electro Mechanical Services, Second Revised, 2014, (ISBN: 9788175259805)

BCE314P	CONCRETE TECHNOLOGY LABORATORY	L	T	P	C
		0	0	2	1

Pre-requisite: Nil

Course Objectives:

1. To judge the properties of cement required in concrete mix design.
2. To classify the fine aggregate into different zones and grading of coarse aggregates.
3. To prepare concrete mix and determine the workability test of fresh concrete.
4. To create concrete mix as per IS code and find the compressive strength of concrete.

Expected Course Outcome:

Upon completion of this course, the student will be able to

1. Judge the properties of cement required in concrete mix design.
2. Classify the fine aggregate into different zones and grading of coarse aggregates.
3. Prepare concrete mix and determine the workability test of fresh concrete.
4. Create concrete mix as per IS code and find the compressive strength of concrete.

List of experiments:

1. Testing of cement.
   Standard consistency, setting time (initial and final), fineness, soundness and compressive strength test (3 days, 7 days and 28 days).
2. Testing of Aggregates.
   (a) Fine aggregate.
   Sieve analysis for zoning and fineness modulus (FM), Bulking of sand, Absorption and moisture content.
   (b) Coarse aggregate.
   Sieve analysis for grading, absorption and moisture content, flakiness index, Elongation index, Impact value, Crushing value and Abrasion value.
3. Compressive strength test of concrete, workability test of fresh concrete.
4. Concrete Mix design by IS method.

Text Book(s)

1.	M.S. Shetty, Concrete Technology, Theory and Practice, S. Chand Publication, Sixth Edition, 2018. (ISBN- 9788121900034,978-8121900034)

Reference Books

1.	M.L. Gambhir, Concrete Technology, McGraw Hill Book Company, Fifth Edition, 2017. (ISBN-1259062554, 978-1259062551)
2.	B.L. Gupta and A. Gupta, Concrete Technology, Jain Book Agency, 2013. (ISBN-8180140407, 978-8180140402).
3.	IS 10262: 2019, Concrete Mix Proportioning
4.	IS 383: 2016, Specification for coarse and fine aggregates for concrete.
5.	IS 2386 (Part-I): 1963, Method of test for aggregate for concrete

BCE315P	FLUID MECHANICS LABORATORY	L	T	P	C
		0	0	2	1

Pre-requisite: Fluid Mechanics Theory

Course Objectives:

1. To know the basic measurement techniques of fluid mechanics and its appropriate application.
2. To obtain the results obtained in the laboratory for various experiments.
3. To study the practical working of Orificemeter, Mouthpeice and different notches.
4. To understand the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.

Expected Course Outcome:

Upon completion of this course, the student will be able to

1. Understand the different flow measurement equipment's and their procedures.
2. Identify the science of fluid flow and its applications.
3. Understand the practical determination of determination of coefficient of discharge.
4. Understand the process of writing a technical laboratory report.

Lists of Experiments to be conducted:

1. Verification of Bernoulli's Theorem.
2. Determination of metacentric height of a floating body.
3. Determination of Coefficient of discharge for an Orificemeter.
4. Determination of Coefficient of discharge for a Mouthpiece.
5. Determination of discharge of Rectangular Notch.
6. Determination of discharge of Triangular Notch.
7. Determination of water surface profile for a free vortex flow.
8. Determination of water surface profile for a forced vortex flow.