SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	3	1	-	4
Subject Name		Engineering Mathematics-II				
Subject Code		BMA20S301				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To introduce the basic concepts required to understand, construct, solve and interpret differential equations.
2. To teach methods to solve differential equations of various types.
3. To give an ability to apply knowledge of mathematics on engineering problems.

Course Outcomes:

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

CO1: Explain differential equations according to certain features.

CO2: Describe first order linear equations and nonlinear equations of certain types and interpret the solutions.

CO3: Apply the conditions for the existence and uniqueness of solutions for linear differential equations.

CO4: Evaluate second and higher order linear differential equations with constant coefficients and construct all solutions from the linearly independent solutions.

CO5: Plan initial value problems using the Laplace transform.

Unit	Syllabus	Periods
UNIT-I	**First order ordinary differential equations** Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. **Ordinary differential equations of higher orders** Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.	8
UNIT-II	**Partial Differential Equations - First order** First order partial differential equations, solutions of first order linear and non-linear PDEs. **Partial Differential Equations – Higher order**	

	Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries.	**12**
UNIT-III	**Complex Variable – Differentiation** Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding. Harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm).Conformal mappings, Mobius transformations and their properties. **Complex Variable - Integration** Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour. Applications of complex integration by residues, Evaluation of definite integral involving sine and cosine. Evaluation of certain improper integrals using the Bromwich contour.	**13**
UNIT-IV	**Numerical Methods – 1** Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	**11**
UNIT-V	**Numerical Methods – 2** Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first	**12**

	and second order equations. Milne's and Adam's predicator corrector methods. Partial differential equations: Finite difference solution two-dimensional Laplace equation and Poisson equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.	

TEXT BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. Di Prima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

REFERENCE BOOKS

1. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	3	1	-	4
Subject Name		Building Planning & Design				
Subject Code		BCE20S302				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objective

1. To make aware the student with sustainability aspects of building.
2. To impart knowledge to students about significance of building bye-laws & rules & regulation regarding building planning.
3. To impact knowledge to students regarding specific consideration required to be considered under Indian condition for planning & designing of building.
4. To appraise students about the rules & consideration to get adequate ventilation, lighting & Sound insulation for improved energy efficiency of building.
5. To make students understand about various essential requirements of different type of building.
6. To make aware students about green building rating for enhanced sustainability.

Course Outcomes:

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

CO1: Explain basics of building planning & design.

CO2: Describes sustainability principle, by laws & characteristics of thermal and sound insulation.

CO3: Apply sustainability concepts & principles in planning & design of buildings.

CO4: Evaluate environmental, sustainable & safety aspects of a building.

CO5: Plan different types of buildings as per by laws & coda provisions.

Unit	Syllabus	Periods
UNIT-I	Natural Environment &Built environment, Ecology, Ecosphere - sustainable development, Dimensions of sustainability. Built Environment &livability, integrated approach in design, challenges in sustainable development. Green environment, expectations from green building, IGBC, USGBC, LEED - GRIHA, SVA, GRIHA.	**10**
UNIT-II	Building Bye – laws, Functions of local authority, Terminology i.e. (Building line, control line, FAR, light plane etc.) Principles underlying building bye- laws, classification of building, requirements of parts of Buildings, site section of building, orientation, factors affecting orientation, orientation criteria for Indian conditions. Provisions of NBC.	**12**
UNIT-III	Principles of planning of buildings (Aspects, prospect, Furniture requirement, rooming, grouping, privacy circulation etc.), Principles of architectural composition (Unity, contrast, scale, proportion, balance, Rhythm, character, etc.), Massing, Sun and the Building, Sun path, Sun shading & devices, Design of sun shades.	**11**
UNIT-IV	Thermal insulation, Heat transfer in building, Thermal insulation materials, methods of thermal insulation ventilation: natural & artificial, necessity & functional requirement of ventilation, system of ventilation, types of mechanical ventilation, air conditioning, functional requirement of air conditioning, Essentials of air conditioning, acoustic and sound insulation, Behavior of sound acoustical defects. Sabine formula, acoustical design of various spaces, sound insulation methods & materials, illumination (natural & artificial).	**13**
UNIT-V	Design and planning consideration for various types of building i.e., Residential Building, Education buildings, Hospitals & Dispensaries, Hotels, Commercial building, recreational buildings, government offices & other, standards specified by Bye-laws, various aspects of sustainability & energy efficiency applied to various types of Building, green building concept applied to various types of building.	**10**

Textbooks:

1. Building Drawing (Built Environment), Sah, Kale and Pathi, Tata McGraw hill, 4th edition, reprint 2007.
2. Building Planning, Designing and Scheduling, Gurucharan Singh, Standard Publisher, distribution, 2009.
3. Building Design and Drawing, Mallik and Meo, Computech Publication Ltd New Asian; 5th edition 2009.

Reference books

1. Building Design and drawing, Y.S. Sane, StandardPublisher,2006.
2. National Building Codes (Latest Edition), 2016 by Bureau of Indian Standards (Third Revision).
3. Building Construction, B.C. Punmia, Laxmi Publication, 11th edition.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	3	-	-	3
Subject Name		Building Materials & Construction				
Subject Code		BCE20S303				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To study the properties of concrete ingredients i.e., cement. Sand and coarse aggregate by conducting different tests.
2. To select of different types of admixtures to improve the properties of concrete for different field applications.
3. To conduct the field and laboratory tests on concrete in fresh and hardened state.
4. To provide knowledge about various types of bricks, stones, woods &timber, ferrous & nonferrous construction material & their applications.
5. To provide knowledge on design of foundation, including selection of appropriate foundation.
6. To understand laying & construction of brick & stone masonry and various methods of damp proofing etc.
7. To provide knowledge about stairs, floors & roofs in various types of buildings.

Course Outcomes:

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

CO1: Explain the basic elements of buildings, engg. Materials & construction.

CO2: Evaluate the properties of various materials like cement, aggregate, concrete, admixture, brick, stone etc.

CO3: Distinguish the suitability of building materials in the construction of elements of buildings.

CO4: Evaluate various types of concrete in building construction accordingly.

CO5: Apply various techniques for finishing & protection works of various elements of building.

Unit	Syllabus	Periods
UNIT-I	**Types of Foundation& its design:** masonry construction, masonry classification, stone v/s brick masonry, joints in stone masonry, brick masonry (bonds in brick masonry, characteristics of bonds, type of bonds), typical structures in brickwork, Damp prevention (causes, effects, control &prevention techniques, material used for damp proofing), Anti termite treatment, water proofing treatment, Arches & lintels, stair & stair	8

	case, (types & design of stair case), Types of floor & flooring, Roof & roof covering.	
UNIT-II	**Ingredients of Concrete:** Portland cement Chemical composition of cement, Hydration of cement, setting of cement, tests on physical properties of cement. Types of Portland cement – Ordinary Portland cement – Rapid Hardening Portland cement – low heat Portland cement- Sulphate Resisting cement – Portland Blast furnace cement- Super Sulphated cement- Portland Pozzolana cement and Pozzolanas: Fly ash; use of pozzolanas, white cement, Expansive cements – High alumina cement. **Aggregates:** General classification of aggregates, natural and artificial aggregates, particle shape and texture, bond of aggregate, strength of aggregate, Mechanical properties of aggregate, specific gravity, Bulk density, porosity and absorption of aggregate, moisture content of aggregate, Bulking of sand deleterious substances in aggregates, organic impurities. Soundness of aggregates, Alkali- aggregate reaction, Alkali carbonate reaction, sieve analysis – Grading curves, Fineness modulus, grading requirements, grading of fine and coarse aggregates and Gap graded aggregates. Thermal properties of aggregates. **Admixtures:** Introduction, functions of admixtures, classification of admixtures, Accelerators, Retarders, Water Reducing Agents, Super plasticizers.	**14**
UNIT-III	**Fresh and Hardened Concrete:** Fresh Concrete**,** Workability of concrete, factors affecting workability, measurement of workability using slump test, Compaction factor test, Flow test, Vee- Bee Test, Ball penetration test, Nasser's ºK- probe test, Segregation and Bleeding of concrete, Mixing of concrete, Vibration of concrete, Different types of mixers and vibrators. Concreting in Hot weather and Cold weather. **Hardened Concrete:** Compressive & Flexural strength of concrete, Stress and strain characteristics of concrete, drying shrinkage of concrete, Creep of concrete, Permeability and durability of concrete, Fire resistance of concrete, Thermal properties of concrete. Micro-cracking of concrete, methods of curing, Influence of temperature on strength, Fatigue & Impact strength of concrete.	**11**
UNIT-IV	Bricks (classification, characteristics, manufacturing, testing, and types). Stones (classification, Quarrying, seasoning characteristics, testing, selection & uses, preservation)**,** Wood & Timber (Classification, Structure & characteristics, seasoning and its methods, defects & diseases, preservation & various treatment testing), wood products and their applications.	**12**
UNIT-V	Mortar (Classification, characteristics, functions of ingredients). Types of mortar and their uses grout, guniting, ferrous material (Pig iron, CI, Mild steel, wrought iron, stainless steel, compositions & proposition).	**12**

	Reinforced steel bars (classification, types, designation), Aluminum (its alloys & uses). Copper (its alloys &uses), Ceramics (classification, properties, commercial forms), Paint varnishes & enamels (types, composition, method of application, defects).	

Text-Book:-

1. Concrete Technology, M. L. Gambhir, Tata McGraw Hill education Pvt. Ltd., 5th edition, 2013.
2. Concrete Technology, M.S. Shetty, S. Chand Publications, 2006.

Reference Books:-

1. Building Materials, M. L. Gambhir, Tata McGraw Hill education Pvt. Ltd., 2017.
2. Building Construction, B.C. Punmia, A.K. Jain, Laxmi Publishers New Delhi, 2016.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	3	-	-	3
Subject Name		Surveying				
Subject Code		BCE20S304				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To understand the working of theodolite.
2. To understand the determination of heights & distances by tacheometry.
3. To understand various types of curves used in practice.
4. To provide knowledge on setting out civil engineering works & detailed field surveying.
5. To understand the concepts of photographic surveying &GIS.

Course Outcomes:

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

CO1: Explain the techniques used for linear & angular measurements in surveying.

CO2: Analyse different geodetic methods of survey such as triangulation, trigonometric levelling, tachometry, photographic survey & GIS.

CO3: Apply methods in control surveys.

CO4: Apply tachometry in traverse computations.

CO5: Apply various methods for setting curves, area & volume computations.

Unit	Syllabus	Periods
UNIT-I	Traversing by theodolite, Fieldwork checks, traverse computations, latitude and departures, computations of co-ordinates, plotting & adjustment of traverse. Omitted measurements. Trigonometrical levelling, precise levelling.	8
UNIT-II	**Tachometry** Tacheometric systems and principles, stadia system, uses of analectic lens, tangential system, substance system, instrument constant, field work reduction, direct reading tacheometers, use of tacheometry, accuracy.	9

UNIT-III	**Curves** Classification and use, elements of circular curves, setting out curves by offsets and by theodolites, obstacles and special problems, compound curves, reverse curves, transition curves, cubic spiral and lemniscate, vertical curves, computation and setting out.	**12**
UNIT-IV	**Control Surveys** Providing frame work of control points, triangulation principle, forms of framework, reconnaissance survey, selection and making of stations, Control line, baseline measurement & corrections, flexible apparatus and corrections, computation of sides, precise traversing.	**12**
UNIT-V	**Photographic Surveying & GIS:** Principles of photographic surveying – aerial photography, tilt and height distortions, uses. Basics of GIS &GPS.	**11**

Text Book(s)

1. Surveying Vol., I, II, III, B.C. Punmia, Laxmi Publications New Delhi, 2016.
2. Fundamentals of surveying, S.K. Roy, Prentice Hall of India New Delhi, 2nd edition 1999.
3. Surveying theory & Practice, R.E. Devise, Mc GrawHill, New York, 4th revised edition 2001.

Reference Books:

1. Plane & Geodetic surveying Vol. I & II, David Clark & J Clendening, Constable & C. London, 2017.
2. Surveying Vol., I & II, K.R. Arora, Standard book House, New Delhi, 13th edition 2016.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	3	-	-	3
Subject Name		Strength of Materials				
Subject Code		BCE20S305				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objective:

1. To understand the concepts of simple and compound stresses and strains.
2. To understand the behavior of elastic materials in bending, shear and torsion.
3. To understand the stability behavior of long columns under axial load.
4. To understand the power transmission by shift.
5. To understand stresses & strain developed in storage vessels
6. To calculate stresses / strain in statically indeterminate structures.

Course Outcomes:

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

CO1: Explain the concepts of stress, strains, bending, deflection, buckling & torsion.

CO2: Explain various theories for determining stress, buckling of columns & deflections of structures.

CO3: Apply various theories for determining stress, buckling of columns &deflections of structures.

CO4: Evaluate the stresses in bending, shear and torsion.

CO5: Analyse various sections for stresses, strain, bending, torsion, buckling & deflections.

Unit	Syllabus	Periods
UNIT-I	**Stress and Strains:** Concept of Elastic body, stress and strain. Hooke's law various types of stress and strains. Elastic constants and their relation Stresses in compound bars, composite and tapering bars, temperature stresses. Two-dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and strains. Mohr's circle of stresses. Strain energy and theories of failure.	13

UNIT-II	**Theory of simple bending:** Concept of pure bending and bending stress, equation of bending, Neutral axis, Section-Modulus, bending stress distribution across a section, Shear Stresses in Beams, beams of uniform strength, shear centre.	**10**
UNIT-III	**Torsion of Shafts:** Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Hollow circular shafts. Combined bending and torsion. Open and closed springs, leaf spring and spiral spring. Pressure Vessels: Thin cylinders and spheres. Stress due to internal pressure. Change in diameter and volumes.	**13**
UNIT-IV	**Columns and Struts:** Euler's buckling load for uniform section, various end conditions. Slenderness Ratio. Merchant Ranking formulae, Eccentric loading on columns.	**11**
UNIT-V	Deflection of statically determinate structure by Geometrical methods & Introduction of method of virtual work.	**10**

Text Books:

1. Strength of Materials, Sadhu Singh, Khanna Publishing, 1st edition, 2016.
2. Strength of Materials, S. Ramamrutham, R. Narayanan, Dhanpat Rai Publishing Company, 18th edition, 2014.
3. Strength of Materials, R. K. Bansal, Laxmi Publication; 6th edition 2018.
4. Strength of Materials, Timoshenko, Publisher CBS, 3rd edition 2004.
5. Strength of Materials, Higdon Style, Publisher Wiley, 3rd edition1978.

Reference Books

1. Strength of Materials Vol. I & II, B. C. Punmia, Laxmi Publication, 10th edition2018.
2. Mechanics of Materials, R.C. Hibbler, Pearson Publication, 2016.
3. Mechanics of Materials, J. M. Gere & B.J. Goodno, Cengage Publisher, 8th edition 2014.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	-	-	2	1
Subject Name		Software Lab				
Subject Code		BCE20S306				
Paper	English					
	Hindi					
Max. Marks		50				

Course Outcomes:

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

CO1: Attempt to draw different components of a building.

CO2: Produce plan, elevation & section of various components of a residential and institutional building.

CO3: Use Auto CAD software in civil engineering drawing.

CO4: Prepare drawing sheets of various types of buildings like residential, Institutional, commercial etc.

List of Experiments:

1. One drawing sheet containing Foundations and Footing using AutoCAD.
2. One drawing sheet containing Doors, Windows, Ventilators using AutoCAD.
3. One drawing sheet containing Lintels, Trusses and Arches etc. using AutoCAD.
4. One drawing sheet containing detailed planning of one/two room residential building (Common to all students).
5. Drawing sheets one each of residential building using AutoCAD.
6. One Drawing sheet of Institutional / Commercial building / Hospital etc. using AutoCAD.
7. Sketches of various building components i.e., masonry, brick / stone, floors, roof & roof covering.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	-	-	2	1
Subject Name		Self Learning / Presentation				
Subject Code		BCE20S307				
Paper	English					
	Hindi					
Max. Marks		25				

Course Objectives:

1. To encourage students to read, study & understand different topics of civil Engineering published in articles, literatures.
2. To help in presenting different topics of civil engineering and related subjects to supplement theoretical knowledge gained in class.
3. To make student acquire good oral & written communication skills.
4. To promote the habit of lifelong learning.
5. To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

Course Outcomes:

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

CO1: Analyze contemporary issues in civil engineering & its allied areas through literature survey.
CO2: Distinguish state of art & relevance of the topic in national & international arena.
CO3: Demonstrate good oral & written communication skills.
CO4: Develop poster and power point presentations for effective communication.
CO5: Display lifelong learning.

Content

Any relevant topic related to civil engineering from within or beyond the syllabus through Swayam /NPTEL/MOOC.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	-	-	4	2
Subject Name		Summer Internship Project - I				
Subject Code		BCE20S308				
Paper	English					
	Hindi					
Max. Marks		25				

Course Objectives:

1. To encourage students to read, study & understand different topics of civil engineering.
2. To make student acquire good oral & written communication skills.
3. To promote the habit of lifelong learning.

Course Outcomes:

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

CO1: Observe various activities in field.

CO2: Examine the utility of general and specific equipment for construction.

CO3: Differentiate the construction projects individually and in team.

CO4: Develop the writing and communication skills for various engineering problems.

CO5: Adapt lifelong learning for benefit of society.

Contents

1. Each candidate shall have to undergo 15 days in-house summer internship at the institute after the completion of their 2nd Semester exams (in summer vacations).
2. Candidate can choose from various modules which are offered by the institute and after successful completion of internship they have to submit detailed report.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	-	-	2	1
Subject Name		Building Materials & Construction Lab				
Subject Code		BCE20S309				
Paper	English					
	Hindi					
Max. Marks		50				

Course Objective:

1. The objective of this course is to understand the characteristics and behavior of civil engineering materials used in buildings and infrastructure.
2. Students will learn standard principles and procedure to design prepare and/or test materials such as concrete mix design including field test methods for fresh concrete.
3. Know how to select materials based on their properties and their proper use for a particular facility under prevailing loads and environmental conditions.
4. Students will have exposure to practical applications including writing of a technical report related to each experiment.

Course Outcomes:

Upon completion of practical course, the students will be able to:

CO1: Determine the properties of cement, sand & aggregate as per IS code.

CO2: Determine the workability of concrete for suitability of concrete mix in different construction works.

CO3: Evaluate compressive strength of various concrete mixes.

CO4: Determine physical properties of brick by experiment and practice accordingly.

CO5: Examine the properties of the cement mortar for various elements of the buildings.

List of Experiments:

1. Determination of properties of cement, sand & aggregate.
2. Determination of workability of concrete by slump test.
3. Determination of workability of concrete by compacting factor apparatus.
4. Determination of workability by Vee Bee consistometer.
5. Water absorption & efflorescence of brick.
6. Field testing on bricks.
7. Crushing strength of bricks.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	-	-	2	1
Subject Name		Surveying				
Subject Code		BCE20S310				
Paper	English					
	Hindi					
Max. Marks		50				

LIST OF EXPERIMENTS

List of Experiments:

1. Measurement of horizontal and vertical angle by Vernier Theodolite.
2. Theodolite traversing.
3. Determination of R.L. of a point whose base is accessible by Trigonometrical levelling.
4. Determination of R.L. of a point whose base is inaccessible by Trigonometrical levelling.
5. Determination of tachometric contents infield.
6. Determination of height & distance by using Tangential tachometry
7. Determination of height & distance by Stadia method of tachometry.
8. Measurement of base line by using Substance Bar.
9. Setting out of a simple circular curve by using Rankine's method.
10. Setting out of a simple circular curve by using Offset from the chord produced or deflection distance.
11. Determination of horizontal &vertical position of a point by Total Station.
12. Traversing by Total Station.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		III/II	-	-	2	1
Subject Name		Strength of Materials Lab				
Subject Code		BCE20S311				
Paper	English					
	Hindi					
Max. Marks		50				

Course Objective:

The objective of the strength of materials lab is to demonstrate the basic principles in the area of strength and mechanics of materials and structural analysis to the undergraduate students through a series of experiments.

Course Outcomes:

Upon completion of practical course, the students will be able to:

CO1: Evaluate properties of material by impact test.

CO2: Evaluate properties of material by hardness test.

CO3: Evaluate properties of material by tensile test.

CO4: Determine compressive & flexural strength of materials.

Laboratory Work

List of Experiments

1. Impact Test.
2. Brinell Hardness Test.
3. Behavior of columns with Different End Conditions.
4. Tensile test.
5. Compression test.
6. Flexure test.
7. Shear test.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		IV/II	2	1	-	3
Subject Name		Engineering Mathematics-III				
Subject Code		BMA20S401				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To introduce the basic concepts required to understand, construct, solve and interpret differential equations.
2. To teach methods to solve differential equations of various types.
3. To give an ability to apply knowledge of mathematics on engineering problems.

Course Outcomes:

CO1: Apply the fundamental concepts of Ordinary Differential Equations and Partial Differential Equations and the basic numerical methods for their resolution.

CO2: Solve the problems choosing the most suitable method.

CO3: Understand the difficulty of solving problems analytically and the need to use numerical approximations for their resolution.

CO4: Use computational tools to solve problems and applications of Ordinary Differential Equations and Partial Differential Equations.

CO5: Formulate and solve differential equation problems in the field of Industrial Organization Engineering.

Unit	Syllabus	Periods
UNIT-I	**Transform Calculus -1** Polynomials – Orthogonal Polynomials – Lagrange's, Chebyshev 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.	10
UNIT-II	**Transform Calculus-2** Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications.	9

UNIT-III	**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. **Propositional Logic** Syntax and semantics, proof systems, satisfy ability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory.	**12**
UNIT-IV	**Partially ordered sets** Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo-Boolean lattices. **Algebraic Structures** Algebraic structures with one binary operation – semi group, monoid and group. Cosets, Lagrange'stheorem, 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).	**13**
UNIT-V	**Introduction to Counting** Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions. **Introduction to Graphs** Graphs and their basic properties – degree, path, cycle, sub graph, isomorphism, Eulerian and Hamiltonian walk, trees.	**11**

Text Books:

1. B. S. Grewal, "Higher Engineering Mathematics", 43rd edition, Khanna publishers, 2017.
2. N P. Bali and Manish Goyal, "A text book of Engineering mathematics" Laxmi publications, latest edition.

Reference Book:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, John Wiley & Sons, 2011.
2. R. K. Jain and S. R. K. Iyengar , Advanced Engineering Mathematics, 3rd edition, Alpha Science International Ltd., 2020.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13th edition, Pearson Publishers.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		IV/II	2	1	-	3
Subject Name		Geotechnical Engineering				
Subject Code		BCE20S402				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To inculcate the basic knowledge of soil such as its identification and classification, determination of various engineering properties and its suitability as a foundation/ sub grade material.
2. To develop an understanding of the relationships between physical characteristics and mechanical properties of soils by experimentally measuring them.
3. To explain role of water in soil behavior and how soil stresses, permeability and quantity of seepage including flow net are estimated.
4. To determine shear parameters and stress changes in soil due to foundation loads & estimate the magnitude and time-rate of settlement due to consolidation.
5. To apply the principles of soil mechanics in stability analysis of slopes and settlement calculations.
6. To explain various types of foundations.

Course Outcomes:

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

CO1: Evaluate different properties of soil, types of foundations and its classification.

CO2: Examine the flow and shear parameters & their effects on various types of soil.

CO3: Determine the stress distribution & shear strength parameters of soil by various methods.

CO4: Analyse the stability of slopes, earth pressures & retaining walls using analytical methods.

CO5: Evaluate suitable foundation system for various site conditions.

Unit	Syllabus	Periods
UNIT-I	**Basic Definitions & Index Properties** Introduction–Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Basic Definitions and their relationships - Soil as three-phase system, Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits. Clay mineralogy & their Influence on engineering behavior, Expansive	10

	soils, their Characteristics & Challenges.	
UNIT-II	**Permeability, Seepage and Consolidation** Darcy's law & its validity, Determination of coefficient of permeability: Laboratory methods: constant-head & falling-head method. Effective and total stresses, Effect of water table & capillary action. Seepage pressure, Quick sand condition. Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one- dimensional consolidation. Consolidation tests, Fitting of curves. Normally and over consolidated clays. Determination of consolidation pressure settlement analysis. Calculation of total settlement.	**11**
UNIT-III	**Stress Distribution in Soils and Shear Strength of Soils** Stress distribution beneath loaded areas by Boussinesq and Westerguard's analysis. Newmark's influence chart. Contract pressure distribution. Mohr – Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.	**12**
UNIT-IV	**Stability of Slopes & Earth Pressure** Infinite and finite slopes. Types of slope failure, Stress path. Stability curves. Effect of ground water, Analytical and graphical methods of stability analysis. Earth Pressure at active, passive and at rest conditions. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cohesionless and cohesive soils. Effect of surcharge, water table etc.	**11**
UNIT-V	**Soil Foundations** Shallow Foundation - Types of foundations. Bearing capacity of foundation on cohesionless and cohesive soils. General & local shear failures. Factors affecting bearing capacity. Theories of bearing capacity – Terzaghi, Vesic, Skempton, Meyerhof and I.S. code on bearing capacity. Deep Foundation - Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesionless and cohesive soils. Static and dynamic formulae. Settlement of pile group, Negative skin friction, Under Ream Piles, Plate load test.	**10**

Text Books

1. Soil Mech. & Foundation Engg. Dr. K. R. Arora, Std. Publishers Delhi, 7th edition 2014.
2. Soil Mech. & Foundation, Dr. B. C. Punmia, Laxmi Publications, Delhi, 16th edition2017.
3. Soil Mech. & Found Engg. S. K. Garg, Khanna Publishers, Delhi, 1stedition,2003.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		IV/II	2	1	-	3
Subject Name		Fluid Mechanics – I				
Subject Code		BCE20S403				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To understand fluid properties and concept of fluid continuum.
2. To understand the concepts of kinematics & dynamics of fluid flow.
3. To apply fluid flow principles to various fluid flow problems.
4. To understand the mechanism of fluid measurement.
5. To understand the method of simulation & dimensional analysis.
6. To understand the concepts of laminar flow.

Course Outcomes:

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

CO1: Define various fluid properties & states of fluid.
CO2: Apply principles of fluid flow & dimensional analysis.
CO3: Solve fluid flow problems.
CO4: Analyze characteristics of fluid at rest, fluid at motion & dimensionless numbers.
CO5: Discriminate different types of fluid flow, measurement techniques & principles.

Unit	Syllabus	Periods
UNIT-I	**Review of Fluid Properties** Engineering units of measurement, density, specific weight, specific volume, specific gravity, surface tension, capillary, viscosity, bulk modulus of elasticity, pressure and vapour pressure. **Fluid Statics** Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems – gravity dams and Tainter gates), buoyant force, Stability of floating and submerged bodies, Relative equilibrium.	9
UNIT-II	**Kinematics of Flow** Types of flow-ideal & real, steady and unsteady, uniform & non-	

	uniform, one, two and three dimensional flow, path lines, streamlines, streamlines and stream tubes, continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets - their utility & method of drawing flow nets.	**10**
UNIT-III	**Dynamics of Flow** Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum equation, forces of fixed and moving vanes, velocity triangles. **Fluid Measurements** Velocity measurement, flow measurement (Orifices, nozzles, mouth pieces, orifice meter, Nozzle meter, venturimeter, weirs and notches).	**13**
UNIT-IV	**Dimensional Analysis and Hydraulic Similitude** Dimensional analysis, dimensional homogeneity, use of Buckingham-pie theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, etc.).	**9**
UNIT-V	**Laminar Flow** Introduction to laminar, transition & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, stokes law, Bach wash processing, Instability of laminar flow to turbulent flow.	**12**

Text Books:

1.Fluid Mechanics, Modi & Seth, Standard Book House, Delhi, 21st edition, 2018.
2.Fluid mechanics, Girde & Mirazgaonkar, SCI Tech Publishers, 2019.
3.Fluid Mechanics, R.K. Bansal, Laxmi Publishers, 2015.

Reference Books:

1. Fluid Mechanics, A.K. Jain, Khanna Publishers, Delhi, 2014.
2. Fluid Mechanics, Streeter, McGraw Hill Publishers, 9th edition, 2017.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		IV/II	3	1	-	4
Subject Name		Structural Analysis				
Subject Code		BCE20S404				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To develop an understanding of the behavior of structure under serviceability load.
2. To understand the mechanics of the material behavior of different type of structures.
3. To understand the concepts of analysis of indeterminate structures by various classical methods.
4. To make student aware of different methods of structural analysis.

Course Outcomes:

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

CO1: Classify different type of structures based on support conditions.

CO2: Explain various methods & principles for analysis of structures.

CO3: Apply various methods & principles for structural analysis.

CO4: Analyse various structures using various methods, principles & theorems.

CO5: Evaluate different methods of structural analysis.

Unit	Syllabus	Periods
UNIT-I	**Deflection of beams** Double Integration method. Area Moment Method and Slope - Deflection Method. Beam of variable cross section, M/EI diagram, Conjugate Beam Method.	10
UNIT-II	**Virtual work and Energy Principles** Principles of Virtual work applied to deformable bodies. Maxwell's Reciprocal theorems, Energy theorems, Application to pin jointed frames only.	9
UNIT-III	**Indeterminate Structures –I** Static and Kinematics indeterminacy, Analysis of Fixed and continuous beams by Theorem of three moments, Effect of sinking and rotation of supports.	12

UNIT-IV	**Indeterminate Structures – II** Analysis of beams and analysis of frames (with and without sway) by slope Deflection method.	**10**
UNIT-V	**Moment Distribution Method** Moment distribution method for analysis of beams and analysis of frames (without sway) Three hinged arches of different shapes, Eddy's Theorem. Two Hinged and Fixed Arches.	**11**

Text Books:

1. Basic Structural Analysis, Reddy C. S., Tata McGraw Hill Publishing Company, 2017.
2. Theory of Structures, S. Ramamrutham, R. Narayanan, Dhanpat Rai Publications, 9th edition, 2014.
3. Theory of Structures, B.C. Punmia, Laxmi Publications, 2017.

Reference Books:

1. Structural Analysis – A Unified classical and matrix Approach, Ghali A & Neville.M, Chapman and Hall, New York, 6thedition, 2009.
2. Intermediate structural analysis, Wang C.K., McGraw Hill, New York, 1984.
3. Structural Analysis, Aslam Kassimali, C. L. Publisher, 2014.
4. Structural Analysis, R. C. Hibbler, Pearson Publication, 2017.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		IV/II	3	1	-	4
Subject Name		Engineering Hydrology				
Subject Code		BCE20S405				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. To develop an understanding of various components of hydrological cycle, their behaviors& factors affecting it & solve problems on measurement on rainfall, infiltration, evaporation.
2. To understand concepts of Hydrometry & ground water hydrology.
3. To discuss the importance of estimation of runoff, analysis of rainfall data and various hydrographs and analyze various problems off runoff using various hydrograph theories.
4. To develop an understanding of various methods of flood estimation in general & flood frequency in detail.
5. To develop the concept of flood routing through reservoir & channel and its application in flood forecasting & flood control.

Course Outcomes:

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

CO1: Explain the basics of surface, subsurface flow, floods & hydrograph.
CO2: Describe various methods of hydrological studies.
CO3: Apply basic principles for measurement & forecasting of rainfall & runoff.
CO4: Analyse runoff hydrograph by various methods.
CO5: Evaluate various hydrological analysis methods.

Unit	Syllabus	Periods
UNIT-I	**Hydrology:** Hydrological cycle, Precipitation and its measurement, Recording and non-recording rain gauges, estimating missing rainfall data, Rain gauge networks, Mean depth of precipitation over a drainage area, Mass rainfall curves, Intensity – duration curves, Depth – Area Duration curve, Infiltration and infiltration indices, Evaporation, evaporimeters, evapotranspiration & estimation.	10
UNIT-II	**Hydrometry and Ground Water:** Methods of Stream gauging, Direct and Indirect methods, Area – velocity method, Dilution technique methods, Ultrasonic method, Stage – Discharge Relationship (Rating	9

	curves). Forms of subsurface water, Aquifer properties, Geological formations as aquifers, Hydraulics of wells, Steady flow into a well, Well loss, Introductions to ground water recharge methods and Rain water harvesting.	
UNIT-III	**Hydrographs:** Runoff, Flow duration curve, Flow mass curve, Estimation of runoff, Rainfall – Runoff relationship, Hydrograph and its analysis, Unit hydrograph and its derivation for isolated and complex storms, S-curve hydrograph, Instantaneous unit hydrograph, Synthetic unit hydrograph.	**9**
UNIT-IV	**Floods:** Foods and its estimation by different methods, Design flood by Unit hydrograph and Design Storm, Flood frequency studies: Gumbel's Method, Log Pearson Types – III Distribution, Lognormal distribution, Limitations of Frequency studies.	**10**
UNIT-V	**Floods Routing:** Hydrologic Routing: Reservoir Routing – Modified Pul's method, Goodrich method. Channel Routing – Muskingum method **Hydraulic Routing:** Numerical methods. Introduction to Time series models, Flood control measures.	**10**

Text Books:

1. Engineering. Hydrology, K. Subhramanya, Tata McGraw Hill Publ. Co. 4thedition, 2013.
2. Hydrology & Water Resources Engineering, S. K. Garg, Khanna Publishers, 2016.

Reference Books:

1. Engineering. Hydrology, J. NEMEC, Prentice Hall, 1972.
2. Hydrology for Engineers, Linsley, Kohler, Paulnus, Tata Mc GrawHill, 2014.
3. Engineering. Hydrology, H. M. Raghunath, New Age International Publishers, 5th edition, 2015.

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		IV/II	2	1	-	3
Subject Name		Data Science				
Subject Code		BCE20S406				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:
The objective of this course is to impart necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.

Course Outcomes:
Upon completion of the course, the students will be able to:
CO1: Explain understanding of the mathematical foundations needed for data science.
CO2: Describe to collect, explore, clean, munge and manipulate data.
CO3: Apply models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.
CO4: Gain knowledge about basic concepts of Machine Learning.
CO5: Analyze Build data science applications using Python based toolkits.

Unit	Syllabus	Periods
UNIT-I	**Introduction to Data Science** Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.	8
UNIT-II	**Introduction to Programming Tools for Data Science** Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, visualizing Data: Bar Charts, Line Charts, Scatterplots, working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.	9
UNIT-III	**Mathematical Foundations** Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, P-hacking, Bayesian Inference.	9

UNIT-IV	**Machine Learning** Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks Learning and Generalization, Overview of Deep Learning.	**10**
UNIT-V	**Case Studies of Data Science Application** Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.	**8**

Text Books:

1. Jain V.K., “Data Sciences”, Khanna Publishing House, Delhi.
2. Jain V.K., “Big Data and Hadoop”, Khanna Publishing House, Delhi.
3. Jeeva Jose, “Machine Learning”, Khanna Publishing House, Delhi.
4. Chopra Rajiv, “Machine Learning”, Khanna Publishing House, Delhi.

Reference Books:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press. http://www.deeplearningbook.org.
4. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, MorganKaufmann Publishers.

EKLAVYA UNIVERSITY
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SCHOOL OF ENGINEERING

SYLLABUS

CIVIL ENGINEERING

Class		**B.TECH.**	**L**	**T**	**P**	**C**
Semester/Year		**IV/II**	**-**	**-**	**6**	**3**
Subject Name		**Survey Practice Lab**				
Subject Code		**BCE20S407**				
Paper	**English**					
	Hindi					
Max. Marks		**50**				

Course Outcomes:

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

CO1: Observe topographical characteristics.

CO2: Differentiate methods to perform ground survey.

CO3: Prepare longitudinal & cross section profiles

CO4: Develop contour map by using tachometer & total station.

CO5: Prepare the details of features using Plane table surveying.

CO6: Produce a simple circular curve by using Rankine's method for alignment.

Syllabus:

Field Work:

1. Profile leveling & cross sectioning.
2. Prepare contour map by using Tachometric method.
3. Locating details by Plane Table surveying Setting out of simple circular curves.
4. Triangulation – Adjustment of quadrilateral by least square method.
5. Use of Total Station in surveying.

SYLLABUS

CIVIL ENGINEERING

Class		**B.TECH.**	**L**	**T**	**P**	**C**
Semester/Year		**IV/II**	**-**	**-**	**2**	**1**
Subject Name		**Geotechnical Engineering Lab**				
Subject Code		**BCE20S408**				
Paper	**English**					
	Hindi					
Max. Marks		**50**				

Course Outcomes:

Upon completion of practical course, the students will be able to:

CO 1: Check physical properties of soil.
CO 2: Check strength properties of soil.
CO 3: Differentiate the flow properties and stresses of soil.
CO 4: Check shear strength of soil.

List of Experiments:

1. Moisture Content Determination. Oven Drying Method.
2. Grain Size Analysis – Mechanical Method.
3. Grain Size Analysis – Hydrometer Method.
4. Liquid & Plastic Limit Tests.
5. In-Place Density tests – Core Cutter Method, Sand Replacement Method.
6. Specific Gravity Tests.
7. Permeability Tests, Variable Head Method.
8. Compaction Test.
9. Unconfined Compression Test.
10. Direct Shear Test.
11. Triaxial Shear Test (Demonstration).

SYLLABUS

CIVIL ENGINEERING

Class		B.TECH.	L	T	P	C
Semester/Year		IV/II	-	-	2	1
Subject Name		Fluid Mechanics – I Lab				
Subject Code		BCE20S409				
Paper	English					
	Hindi					
Max. Marks		50				

Fluid Mechanics – I Lab
Course Outcome: Upon completion of practical course, the students will be able to: **CO1:** Differentiate between different flow measurements devices. **CO2:** Notice flow through pipes & fall velocity of particle. **CO3:** Correct the instrumental errors. **CO4:** Apply Stokes's law to calculate terminal velocity.
List of Experiments: 1. Calibration of Venturi meter. 2. Determination of Cc, Cd, Cv of Circular Orifice. 3. Calibration of Mouthpiece. 4. Calibration of Orifice Meter. 5. Reynolds experiment for demonstration of stream lined & turbulent flow. 6. Determination of Friction Factor for a pipe. 7. Verification of Stokes's law.