Name of the Department: Civil Engg.

Course Outcome	Engineering Knowledge PO-a	Problem Analysis PO-b	Design/development of solutions PO-c	Conduct investigations of complex problems PO-d	Modern tool usage PO-e	The engineer and society PO-f	Environment and sustainability PO-g	Ethics PO-h	Individual and team work PO-i	Communication PO-j	Project management and finance PO-k	Life-long Learning PO-l	Analysis and Design Skill PSO-m	Research and Innovation PSO-n	Sustainable Outlook PSO-o	Learning Level	Focus on Employability / Entrepreneurship/ Skill Development	Assessment Tools to Measure Attainment of CO
BTCH101-18 : Chemistry-I (Theory)																		
CO1:Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.	√	√	√	√	√		√									Understand & Analyze	Skill Development	Class, Quiz, Tests and viva
CO2:Rationalise bulk properties and processes using thermodynamic considerations.	√	√	√	√	√											Understand & Analyze		Class, Quiz, Tests and viva
CO3:Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.	√	√	√	√	√											Understand & Analyze		Class, Quiz, Tests and viva
CO4:Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity	√	√	√	√	√		√									Understand & Analyze		Class, Quiz, Tests and viva
CO5:List major chemical reactions that are used in the synthesis of molecules.	√	√	√	√	√		√									Understand & Analyze		Class, Quiz, Tests and viva
Paper: BTEE-101-18 Basic Electrical Engineering																		
CO1:Have the knowledge of DC circuits, AC Circuits, basic magnetic circuits, working principles of electrical machines, and components of low voltage electrical installations	√	√	√	√	√		√		√	√						Understand	Skill Development	MSTs, Tutorial, Class/Quiz Tests
CO2:Be able to analyze of DC circuits, AC Circuits	√	√	√	√	√		√		√							Analyze		MSTs, Tutorial, Class/Quiz Tests
CO3:Understand the basic magnetic circuits and apply it to the working of electrical machines	√	√	√	√	√		√		√	√		√	√		√	Understand		MSTs, Tutorial, Class/Quiz Tests
CO4:Be introduced to types of wiring, batteries, and LT switchgear.				√			√		√							Understand		MSTs, Tutorial, Class/Quiz Tests

Paper BTPH111-18 Mechanics of Solids Lab

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CO1: Able to verify the theoretical concepts/laws learnt in theory courses.	√	√	√	√	√	√			√	√		√	√	√		understanding	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Trained in carrying out precise measurements and handling sensitive equipment.	√	√	√	√	√	√			√	√		√	√	√		understanding		Minor Exams, Quiz, End Term Exams
CO 3: Understand the methods used for estimating and dealing with experimental uncertainties and systematic "errors".	√	√	√	√	√	√			√	√		√	√	√	√	apply		Minor Exams, Quiz, End Term Exams
CO 4: Learn to draw conclusions from data and develop skills in experimental design.	√	√	√	√	√	√			√	√		√	√	√		apply		Minor Exams, Quiz, End Term Exams
CO 5: Document a technical report which communicates scientific information in a clear and concise manner.	√	√	√	√	√	√			√	√		√	√	√		apply		Minor Exams, Quiz, End Term Exams

Paper BTPH101-18 Mechanics of Solids

CO1:Understand the vector mechanics for a classical system.	√	√	√	√	√	√		√	√	√		√	√	√	√	understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO2:Identify various types of forces in nature, frames of references, and conservation laws.	√	√	√	√	√	√		√	√	√		√	√	√	√	apply		Minor Exams, Quiz, End Term Exams
CO3:Know the simple harmonic, damped, and forced simple harmonic oscillator for a mechanical system.	√	√	√	√	√	√		√	√	√		√	√	√	√	apply		Minor Exams, Quiz, End Term Exams
CO4:Analyze the planar rigid body dynamics for a mechanical system.	√	√	√	√	√	√		√	√	√		√	√	√	√	apply		Minor Exams, Quiz, End Term Exams
CO5:Apply the knowledge obtained in this course to the related problems.	√	√	√	√	√	√		√	√	√		√	√	√	√	apply		Minor Exams, Quiz, End Term Exams

BTCH102-18 : Chemistry-I (Lab)

CO1:Estimate rate constants of reactions from concentration of reactants/products as a function of time	√	√	√	√	√		√		√							Understand & Analyze	Skill Development	Practical Exam, Class/Quiz Tests
CO2:Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc	√	√	√	√	√		√		√							Understand & Analyze		Practical Exam, Class/Quiz Tests, ViVa
CO3:Synthesize a small drug molecule and analyse a salt sample	√	√	√	√	√		√		√							Understand & Analyze		Practical Exam, Class/Quiz Tests, ViVa

Paper BTAM101-18Mathematics-I (Calculsand Linear algebra)

CO1: The fallouts of Rolle's theorem that is fundamental to application of analysis to engineering	√	√	√			√										Understand & Analyze		Minor Exams, Quiz, End Term Exams
CO 2: To apply differential and integral calculus to evaluate definite, improper integrals and its applications.	√	√	√	√		√										Understand & Analyze		Minor Exams, Quiz, End Term Exams

CO 3: The convergence of sequence and series and to apply different tests of convergence.	√	√	√			√										Understand & Analyze	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: To deal with functions of several variables that are essential in most branches of engineering.	√	√	√			√										Understand & Analyze		Minor Exams, Quiz, End Term Exams
CO 5: The essential tool of matrices and linear algebra in a comprehensive manner.	√	√	√	√		√										Understand & Analyze		Minor Exams, Quiz, End Term Exams

Paper BTME101-18 Engineering Graphics & Design

CO1: design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	√	√	√	√	√	√	√	√	√	√	√	√				Design	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: to prepare to communicate effectively.	√	√	√	√	√	√	√	√	√	√	√	√				Communicate		Minor Exams, Quiz, End Term Exams
CO 3: to prepare to use the techniques, skills, and modern engineering tools necessary for engineering practice.	√	√	√	√	√	√	√	√	√	√	√	√				Apply		Minor Exams, Quiz, End Term Exams

Paper BTMP 101-18 Workshop/Manufacturing Practices

CO1: gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.	√	√	√	√	√	√	√	√	√	√	√					Understanding	Skill Development	Minor Exams, Project based learning, Assignments,End Term Exams
CO 2: able to fabricate components with their own hands.	√	√	√	√	√	√	√	√	√	√	√					Apply		Minor Exams, Project based learning, Assignments,End Term Exams
CO 3: Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.	√	√	√	√	√	√	√	√	√	√	√					Understanding		Minor Exams, Project based learning, Assignments,End Term Exams
CO 4: By assembling different components, they will be able to produce small devices of their interest.	√	√	√	√	√	√	√	√	√	√	√					Apply		Minor Exams, Project based learning, Assignments,End Term Exams

Paper BTHU-101-18 (English) & Paper BTHU-102-18 (English lab)

CO1: To help the students become the independent users of English language	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Understanding		Mid Semester Exams, Assignment, End Term Exams
CO 2: Students will acquire basic proficiency in listening and speaking skills.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Understanding		Mid Semester Exams, Assignment, End Term Exams

CO 3: Students will be able to understand spoken English language, particularly the language of their chosen technical field.	√	√	√	√	√	√	√	√	√	√	√	√	√	√		Understanding	Skill Development	Mid Semester Exams, Assignment, End Term Exams
CO 4: They will be able to converse fluently	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Understanding		Mid Semester Exams, Assignment, End Term Exams
CO 5: They will be able to produce on their own clear and coherent texts.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Understanding		Mid Semester Exams, Assignment, End Term Exams

Paper BTAM201-18Mathematics-II (Differential Equations)

CO1: The mathematical tools needed in evaluating multiple integrals and their usages.	√	√	√	√	√	√												Minor Exams, Quiz, End Term Exams
CO 2: The effective mathematical tools for the solutions of differential equations that model physical processes.	√	√	√	√	√	√											Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: The tools of differentiation and integration of functions that are used in various techniques dealing engineering problems.	√	√	√	√	√	√												Minor Exams, Quiz, End Term Exams

Paper BTCE- 301-18 Surveying & Geomatics

CO1: Understand the concept, various methods and techniques of surveying	√				√				√			√				Understand		Minor Exams, Quiz, End Term Exams
CO 2: Compute angles, distances and levels for given area	√	√	√	√					√			√	√			Analyse and design		Minor Exams, Quiz, End Term Exams
CO 3: Apply the concept of tachometry survey in difficult and hilly terrain.	√	√	√	√		√			√			√	√			Application		Minor Exams, Quiz, End Term Exams
CO 4: Select appropriate instruments for data collection and survey purpose	√	√				√			√			√				Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Analyze and retrieve the information from remotely sensed data and interpret the data for survey.	√	√	√	√	√	√			√		√	√	√			Analyse and design		Minor Exams, Quiz, End Term Exams
CO 6: Understand the concepts related to GIS and GPS and analyze the geographical data.	√	√	√	√	√	√	√		√		√	√	√	√		Analyse		Minor Exams, Quiz, End Term Exams

Paper BTCE- 302-18 Solid Mechanics

CO1: Understand the concept of static equilibrium, deformations, and material constitutive behaviour.	√	√							√			√				Understand		Minor Exams, Quiz, End Term Exams
CO 2: Describe the concepts of stress, strain and elastic behaviour of materials subjected to tension, compression and torsion.	√	√	√	√					√			√	√	√		Understand,Analyse		Minor Exams, Quiz, End Term Exams
CO 3: Apply the concept of Mohr's circle in the stress/strain calculations.	√	√		√		√			√			√	√	√	√	Understand,Analyse	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 4: Develop SFD and BMD for different type of beams	√	√	√	√		√			√			√	√	√	√	Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 5: Plot elastic curves for beams undergoing displacements	√	√	√	√		√	√	√	√			√	√	√	√	Analyse		Minor Exams, Quiz, End Term Exams
CO 6: Understand the behaviour of columns and struts under axial loading.	√	√	√	√		√	v		√			√	√	√	√	Undestand, Analyse		Minor Exams, Quiz, End Term Exams

Paper BTCE- 303-18 Fluid Mechanics

CO1: Understand the basic terms used in fluid mechanics and its broad principles	√					√			√	√						Understand		Minor Exams, Quiz, End Term Exams
CO 2: Estimate the forces induced on a plane/ submerged bodies	√	√							√	√						Apply		Minor Exams, Quiz, End Term Exams
CO 3: Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale.	√	√	√		√		√		√	√				√		Analyze	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation.	√	√		√					√	√		√	√	√		Evaluate		Minor Exams, Quiz, End Term Exams
CO 5: Calculate drag force exerted by fluid on the body of varying shapes and able to minimize them.	√		√						√	√			√			Apply		Minor Exams, Quiz, End Term Exams
CO 6: Design and addressing problems in open channel (lined/ unlined) of different shapes and size optimally as per site condition.	√		√	√					√	√	√		√		√	Create		Minor Exams, Quiz, End Term Exams

Paper BTAM- 301-18MathematicsIII (Transform & Discrete)

CO1: Understand the basic results on vector function, their properties and fields so as to apply them for solving problems of engineering.		√	√					√	√	√		√		√		Understand		Minor Exams, Quiz, End Term Exams
CO 2: Find length, area and volume using integral calculus that is an important application in engineering.		√	√					√		√	√			√		Apply		Minor Exams, Quiz, End Term Exams
CO 3: Solve some real problems in engineering using Gauss Divergence and Stokes' theorem				√												Analyze	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: To formulate Laplace transform of functions and its applications to solve differential equations that form real life problems in engineering.				√				√	√	√		√				Evaluate		Minor Exams, Quiz, End Term Exams
CO 5: To formulate Fourier Series, its properties and its applications to solve problems in engineering.								√	√	√		√				Apply		Minor Exams, Quiz, End Term Exams

Paper BTEC- 305-18 Basic Electronics & applications in Civil Engineering

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CO1: Understand construction of diodes and their rectifier applications.			√				√		√			√				Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Appreciate the construction and working bipolar junction transistors and MOSFETs.				√			√	√			√					Understand		Minor Exams, Quiz, End Term Exams
CO 3: Design Op-Amp IC based fundamental applications.	√						√									Understand		Minor Exams, Quiz, End Term Exams
CO 4: Comprehend working of basic elements of digital electronics and circuits.			√					√	√	√		√				Understand		Minor Exams, Quiz, End Term Exams

Paper HSMC- 132-18 Civil Engineering Introduction, Societal & Global Impact

CO1: Introduction to what constitutes Civil Engineering	√															Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Understanding the vast interfaces this field has with the society at large							√		√				√	√		Understand		Minor Exams, Quiz, End Term Exams
CO 3: Providing inspiration for doing creative and innovative work for the benefit of the society		√					√		√				√	√		Application		Minor Exams, Quiz, End Term Exams
CO 4: Need to think innovatively to ensure Sustainability																Application		Minor Exams, Quiz, End Term Exams
CO 5: Highlighting the depth of engagement possible within civil engineering and exploration of various possibilities of a career in this field	√												√			Application		Minor Exams, Quiz, End Term Exams

Paper BTCE-306-18 Surveying & Geomatics Lab

CO1: Assess horizontal & vertical angles by Theodolite.	√	√	√						√			√	√			Application	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Survey the area using different methods of plane tabling and compass survey	√	√	√	√					√			√	√			Application		Minor Exams, Quiz, End Term Exams
CO 3: Compute the reduce levels using various methods of leveling.	√		√	√					√			√	√			Application		Minor Exams, Quiz, End Term Exams
CO 4: Predict the location of any point horizontally and vertically using Tachometry	√		√	√					√			√	√			Application		Minor Exams, Quiz, End Term Exams
CO 5: Setting out curves in the field	√		√	√					√			√	√			Application		Minor Exams, Quiz, End Term Exams
CO 6: Use electronic survey instrument	√			√	√				√			√	√			Application		Minor Exams, Quiz, End Term Exams

Paper BTCE-307-18 Fluid Mechanics Lab

CO1: Select appropriate pressure measuring device under different condition of flow.	√		√			√			√	√		√			√	Create		Minor Exams, Quiz, End Term Exams
CO 2: Determine the stability of a floating body	√	√					√		√	√		√				Understand		Minor Exams, Quiz, End Term Exams

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CO 3: Understand and apply Bernoulli's theorem practically	√						√		√	√	√	√	√	√		Application	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Find discharge of fluid through pipe, orifices and in open channel	√		√	√					√	√	√	√				Application		Minor Exams, Quiz, End Term Exams
CO 5: Estimate the major and minor losses in pipe.	√	√				√			√	√	√	√				Create		Minor Exams, Quiz, End Term Exams
CO 6: Estimate the various elements and energy losses in hydraulic jump.	√	√		√					√	√	√	√	√		√	Evaluate		Minor Exams, Quiz, End Term Exams

Paper BTCE-308-18 Solid Mechanics Lab

CO1: Understand the importance of physical properties of steel.	√	√				√	√		√			√			√	Application	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Identify and comprehend code provisions for testing different properties of steel	√	√	√	√		√	√		√			√	√	√	√	Application		Minor Exams, Quiz, End Term Exams
CO 3: Develop stress-strain curve for axial compression	√	√	√	√		√	√		√			√	√	√	√	Application		Minor Exams, Quiz, End Term Exams
CO 4: Assess hardness and impact strength of steel.	√	√	√	√		√	√		√			√	√	√	√	Application		Minor Exams, Quiz, End Term Exams
CO 5: Assess flexural strength of a given material.	√	√	√	√		√	√		√			√	√	√	√	Application		Minor Exams, Quiz, End Term Exams
CO 6 : Evaluate fatigue and impact strength of steel.	√	√	√	√		√	√		√			√	√	√	√	Application		Minor Exams, Quiz, End Term Exams

Paper BTCE-401 Concrete Technology

CO1: Understand the relevance of different properties of constituent materials on properties of concrete.	√				√		v	√	√	√	√	√				Understand	Emplyability	Minor Exams, Quiz, End Term Exams
CO 2: Understand the behaviour and durability aspects of concrete under different loading and exposure conditions.	√				√			√	√	√	√	√		√	√			Minor Exams, Quiz, End Term Exams
CO 3: Understand the issues involved in production and use of concrete	√				√			√	√	√	√	√				Analyse and design		Minor Exams, Quiz, End Term Exams
CO 4:Design of concrete mixes as per BIS specifications.	√	√	√	√	√			√	√	√	√	√			√	Analyse and design		Minor Exams, Quiz, End Term Exams
CO 5: Understand various testing methods for concrete and their applicability	√				√	√	√	√	√	√	√	√		√	√			Minor Exams, Quiz, End Term Exams
CO 6: Knowledge of special type of non-conventional concretes.	√				√	v	v	√	√	√	√	√		√	√	Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-402 Material, Testing & Evaluation

CO1: Appraisal about the role of materials in civil engineering	√					√	√		√			√		√	√	Understand, Application		Minor Exams, Quiz, End Term Exams

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CO 2: Introduce common measurement instruments, equipments and devices to capture the material response under loading	√	√		√	√	√	√		√			√	√	√	√	Understand, Application	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice	√	√	√	√	√	√	√		√			√	√	√	√	Understand, Application		Minor Exams, Quiz, End Term Exams
CO 4:Ability to write a technical laboratory report.	√	√	√	√		√	√		√			√			√	Understand, Application		Minor Exams, Quiz, End Term Exams

Paper BTCE-403 Hydrology & Water Resources

CO1: Understand the interaction among various processes in the hydrologic cycle.	√									√		√				Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Calculate the average annual rainfall of any area using the rain gauge data and inter-relations of various parameters as infiltration, evapotranspiration etc	√	√	√	√		√			√	√		√	√	√	√	Analyse		Minor Exams, Quiz, End Term Exams
CO 3: Understand the various component of hydro graphs and able to estimate the run off	√	√	√	√		√			√	√		√	√	√	√	Analyse & Design		Minor Exams, Quiz, End Term Exams
CO 4: Find the water requirement for different crops and able to proposed appropriate method of applying water.	√	√	√	√		√	√	√	√	√		√	√	√	√	Design		Minor Exams, Quiz, End Term Exams
CO 5: Understand the distribution system of canal and various components of irrigation system	√					√	√	√		√	√	√		√	√	Understand		Minor Exams, Quiz, End Term Exams
CO6: Classify dams and spillways, their problems and able to determine forces exerted by fluid on dams.	√	√	√	√		√	√	√	√	√	√	√	√	√	√			Minor Exams, Quiz, End Term Exams

Paper BTCE-404 Transportation Engineering

CO1: Appreciate the importance of different modes of transportation and characterize the road transportation.	√					√										Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Alignment and geometry of pavement as per Indian Standards according to topography.		√														Analyse		Minor Exams, Quiz, End Term Exams
CO 3: Assess the properties of highway materials in laboratory		√		√												Analyse & Design		Minor Exams, Quiz, End Term Exams
CO 4: Understand the importance of railway infrastructure planning and design.	√					√										Design		Minor Exams, Quiz, End Term Exams
CO 5: Identify the functions of different component of railway track	√															Understand		Minor Exams, Quiz, End Term Exams
CO 6: Outline the importance of Airport Infrastructure	√					√												Minor Exams, Quiz, End Term Exams

Paper BTCE-405 Disaster Preparedness

CO1: Identify various types of disasters, their causes, effects & mitigation measures.		√										√		√		Understand		Minor Exams, Quiz, End Term Exams

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CO 2: Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.				√										√		Application	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Understand the use of emergency management system to tackle the problems	√													√		Understand		Minor Exams, Quiz, End Term Exams
CO 4: Discuss the role of media, various agencies and organisations for effective disaster management.		√											√			Analyse		Minor Exams, Quiz, End Term Exams
CO 5:Design early warning system and understand the utilization of advanced technologies in disaster management.			√										√			Application		Minor Exams, Quiz, End Term Exams
CO 6:Compare different models for disaster management and plan & design of infrastructure for effective disaster management.			√										√			Application		Minor Exams, Quiz, End Term Exams

Paper BTCE-406-18 Concrete Testing Lab

CO1: Evaluate properties of building materials, such as cement and aggregates	√			√	√	√	√	√	√	√	√	√	√	√		Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Conduct experiments and check the acceptance criteria (if any).	√			√	√	√	√	√	√	√								Minor Exams, Quiz, End Term Exams
CO 3: Design concrete mixes as per BIS provisions.	√	√	√	√	√	√	√	√	√		√	√	√	√		Analyse and design		Minor Exams, Quiz, End Term Exams
CO 4: Analyze the properties of concrete in fresh and hardened state.	√			√	√	√		√	√	√	√	√	√	√		Analyse and design		Minor Exams, Quiz, End Term Exams
CO 5: Create a well organized document and present the results appropriately.	√			√	√	√	√	√	√	√								Minor Exams, Quiz, End Term Exams
CO 6: Understand and apply non destructive testing (NDT) for evaluating concrete quality.	√	√		√	√	√	√	√	√	√	√	√	√	√		Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-407-18 Transportation Lab

CO1: Characterize the pavement materials as per the Indian Standard guidelines	√								√								Employability	Minor Exams, Quiz, End Term Exams
CO 2: Evaluate the strength of subgrade soil by CBR test.		√							√									Minor Exams, Quiz, End Term Exams
CO 3: Conduct experiments to evaluate aggregate properties.	√			√					√									Minor Exams, Quiz, End Term Exams
CO 4:Determine properties of bitumen material and mixes	√			√					√									Minor Exams, Quiz, End Term Exams
CO 5: Evaluate the pavement condition by rough meter and Benkelman beam test.	√			√					√									Minor Exams, Quiz, End Term Exams
CO 6: .Create a well organized report and present the results appropriately			√						√									Minor Exams, Quiz, End Term Exams

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Paper BTCE-501-18 Engineering Geology

CO1: The basic concepts of geological processes and their importance in civil Engineering	√	√														Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Identification of rocks and minerals and their characteristics	√	√														Understand		Minor Exams, Quiz, End Term Exams
CO 3: Significance of geological structures in civil engineering proj	√	√				√			√			√				Analysis		Minor Exams, Quiz, End Term Exams
CO 4: Site characterization and geologic considerations in construction	√	√	√	√	√	√	√	√	√	√		√	√		√	Analysis and Design		Minor Exams, Quiz, End Term Exams

PaperBTCE-502-18 Elements of Earthquake Engineering

CO1: Understand the phenomenon of occurrence and history of earthquakes and classify their kinds and effects.	√											√				understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2Appreciate the role of earthquake forces in structural design of building.	√			√		√						√	√	√		understand		Minor Exams, Quiz, End Term Exams
CO 3: Evaluate and analyze Degree of Freedom, Spring action, Damping, Equations of motions, Lateral Force analysis, Floor Diaphragm action, Moment resisting frames and Shear walls.	√	√		√								√	√	√		Analyse		Minor Exams, Quiz, End Term Exams
CO 4: Apply various codal provisions related to seismic design of buildings.	√		√			√						√	√			Design		Minor Exams, Quiz, End Term Exams
CO 5: Acquire new basic knowledge in earthquake engineering	√											√				Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-503-18 Construction Engineering &Management

CO1: An understanding of modern construction practices					√									√		Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2:A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics	√		√				√	√			√	√						Minor Exams, Quiz, End Term Exams
CO 3: A basic ability to plan, control and monitor construction projects with respect to time and cost	√			√										√		Analyse and design		Minor Exams, Quiz, End Term Exams
CO 4: An idea of how to optimise construction projects based on costs								√		√		√				Analyse and design		Minor Exams, Quiz, End Term Exams
CO 5:An idea how construction projects are administered with respect to contract structures and issues	√				√			√		√								Minor Exams, Quiz, End Term Exams
CO 6: An ability to put forward ideas and understandings to others with effective communication processes	√	√			√					√		√				Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-504-18 Environmental Engineering

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CO1: Understand the impact of humans on environment and environment on humans	√					√	√		√	√		√			√	Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil.	√	√	√			√	√		√	√	√	√	√	√	√	Evaluate		Minor Exams, Quiz, End Term Exams
CO 3:Be able to plan strategies to control, reduce and monitor pollution	√			√		√	√		√	√		√		√		Create		Minor Exams, Quiz, End Term Exams
CO 4: Be able to select the most appropriate technique for the treatment of water, wastewater ,solid waste and contaminated air.	√	√	√	√			√		√	√	√	√	√	√		Create		Minor Exams, Quiz, End Term Exams
CO 5: Be conversant with basic environmental legislation	√						√		√	√		√			√	Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-505-18 Structural Engineering

CO1: The students will be able to apply their knowledge of structural mechanics in addressing design problems of structural engineering	√	√	√	√				√	√				√			Analyse and design	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Ability to understand difference between Working stress and Limit State Philosophy by calculating various design parameters.	√	√	√	√				√	√				√			Analyse and design		Minor Exams, Quiz, End Term Exams
CO 3: Design the reinforced concrete beams and slabs using limit state design guidelines of Indian standards.	√	√	√	√			√	√	√		√		√			Analyse and design		Minor Exams, Quiz, End Term Exams
CO 4: They will possess the skills to analyse and design steel structure members	√	√	√	√		√	√	√	√		√		√			Analyse and design		Minor Exams, Quiz, End Term Exams
CO 5: They will have knowledge of structural engineering	√							√	√									Minor Exams, Quiz, End Term Exams

Paper BTCE-506-18 Geotechnical Engineering

CO1: Comprehend the various geotechnical field challenges and understand their fundamental, index and engineering properties and then use (apply) the soil as an engineering material.	√	√							√								Employability	Minor Exams, Quiz, End Term Exams
CO 2:Investigate and write the laboratory reports for soil design properties and parameters by apply the concept of permeability, total and effective stress approaches in soil strength determination		√		√					√									Minor Exams, Quiz, End Term Exams
CO 3: Apply the various specifications of compaction of soils in the construction of highways and earthen dams.		√	√															Minor Exams, Quiz, End Term Exams

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CO 4: Able to apply the knowledge of consolidation, soil deformation parameters, and calculate settlement magnitude and rate of settlement.		√		√													Minor Exams, Quiz, End Term Exams
CO 5: Design the embankment slopes and check the stability of finite slopes.		√															Minor Exams, Quiz, End Term Exams

Paper BTCE-507-18 Geotechnical Lab

CO1: Describe fundamental concepts and principles and practices of Management	√	√															Minor Exams, Quiz, End Term Exams
CO 2: Explain the role and responsibilities of managers and adapt to the various styles of management across organizations.	√	√															Minor Exams, Quiz, End Term Exams
CO 3: Develop analytical abilities to face the business situations.		√														Employability	Minor Exams, Quiz, End Term Exams
CO 4: Apply various tools that would facilitate the decision making process in the business.	√	√															Minor Exams, Quiz, End Term Exams
CO 5: Develop peer based learning and working in groups and teams.																	Minor Exams, Quiz, End Term Exams

Paper BTCE-508-18 Environmental Engineering Lab

CO1: Describe fundamental concepts and principles and practices of Management	√	√	√		√	√	√	√		√						Understand & Analyze	Practical Exam, Class/Quiz Tests
CO 2: Explain the role and responsibilities of managers and adapt to the various styles of management across organizations.				√	√	√	√	√	√	√	√	√				Understand & Analyze	Practical Exam, Class/Quiz Tests, ViVa
CO 3: Develop analytical abilities to face the business situations.				√	√	√	√	√	√	√	√	√				Understand & Analyze	Practical Exam, Class/Quiz Tests, ViVa
CO 4: Apply various tools that would facilitate the decision making process in the business.	√	√	√	√	√	√	√	√	√	√	√	√				Understand & Analyze	Practical Exam, Class/Quiz Tests, ViVa
CO 5: Develop peer based learning and working in groups and teams.	√			√	√	√	√	√			√	√				Understand & Analyze	Practical Exam, Class/Quiz Tests, ViVa
CO 6: Evaluate and compare different techniques of experimental analysis	√	√	√	√	√			√	√	√	√	√				Understand & Analyze	Practical Exam, Class/Quiz Tests, ViVa

Paper BTCE-509-18 Structural Lab

CO1: Describe fundamental concepts and principles and practices of Management	√	√			√											Understand & Analyze	Minor Exams, Quiz, End Term Exams
CO 2: Explain the role and responsibilities of managers and adapt to the various styles of management across organizations.		√						√								Understand & Analyze	Minor Exams, Quiz, End Term Exams
CO 3: Develop analytical abilities to face the business situations.	√															Understand & Analyze	Minor Exams, Quiz, End Term Exams

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CO 4: Apply various tools that would facilitate the decision making process in the business.		√		√	√				√						Understand & Analyze		Minor Exams, Quiz, End Term Exams
CO 5: Develop peer based learning and working in groups and teams.									√						Understand & Analyze		Minor Exams, Quiz, End Term Exams

Paper BTCE-532-18 Training – II*

CO1: Describe fundamental concepts and principles and practices of Management					√				√					√			Minor Exams, Quiz, End Term Exams
CO 2: Explain the role and responsibilities of managers and adapt to the various styles of management across organizations.					√				√					√			Minor Exams, Quiz, End Term Exams
CO 3: Develop analytical abilities to face the business situations.					√				√					√		Employability	Minor Exams, Quiz, End Term Exams
CO 4: Apply various tools that would facilitate the decision making process in the business.					√				√					√			Minor Exams, Quiz, End Term Exams
CO 5: Develop peer based learning and working in groups and teams.					√				√					√			Minor Exams, Quiz, End Term Exams

Paper BTCE- 601-18 Engineering Economics, Estimation & Costing

CO1: Have an idea of basic principles and elements of economics in general.						√	√	√		√	√	√				Understand		Minor Exams, Quiz, End Term Exams
CO 2: Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.		√		√		√	√	√		√	√	√				Analyse and application		Minor Exams, Quiz, End Term Exams
CO 3: Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.	√		√	√		√	√	√		√	√	√				Analyse and application	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.	√		√			√	√	√		√	√	√	√			Analyse and application		Minor Exams, Quiz, End Term Exams
CO 5: Be able to understand how competitive bidding works and how to submit a competitive bid proposal			√			√	√	√		√	√	√				Understand		Minor Exams, Quiz, End Term Exams

Paper PECE-602A-18 Elective –I(Foundation Engineering)

CO1: Understand the methods of surface and subsoil exploration and to prepare investigation report.	√			√						√	√	√				Analyse and application		Minor Exams, Quiz, End Term Exams
CO 2:Estimate the stresses in soils and bearing capacity of soil for shallow foundation	√	√										√				Analyse and application		Minor Exams, Quiz, End Term Exams
CO 3: Design various types of shallow foundation and to estimate settlement.	√	√	√									√				Analyse and application	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 4: Apply the concepts of deep foundation and solve problems related with pile foundation.	√	√	√									√				Analyse and application		Minor Exams, Quiz, End Term Exams

Paper PECE- 602B-18 Elective –II(Ground Improvement Techniques)

CO1:To study Insitu densification of cohesion		√	√	√	√	√	√			√				√		Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO2:To identify and analyze soil improvement with additions of materials		√	√	√	√	√	√			√	√	√				Understand		Minor Exams, Quiz, End Term Exams
CO3:To learn soil improvement techniques using reinforcing elements		√	√	√	√	√	√		√					√		Analyse and application		Minor Exams, Quiz, End Term Exams
CO4:To have in depth knowledge of geotextile material and its properties	√										√					Analyse and application		Minor Exams, Quiz, End Term Exams

Paper PECE- 602C-18 Elective – III(Advance Soil Mechanics)

CO1: Do earth dam design and stability analysis for all kind of drainage conditions	√	√							√				√			Analyse and application		Minor Exams, Quiz, End Term Exams
CO 2: Do stability analysis of any kind of slope and its protection		√		√					√							Analyse and application		Minor Exams, Quiz, End Term Exams
CO 3: Understand the earth pressure theories and able to calculate lateral earth pressure for different conditions		√	√										√			Analyse and application	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Evaluate depth of embedment for cantilever as well as anchored sheet piles.		√		√									√			Analyse and application		Minor Exams, Quiz, End Term Exams
CO 5: Learn the concept of machine foundation		√							√							Analyse and application		Minor Exams, Quiz, End Term Exams

Paper PECE -602D-18 Open Elective-I (Geosynthetics Engineering)

CO1: Identify the functions of geosynthetics	√	√							√				√			Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Select the geosynthetic products		√		√			√		√							Understand		Minor Exams, Quiz, End Term Exams
CO 3: Identify the testing methods for geosynthetics		√	√			√							√			Understand		Minor Exams, Quiz, End Term Exams
CO 4: Design withgeosynthetic products		√		√									√			Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE-602E-18 (Geo Environmental engineering)

CO1:To understand and analyze issues regarding soil contamination	√	√														Understand		Minor Exams, Quiz, End Term Exams
CO2:To study cause and effect of water contamintion	√	√		√	√	√	√				√	√	√	√		Understand		Minor Exams, Quiz, End Term Exams

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CO3:To identify remediation of contaminants from soil and ground water	√	√		√	√	√	√									Analysis	Skill Development	Minor Exams, Quiz, End Term Exams
CO4:To have knowldege of soil waste disposal and stabilization	√	√							√	√	√	√	√			Analysis		Minor Exams, Quiz, End Term Exams
CO5:Learn the concept of engineered landfill	√	√				√			√	√	√	√	√			Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE -602F-18(Rock Mechanics)

CO1: Identify the problems associated with underground excavations	√	√														Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Classify the rock mass using the reference data	√	√														Understand		Minor Exams, Quiz, End Term Exams
CO 3: Understand the failure criteria of rock	√	√				√			√			√				Analysis		Minor Exams, Quiz, End Term Exams
CO 4: Determine in-situ stresses from field test data	√	√	√	√	√	√	√	√	√	√		√	√		√	Analysis and Design		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE - 603A-18(Design of Concrete Structures)

								√	√				√			Analyse and Design	Skill Development	Minor Exams, Quiz, End Term Exams
CO1: To apply the loads on building frames and analyse them using direct and indirect methods.	√	√	√															
CO 2: To analyse the concrete components i.e. continuous beams, flat slabs, tanks and retaining walls, etc	√	√	√					√	√		√		√			Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 3: To design and detail the concrete components i.e. curved beams, flat slabs, tanks and retaining walls, etc	√	√	√					√	√		√		√			Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 4:To analyse and design the special foundations i.e. raft, pile and machine foundations.	√	√	√					√	√		√		√			Analyse and Design		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE-603B-18(Design of Steel Structures)

								√	√		√		√			Analyse and Design	Skill Development	Minor Exams, Quiz, End Term Exams
CO1: To apply the knowledge for analysis and design of various components of a plate girder.	√	√	√															
CO 2: To analyse , evaluate and design the different types of beam-column connections.	√	√	√					√	√		√		√			Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 3: To design the column bases and footings for a steel structure under various loading conditions	√	√	√					√	√		√		√			Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 4:To analyse the loads and design various elements of industrial buildings.	√	√	√					√	√		√		√			Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 5: To demonstrate the basic knowledge of plastic analysis of simple steel elements.	√	√	√					√	√		√		√			Analyse and Design		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE-603C-18(Advanced Structural Analysis)

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CO 4: Recognize the ideal material for different repair and retrofitting techniques.	√	√	√	√	√	√	√		√			√	√	√	√	Understand, Analyse and Design		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE-604D-18(Construction Cost Analysis Methods)

CO1: To Prepare Capital budgeting of a Construction site.	√	√	√							√	√	√	√			Understand, Analyse	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: To Prepare a Performance statement of a company'	√	√	√							√	√	√	√			Understand, Analyse		Minor Exams, Quiz, End Term Exams
CO 3: To estimate various financial instrumental such as IRR, Break even analysis			√	√	√	√	√			√	√	√	√			Understand, Analyse		Minor Exams, Quiz, End Term Exams
CO 4: To prepare a Job Cost report of a Construction Site.			√	√	√	√	√									Understand, Analyse		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE-604F-18(Construction Engineering Materials)

CO1:To Provides a broad understanding of the composition, microstructure, and engineering behavior of various materials used in civil engineering applications	√	√			√				√	√	√	√		√		Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: To Introduces various modifications possibilities in construction materials	√	√			√				√	√	√	√				Understand		Minor Exams, Quiz, End Term Exams
CO 3: To Understand and Explain Special Concrete	√	√							√	√	√	√				Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-OECE-609(Remote Sensing and GIS)

CO1:The characteristics of Remote sensing satellites and Applications of remote sensing		√	√	√					√			√		√		Understand, Analyse	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: The GIS and its Data models		√	√	√							√			√		Understand, Analyse		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE -701A-18(Pavement and geometric design of Highway)

CO1: Understand patterns of Traffic and its behaviou	√					√			√			√	√	√		Understand, Analyse and Design	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Develop an understanding for various sight distances and its affects		√										√	√	√		Understand, Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 3: Analyse and design Horizontal and vertical curves		√		√					√			√	√	√		Understand, Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 4: Apply various tools that would facilitate the decision making process in the business.	√					√			√							Understand, Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 5: Develop and appreciate the concept of intersections	√								√			√				Understand, Analyse and Design		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE -701B-18(Airport planning and Design)

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CO1: Understand the detail concepts of the airport engineering	√					√			√			√	√			Understand, Analyse and Design	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Able to design runway, taxiway and apron pavements.		√										√		√		Understand, Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 3: Suggest the runway orientation and the runway length as per FAA & ICAO guidelines.		√		√					√				√	√		Understand, Analyse and Design		Minor Exams, Quiz, End Term Exams
CO 4: Conceptualise Pavement management system for maintenance	√					√			√							Understand, Analyse and Design		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE -701C-18(Intelligent Transportation systems)

CO1: Understand the concept of Intelligent Transportation system.	√					√			√				√			Understand, Analyse	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Analyse ITS's relevance with Smart growth and energy based planning.												√		√		Understand, Analyse		Minor Exams, Quiz, End Term Exams
CO 3: Conceptualise the urban transportation systems using different models.		√							√				√	√		Understand, Analyse		Minor Exams, Quiz, End Term Exams
CO 4: Explore methodology for smart city based Transit planning	√					√			√							Understand, Analyse		Minor Exams, Quiz, End Term Exams
CO 5: Suggest road safety using ITS.																Understand, Analyse		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE -701D-18(Highway Construction and Management)

CO1: Understand various materials and techniques used to construct pavements.	√					√			√			√	√			Understand, Analyse and design	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Design the bituminous pavement as per standards		√					√			√		√		√		Understand, Analyse and design		Minor Exams, Quiz, End Term Exams
CO 3: Design thickness and joints including drainage of concrete pavements		√		√					√				√	√		Understand, Analyse and design		Minor Exams, Quiz, End Term Exams
CO 4: Suggest maintenance of pavement.	√					√			√							Understand, Analyse and design		Minor Exams, Quiz, End Term Exams
CO 5: Conceptualise pavement management systems.	√	√	√	√									√			Understand, Analyse and design		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE -701E-18(High Speed Rail Engineering)

CO1: Develop an understanding for high-speed Rails.	√		√			√			√			√	√			Understand, Analyse and design	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Outline the requirements for design		√		√			√					√		√		Understand, Analyse and design		Minor Exams, Quiz, End Term Exams
CO 3: Design of points, crossing and turnouts.		√		√					√				√	√		Understand, Analyse and design		Minor Exams, Quiz, End Term Exams

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CO 3: Aanalyse rural sanitation approaches along with the low cost excrete disposal system and sustainable wastewater treatment procedure.	√		√			√	√		√	√	√	√	√		√	Analyze	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Resolve various issues encountered in rural sanitation.	√	√		√		√	√		√	√		√				Application		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE-702C-18(Air and Water Quality Modeling)

CO1: Model Development and mass balance along with equilibrium principles.	√	√	√	√		√			√	√	√	√	√	√		Create	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Develop lake water quality modeling, ground water quality modeling and numerical methods.	√		√						√	√		√		√	√	Create		Minor Exams, Quiz, End Term Exams
CO 3: Do modeling for air pollution, self cleaning of atmosphere and stack emission.	√	√	√	√					√	√	√	√	√	√	√	Create		Minor Exams, Quiz, End Term Exams
CO 4: Understand about Water Quality Index, Air Quality Index and Delphi Method.	√				√		√		√	√		√				Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE-702D-18(Solid and HazardousWaste Management)

CO1: Understand various concepts related to collection, storage and transportation of wastes along with application of recycling and reuse of wastes.	√					√	√		√	√		√			√	Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Apply different processing technologies related to solid wastes and their treatment.	√	√	√	√			√		√	√	√	√	√	√		Create, Apply		Minor Exams, Quiz, End Term Exams
CO 3: Analyse various treatment methods for hazardous wastes & their disposal and also apply different disposal methods of hazardous wastes.	√	√	√	√			√		√	√	√	√	√	√		Create,apply		Minor Exams, Quiz, End Term Exams
CO 4: Design, develop, operate and closure of landfills. Also, to manage and monitor the behavior of landfill materials and sites.	√	√	√	√			√		√	√	√	√	√	√	√	Design		Minor Exams, Quiz, End Term Exams
CO 5: Understand and apply municipal solid waste rules and other rules.	√					√	√		√	√		√				Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE-702E-18(EIA and LCA)

CO1: Understand about EIA in detail and rules, various notifications (2000) and projects required in the EIA Process	√					√	√		√	√		√			√	Unddrstand, Apply		Minor Exams, Quiz, End Term Exams
CO 2: Understand various risks, its issues and their impacts. They should also be able to learn about criteria for selection of EIA methodology, impacts, evaluation and methods	√		√	√			√		√	√	√	√	√	√	√	Create		Minor Exams, Quiz, End Term Exams

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CO 2: To understand the concept of groundwater and well hydraulics.	√	√	√	√		√			√	√		√	√	√	√	Analyse	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: To understand the water quality standards and groundwater management.	√	√	√	√		√			√	√		√	√	√	√	Analyse & Design		Minor Exams, Quiz, End Term Exams
CO 4: Understand the impact of climate change on hydrological cycles and groundwater..	√	√	√	√		√	√	√	√	√		√	√	√	√	Design		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE -703D-18(Hydraulic Modelling)

CO1: To have an overall knowledge about the basics of hydraulic modeling	√					√			√	√						Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: To understand the concept of gravity dominated and friction models.	√	√							√	√						Apply		Minor Exams, Quiz, End Term Exams
CO 3: Use of remote sensing and geographic information system in water quality modeling.	√	√	√		√		√		√	√				√		Analyze		Minor Exams, Quiz, End Term Exams
CO 4: Understand the concepts and models in groundwater hydrology.	√	√		√					√	√		√	√	√		Evaluate		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE -703E-18(Transient in Closed Conduits)

CO1: Identify the basic numerical scheme for unsteady flow in closed conduits.	√		√				√			√	√			√		Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Implement comprehensive and effective flow control, achieving efficient water utilization, and maintaining rich fluvial environments.		√		√	√	√		√			√		√			Apply		Minor Exams, Quiz, End Term Exams
CO 3: Detect and analyze the flow transients through pumps and related hydraulic structures.		√					√		√					√		Analyze		Minor Exams, Quiz, End Term Exams
CO 4: Analyze pipe networks including pumps, valves, surge tanks, etc		√	√		√						√		√			Evaluate		Minor Exams, Quiz, End Term Exams

Paper BTCE-PECE -703F-18(Urban Hydrology and Hydraulics)

CO1: Provide an overview of urban hydrology and Urban water supply demand forecast.	√					√			√	√						Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Identify tools and approaches for urban water management.	√	√								√						Apply		Minor Exams, Quiz, End Term Exams
CO 3:Learn the important types of storm water infrastructure used in urban drainage systems.	√	√	√		√		√		√	√						Analyze		Minor Exams, Quiz, End Term Exams
CO 4: Learn the operation and management of urban drainage system and to develop storm water management models.	√	√								√			√	√		Evaluate		Minor Exams, Quiz, End Term Exams
CO 5: Design urban drainage systems and structures such as culverts, OSD systems and street pipe drainage systems	√		√						√	√			√			Apply		Minor Exams, Quiz, End Term Exams

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Paper BTCE-OECE-701-18(Metro Systems andEngineering)

CO1: Understand the importance of Metro System	√		√				√			√	√			√		Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Understand the construction methods of underground and elevated station		√		√	√	√		√			√		√			Apply		Minor Exams, Quiz, End Term Exams
CO 3: To realize the significance of traffic management systems by incorporating the concepts of Traffic Engineering.		√					√		√					√		Analyze		Minor Exams, Quiz, End Term Exams
CO 4: To realize the importance of safety in metro by understanding the concepts signaling system		√	√		√						√		√			Evaluate		Minor Exams, Quiz, End Term Exams
CO 5: Understand the importance of electrical and mechanical system in metro.		√	√		√						√		√			Evaluate		Minor Exams, Quiz, End Term Exams

Paper BTCE-OECE-702-18(Traffic Management)

CO1: To have an overall knowledge of the traffic components and assess the traffic characteristics and related problems.	√					√				√			√			Understand	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Develop a strong knowledge base of traffic planning and its management in any transportation area		√							√		√					Apply		Minor Exams, Quiz, End Term Exams
CO 3: Provide knowledge of traffic control devices and its techniques in transportation interaction.		√		√				√					√			Analyze		Minor Exams, Quiz, End Term Exams
CO 4: Understand different types of Traffic Management techniques	√					√						√			√	Evaluate		Minor Exams, Quiz, End Term Exams
CO 5: Collect Traffic data, traffic volume count, intersection studies and spot and journey speed studies and further to analyse them.	√							√			√			√		Apply		Minor Exams, Quiz, End Term Exams

Paper BTCE-OECE-703-18(Road Safety)

CO1: Investigate & determine the collective factors and remedies of accident involved.	√					√				√			√			Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Able to collect and represent accident data to identify black spots.		√							√		√					Apply		Minor Exams, Quiz, End Term Exams
CO 3: Understand the role of intelligent transport system in Road safety		√		√									√			Analyze		Minor Exams, Quiz, End Term Exams
CO 4:To massage the traffic system from road safety point of view.	√					√						√			√	Evaluate		Minor Exams, Quiz, End Term Exams
CO 5: Understand various traffic management systems for safety & safety improvement strategies	√							√			√			√		Apply		Minor Exams, Quiz, End Term Exams

Paper BTCE-OECE-704-18(Environmental Impact Assessment)

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CO1: Knowledge about EIA tools & methodologies and identify the suitable methodology and prepare Rapid EIA.	√					√	√		√	√		√			√	Understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Be able to access different case studies/examples of EIA in practice	√	√	√			√	√		√	√	√	√	√	√	√	Evaluate		Minor Exams, Quiz, End Term Exams
CO 3:Access different case studies/examples of EIA in practice.	√			√		√	√		√	√		√		√		Create		Minor Exams, Quiz, End Term Exams
CO 4:Understand the phenomena of impacts on environment.	√	√	√	√			√		√	√	√	√	√	√		Create		Minor Exams, Quiz, End Term Exams

Paper BTCE-OECE-705-18(Construction Materials)

CO1: To Provides a brief description about different types of materials used in building construction for members like foundation, masonry, arches, lintels, balcony, roof, floor, doors, windows, stairs, plastering, painting and other general topics.	√											√				understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Understand the properties of various construction materials, their uses and their different applications.	√			√		√		√				√	√	√		understand		Minor Exams, Quiz, End Term Exams
CO 3: To know the various latest and modern construction materials, properties and their uses.	√	√		√								√	√	√		Analyse		Minor Exams, Quiz, End Term Exams
CO 4: Able to understand the relationship between material properties and structural form.	√		√			√		√				√	√			Design		Minor Exams, Quiz, End Term Exams
CO 5: Able to understand the importance of experimental verification of material properties.	√											√				Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE-BTMC-701-18(Management- I (Organizational Behavior))

CO1: Learn the development of the field of organizational behavior and explain the micro and macro approaches.	√				√							√			√	understand	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Analyse and compare different models used to explain individual behaviour related to motivation and rewards	√			√		√				√		√	√	√		understand		Minor Exams, Quiz, End Term Exams
CO 3: Identify the various leadership styles and the role of leaders in a decision making process	√	√		√								√	√	√		Analyse		Minor Exams, Quiz, End Term Exams
CO 4:Explain group dynamics and demonstrate skills required for working in groups (team building)	√		√			√		√				√	√			Design		Minor Exams, Quiz, End Term Exams
CO 5:Create an adaptable stress management plan for academic success incorporating selected techniques	√							√				√		√		Understand		Minor Exams, Quiz, End Term Exams

Paper BTCE 802-18(Smart Cities)

CO1: Obtain basic knowledge and concept of smart cities and associated challenges.	√						√				√			√		Understand		Minor Exams, Quiz, End Term Exams

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CO 2: Develop an understanding for various sight distances and its affects		√		√	√			√			√		√			Apply	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Learn how to analyze and compare existing smart community projects.		√							√					√		Analyze		Minor Exams, Quiz, End Term Exams
CO 4: Understand the importance of different smart system.			√		√											Evaluate		Minor Exams, Quiz, End Term Exams
CO 5: Understand latest technologies used in intelligent building.		√	√		√						√		√			Evaluate		Minor Exams, Quiz, End Term Exams

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Note: Provide Mapping for all courses of all programs offered by the Department

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Name of the Department: Civil Engg.

M.Tech Civil Engg. CO PO

MTST101 - 18 Advanced Structural Analysis

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

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CO1: Analyze the skeleton structures using stiffness analysis code.	√	√	√	√	√	√	√	√	√		√	√	√	√	√	Excelle	can be entrepreneur in designing and can get employed in Design department	Minor Exams, Quiz, End Term Exams
CO 2:2.Use direct stiffness method understanding its limitations		√		√		√		√		√				√		Good		Minor Exams, Quiz, End Term Exams

MTST102 – 18Advanced Solid Mechanics

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Course Outc	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learnin	Focus on Emp	Assessment Tools to Measure Attainment of CO
CO1: Solve simple problems of elasticity and plasticity understanding the basic concepts.	√	√	√	√		√	√	√	√		√	√	√	√	√	Excelle	Yes	Minor Exams, Quiz, End Term Exams

Engineering Knowledge
Problem Analysis
Design/development of solutions
Conduct investigations of complex problems
Modern tool usage
The engineer and society
Environment and sustainability
Ethics
Individual and team work
Communication
Project management and finance
Life-long Learning
Analysis and Design Skill
Research and Innovation
Sustainable Outlook

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CO 2:Apply numerical methods to solve continuum problems.		√		√						√				√		Good		Minor Exams, Quiz, End Term Exams

MTST901 - 18 Theory of Thin Plates and Shells

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO1: 1.Use analytical methods for the solution of thin plates and shells.	√	√	√		√	√		√	√	√	√	√		√	√	Good	Yes	Minor Exams, Quiz, End Term Exams
CO 2:Use analytical methods for the solution of shells.	√		√		√	√	√		√		√		√	√	√	V.Good	Yes	Minor Exams, Quiz, End Term Exams
CO 3: Apply the numerical techniques and tools for the complex problems in thin plates.			√		√		√		√		√	√	√	√	√	Excellen	Yes	Minor Exams, Quiz, End Term Exams
CO 4: Apply the numerical techniques and tools for the complex problems in shells.	√	√		√			√	√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

MTST902 - 18- Theory and Applications of Cement Composites

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO1: Formulate constitutive behaviour of composite materials – Ferrocement, SIFCON and Fibre Reinforced Concrete - by understanding their strain-stress behaviour.	√	√	√	√		√	√		√		√	√	√	√	√	Good	yes	Minor Exams, Quiz, End Term Exams
CO 2:Classify the materials as per orthotropic and anisotropic behaviour		√		√			√	√		√		√		√		Excelle	yes	Minor Exams, Quiz, End Term Exams

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CO 3: Estimate strain constants using theories applicable to composite materials.		√	√	√		√		√		√		√		√	√	V.Good	yes	Minor Exams, Quiz, End Term Exams
CO 4: Analyse and design structural elements made of cement composites.		√		√			√	√		√		√		√		Good	yes	Minor Exams, Quiz, End Term Exams

MTST903 - 18 - Theory of Structural Stability

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Course Outc	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learnin	Focus on Emp	Assessment Tools to Measure Attainment of CO
CO1:Determine stability of columns and frames	√	√																Minor Exams, Quiz, End Term Exams
CO 2:Determine stability of beams and plates		√		√														Minor Exams, Quiz, End Term Exams

Engineering Knowledge
Problem Analysis
Design/development of solutions
Conduct investigations of complex problems
Modern tool usage
The engineer and society
Environment and sustainability
Ethics
Individual and team work
Communication
Project management and finance
Life-long Learning
Analysis and Design Skill
Research and Innovation
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CO 3: 3.Use stability criteria and concepts for analysing discrete and continuous systems		√	√														Minor Exams, Quiz, End Term Exams

MTST904– 18- Analytical and Numerical Methods for Structural Engineering

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO1: Solve ordinary and partial differential equations in structural mechanics using numerical methods	√	√	√	√		√	√		√		√	√		√	√	V.Good	Yes	Minor Exams, Quiz, End Term Exams
CO 2:Write a program to solve a mathematical problem.		√		√	√		√	√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

MTST905 - 18– Structural Health Monitoring

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Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Diagnosis the distress in the structure understanding the causes and factors.	√	√	√	√	√		√		√		√	√	√	√	√	Good	yes	Minor Exams, Quiz, End Term Exams

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CO 2:Assess the health of structure using static field methods.		√		√	√	√		√	√		√	√	√	√		V.Good	yes	Minor Exams, Quiz, End Term Exams
CO 3: Assess the health of structure using dynamic field tests.		√	√	√	√	√		√		√		√		√	√	Good	yes	Minor Exams, Quiz, End Term Exams
CO 4: Suggest repairs and rehabilitation measures of the structure		√		√	√		√	√		√	√		√	√		Excellen	yes	Minor Exams, Quiz, End Term Exams

MTST906 - 18 – Structural Optimization

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Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Use Variational principle for optimization	√	√		√	√		√	√		√	√		√	√		Good	yes	Minor Exams, Quiz, End Term Exams
CO 2:Apply optimization techniques to structural steel and concrete members.		√		√			√		√			√		√		Good	yes	Minor Exams, Quiz, End Term Exams

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CO 3:Design using frequency constraint.		√	√		√	√		√	√		√	√		√	√	Good	yes	Minor Exams, Quiz, End Term Exams

MTST111– 18–Structural Design Lab

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO1: Design and Detail all the Structural Components of Frame Buildings.	√	√		√	√		√	√		√	√		√	√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO 2:Design and Detail complete Multi-Story Frame Buildings.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

MTST112– 18– Advanced Concrete Lab

Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1. Design high grade concrete and study the parameters affecting its performance.	√	√		√	√		√	√		√	√		√	√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO2. Conduct Non-Destructive Tests on existing concrete structures.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO3. Apply engineering principles to understand behavior of structural/ elements.		√	√		√	√		√	√		√	√		√	√	Good	Yes	Minor Exams, Quiz,, End Term Exams

Research Methodology and IPR

Engineering Knowledge	
Problem Analysis	
Design/development of solutions	
Conduct investigations of complex problems	
Modern tool usage	
The engineer and society	
Environment and sustainability	
Ethics	
Individual and team work	
Communication	
Project management and finance	
Life-long Learning	
Analysis and Design Skill	
Research and Innovation	
Sustainable Outlook	

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand research problem formulation.	√	√		√	√		√	√		√	√		√	√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO 2: Analyze research related information		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO 3: Follow research ethics		√	√		√	√		√	√		√	√		√	√	Good	Yes	Minor Exams, Quiz, End Term Exams

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CO 4: Understand that today's world is controlled by Computer, Information Technology,		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO 5:Understanding that when IPR would take such important place in growth of individuals &		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO 6: Right to be promoted among students in general & engineering in particular.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO 7:Understand that IPR protection provides an incentive to inventors for further research work and	√	√		√	√		√	√		√	√		√	√		Good	Yes	Minor Exams, Quiz, End Term Exams

MTST201 - 18 Finite Element Method in Structural Engineering

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Course Outc	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learnin	Focus on Emp	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO1. Use Finite Element Method for structural analysis.	√	√		√		√		√		√		√	√	√	√	Good	Yes	Minor Exams, Quiz, End Term Exams

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CO2. Execute the Finite Element Program/ Software.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO3. Solve continuum problems using finite element		√	√		√	√		√	√		√	√		√	√	Good	Yes	Minor Exams, Quiz, End Term Exams

MTST202 - 18 – Structural Dynamics

Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1. Analyze and study dynamics response of single degree freedom system using fundamental equation of motion.	√	√	√		√	√		√		√		√		√	√	Good	Yes	Minor Exams, Quiz, End Term Exams
CO2. Analyze and study dynamics response of Multi degree of freedom system using fundamental theoryand equation of motion.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO3.Use the available software for dynamic analysis.		√	√		√	√		√	√		√	√		√	√	Good	Yes	Minor Exams, Quiz, End Term Exams

MTST907 - 18– Advanced Steel Design

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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MTST908 - 18 – Design of Formwork

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO1. Select proper formwork, accessories and material.	√	√			√	√			√	√			√	√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO2. Design the form work for Beams, Slabs, columns, Walls and Foundations.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO3. Design the form work for Special Structures.		√	√			√	√			√	√			√	√	Good	Yes	Minor Exams, Quiz, End Term Exams
CO4. Understand the working of flying formwork.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

MTST909 - 18 – Design of High Rise Structures

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Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

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CO1. Analyse, design and detail Transmission / TV tower, Mast and Trestles with different loading conditions.	√	√			√	√			√	√			√	√		Good	yes	Minor Exams, Quiz, End Term Exams
CO2. Analyse, design and detail the RC and Steel Chimney.		√		√		√		√		√		√		√		Good	yes	Minor Exams, Quiz, End Term Exams
CO3. Analyse. design and detail the tall buildings subjected to different loading conditions using relevant codes.		√	√			√	√			√	√			√	√	Good	yes	Minor Exams, Quiz, End Term Exams

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MTST910 - 18– Design of Masonry Structures

Course Outcc	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learnin	Focus on Emp	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO1. Understand the masonry design approaches.	√	√			√	√			√	√			√	√		Good	yes	Minor Exams, Quiz, End Term Exams

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CO2. Analyse Reinforced Masonry Members.		√		√		√		√		√		√		√		Good	yes	Minor Exams, Quiz, End Term Exams
CO3. Determine interactions between members.		√	√			√	√			√	√			√	√	Good	yes	Minor Exams, Quiz, End Term Exams
CO4. Determine shear strength and ductility of Reinforced Masonry members.		√		√		√		√		√		√		√		Good	yes	Minor Exams, Quiz, End Term Exams
CO5. Check the stability of walls		√		√		√		√		√		√		√		Good	yes	Minor Exams, Quiz, End Term Exams

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CO6. Perform elastic and Inelastic analysis of masonry walls.		√		√		√		√		√		√		√		Good	yes	Minor Exams, Quiz, End Term Exams

MTST911 - 18– Design of Advanced Concrete Structures

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO1. Analyse the special structures by understanding their behaviour.	√	√			√	√			√	√			√	√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO2. Design and prepare detail structural drawings for execution citing relevant IS codes.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

MTST912 - 18 – Advanced Design of Foundations

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Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1. Decide the suitability of soil strata for different projects.	√	√			√	√			√	√			√	√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO2. Design shallow foundations deciding the bearing capacity of soil.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO3. Analyze and design the pile foundation.		√	√			√	√			√	√			√	√	Good	Yes	Minor Exams, Quiz, End Term Exams
CO4. Understand analysis methods for well foundation.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams

MTST913 - 18 – Soil Structure Interaction

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO1. Understand soil structure interaction concept and complexities involved.	√	√		√	√		√	√		√	√		√	√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO2. Evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO3. Prepare comprehensive design oriented computer programs for interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc.	√	√		√	√		√	√		√	√		√	√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO4. Analyze different types of frame structure founded on stratified natural deposits with linear and non-linear stress-strain characteristics.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO5. Evaluate action of group of piles considering stress-strain characteristics of real soils.	√	√		√	√		√	√	√		√	√		√	√	Good	Yes	

MTST914 - 18 - Design of Industrial Structure

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Course Outcome	Engineering Knowledge PO-a	Problem Analysis PO-b	Design/development of solutions PO-c	Conduct investigations of complex problems PO-d	Modern tool usage PO-e	The engineer and society PO-f	Environment and sustainability PO-g	Ethics PO-h	Individual and team work PO-i	Communication PO-j	Project management and finance PO-k	Life-long Learning PO-l	Analysis and Design Skill PSO-m	Research and Innovation PSO-n	Sustainable Outlook PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1. Unde	√	√		√	√		√	√		√	√		√	√		Good	Yes	Minor Exams, Quiz, End Term
CO2. Prepare t	√			√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term
CO3. Conduct	√	√			√	√		√	√		√	√		√	√	Good	Yes	Minor Exams, Quiz, End Term

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CO4. Conduct model testing for free and forced vibrations		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams
																	Yes	

MTST114 – 18 – Numerical Analysis Lab

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO1. Find Roots of non-linear equations by Bisection method and Newton's method.	√	√		√	√		√	√		√	√		√	√		Good	yes	Minor Exams, Quiz, End Term Exams
CO2. Do curve fitting by least square approximations		√		√		√		√		√		√		√		Good	yes	Minor Exams, Quiz, End Term Exams
CO3. Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/ Gauss - Jorden Method		√	√		√	√		√	√		√	√		√	√	Good	yes	Minor Exams, Quiz, End Term Exams

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CO4. To Integrate Numerically Using Trapezoidal and Simpson's Rules		√		√		√		√		√		√		√		Good	yes	Minor Exams, Quiz, End Term Exams
CO5. To Find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge- Kutta Method.		√	√		√	√		√	√		√	√		√	√	Good	yes	Minor Exams, Quiz, End Term Exams

MTST231 – 18 Mini Project

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Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1. Identify structural engineering problems reviewing available literature.	√	√		√	√		√	√		√	√		√	√		Good	Yes	Minor Exams, Quiz, End Term Exams

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CO2. Study different techniques used to analyze complex structural systems.		√		√		√		√		√		√		√		Good	Yes	Minor Exams, Quiz, End Term Exams
CO3. work on the solutions given and present solution by using his/her technique applying engineering principles.		√	√		√	√		√	√		√	√		√	√	Good	Yes	Minor Exams, Quiz, End Term Exams

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Name of the Department: Civil Engg.

PhD CO PO

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Bridge Engineering																		
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**

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CO1: Understand the codal provisions for loading and design standards of bridges	√					√			√	√		√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO2:. Design and detail of different types of reinforced concrete bridges		√							√	√		√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO 3: Design the substructure including pier and pier cap and abutments.		√		√					√	√		√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO 4: Design the various types of foundations for bridges and to know about their construction detail	√					√			√	√		√	√	√		√	√	Minor Exams, Quiz, End Term Exams

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CO 5: To know about different types of bearings, joints and handrails .	√								√	√		√	√			√	√	Minor Exams, Quiz, End Term Exams
CO 6: To know abo	√					√			√	√		√	√			√	√	Minor Exams, Quiz, End Term Exams

Paper: Advance Construction Technology

CO1:To develop understanding of design considerations and various aspects of stability in earthen dams.	√					√			√	√		√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO 2: . To get knowledge about special foundations for different conditions.		√							√	√		√	√	√		√	√	Minor Exams, Quiz, End Term Exams

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CO 3: To develop a thorough understanding of structural aspects of high rise buildings and tall chimneys and also problems of high rise construction.	√	√		√					√	√		√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO 4: To know the advantages of pre-fabricated construction and its design aspects.	√	√		√					√	√		√		√	√	√	√	Minor Exams, Quiz, End Term Exams
CO 5: To know basic concept of prestressing.	√			√	√				√	√		√		√				Minor Exams, Quiz, End Term Exams
CO 6: To get introduced to advanced construction materials like geo-synthetics etc.			√						√	√		√		√	√			Minor Exams, Quiz, End Term Exams

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Paper: Research Methodology

CO1:Understand significance of Research and literature survey , types and teachniques of carrying out research. Learn literature survey and how to conduct review.	√	√	√			√	√		√	√	√	√	√		√	√	√	Minor Exams, Quiz, End Term Exams
CO2:Formulate a research problem	√	√		√			√		√	√	√	√	√			√	√	
CO3: Learn various techniques of data collection and sampling methods		√		√		√			√	√	√	√	√			√	√	
CO4:Analysis of data with statistics									√	√	√	√	√			√	√	Minor Exams, Quiz, End Term Exams

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CO5: Enabling the students develop a proposal and methodology in detail. Develop a thesis using latest software tools.									√	√	√	√	√			√	√	
CO6: Understanding Ethics in Research and develop a research paper	√								√	√	√	√	√			√	√	Minor Exams, Quiz, End Term Exams

Advanced Foundation Design and Construction

CO1: Identify and formulate solution to design foundation system for a structu	√			√		√	√		√	√	√	√	√	√	√	√	√	Minor Exams, Quiz, End Term Exams
CO2: Analyse and design pile foundations.	√	√				√			√	√		√	√	√	√	√	√	Minor Exams, Quiz, End Term Exams

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CO3: Evaluate the importance of well foundation, retaining wall, sheet piles and shoring.	√	√	√		√	√			√	√		√	√	√	√	√	√	Minor Exams, Quiz, End Term Exams
CO4: Suggest suitable ground improvement technique for specific soil.					√				√	√			√	√	√	√	√	
CO5: Examine and discuss effects of earthquakes and construction under water on foundations	√	√	√						√	√		√	√	√	√	√	√	Minor Exams, Quiz, End Term Exams

Paper: Environment Engineering and Management

CO1:Learn how to characterize water and wastewater.	√	√	√	√		√	√			√	√	√	√	√		√	√	Minor Exams, Quiz, End Term Exams

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CO2:Grasp the fundamentals of air pollution and its associated environmental impacts.	√	√	√			√	√			√	√	√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO3:Earn to describe the key concepts of air quality management		√	√			√	√			√	√	√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO4: an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare			√			√	√			√	√	√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO5:Appreciate the importance of EIA as an integral part of planning process.			√			√	√			√	√	√	√	√		√	√	Minor Exams, Quiz, End Term Exams

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Paper: Advanced Geoinformatics

CO1:Identification of rocks and minerals, their characteristics, mode of occurence	√	√	√			√	√		√	√	√	√				√	√	Minor Exams, Quiz, End Term Exams
CO2:The basic concepts of geological processes and their importance in Civil Engineering	√	√				√			√	√	√	√				√	√	
CO3: Principles of Remote Sensing and Photogrammetry		√				√			√	√	√	√	√			√	√	
CO4: GIS and data models									√	√	√	√	√			√	√	Minor Exams, Quiz, End Term Exams
CO5: Hyper spectral remote sensing									√	√	√	√	√			√	√	

Paper: Civil Engineering Applications of Remote Sensing and GIS

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CO1 Understand Photogrammetry: types, calculations and interpretation	√	√		√		√	√		√	√		√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO2: Understand Principles of Remote sensing and Satellite images	√	√	√		√				√	√		√	√	√		√	√	
CO3: Understand GIS and its Data models. Global positioning system, Applications of Remote Sensing .		√							√	√		√	√	√		√	√	
CO4: Remote Sensing and GIS data modeling in environment, urban planning and site selection									√	√		√	√	√		√	√	Minor Exams, Quiz, End Term Exams

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Pavement design, Construction and maintenance

CO1: Design of pavement using various methods.	√			√		√			√	√	√	√		√		√	√	Minor Exams, Quiz, End Term Exams
CO2: Analysis and design of rigid pavement.	√	√			√				√	√		√	√			√	√	Minor Exams, Quiz, End Term Exams
CO3: Understand various methods of pavement construction.	√	√	√						√	√		√	√			√	√	Minor Exams, Quiz, End Term Exams
CO4: 4. Generate Pavement maintenance management system									√	√		√				√	√	

Paper: Hydraulic Engineering

CO1: Develop forecasting models for operation of hydrologic systems	√			√		√	√		√	√	√	√	√	√		√	√	Minor Exams, Quiz, End Term Exams

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CO2:Formulate and solve conjunctive use of surface water and groundwater resource utilization problem	√	√		√			√			√		√		√		√	√	Minor Exams, Quiz, End Term Exams
CO3:Design spillways and energy dissipation structures	√	√	√	√			√			√		√				√	√	Minor Exams, Quiz, End Term Exams
CO4:Understand the characteristics of Soft Computing Techniques										√						√	√	

COMPUTER AIDED DESIGN METHODS

CO1: Learn how to use CAD and its scope.	√			√	√	√			√	√	√	√	√			√	√	Minor Exams, Quiz, End Term Exams

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CO2: Identification of computer graphics like clipping, segmentation, shading etc.	√	√			√				√	√	√	√				√	√	Minor Exams, Quiz, End Term Exams
CO3:Understand computer aided linkage displays and synthesis.	√	√	√		√				√	√	√	√				√	√	Minor Exams, Quiz, End Term Exams
CO4:Enabling the students to develop various matrix methods of structural analysis.									√	√	√					√	√	
CO5: Evaluate data base management and retrieving of data.	√	√	√	√					√	√	√	√				√	√	Minor Exams, Quiz, End Term Exams

ADVANCED STRUCTURAL ENGINEERING

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CO1:Evaluate and analyze three dimensional elasticity problems.	√			√		√			√	√	√	√	√	√		√	√	Minor Exams, Quiz, End Term Exams
CO2:Understand or learn matrix methods of structural analysis with computer program.	√	√			√				√	√	√	√	√			√	√	Minor Exams, Quiz, End Term Exams
CO3:Analyze and design of plate and shell structures using proper software.	√	√	√						√	√	√	√				√	√	Minor Exams, Quiz, End Term Exams
CO4:Understand multi – variable and multi – objective optimization									√	√	√					√	√	

GEOTECHNICAL ENGINEERING

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CO1: Analyze and identify problems related to foundations for earthen dams/slopes on expansive soils	√			√		√			√	√	√	√	√			√	√	Minor Exams, Quiz, End Term Exams
CO2: Understand the behaviour of rocks under dynamic conditions.	√	√							√	√		√				√	√	Minor Exams, Quiz, End Term Exams
CO3: Apply Finite element method to geotechnical problems	√	√	√						√	√		√				√	√	Minor Exams, Quiz, End Term Exams
CO4:Analyse and Specify site investigation techniques for report writing of Pile and Infrastructure projects									√	√		√				√	√	

Town & Country Planning

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CO1: Understand the Basic Definitions, Concepts related to Town Planning, Infrastructure Development, etc.	√			√		√					√	√	√			√	√	Minor Exams, Quiz, End Term Exams
CO 2: To develop: an appreciation of the scope and breadth of planning practice as it has emerged historically and in its contemporary manifestation in India and abroad.	√		√		√			√	√	√	√	√		√		√	√	Minor Exams, Quiz, End Term Exams

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CO 3: To explore the capacities for planners to work collaboratively in addressing transportation and urban infrastructure challenges.	√	√	√				√		√			√	√			√	√	Minor Exams, Quiz, End Term Exams

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Name of the Department: Civil Engg.

BTCE – 301: Fluid Mechanics-I

	Engineering Knowledge	Problem Analysis	Design/development of	Conduct investigations	Modern tool usage	The engineer and society	Environment and	Ethics	Individual and team work	Communication	Project management	Life-long	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

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the knowledge of the basic principles of fluid mechanics for analysis and design of type of flow regime in a given engineering system, to construct an appropriate (fixed, deforming, or moving) control volume for a given engineering system and apply the principles of conservation of mass, momentum, and energy to	√		√		√	√	√		√		√		√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Ability to calculate the hydrostatic forces and moments on planar and curved submerged and floating surfaces to analyze fluid flow problems with the application of the momentum and energy equations.		√		√		√					√		√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Ability to present data or governing equations in non-dimensional form, design experiments, and perform model studies and to decide when appropriate to use ideal flow concepts and the Bernoulli equation.		√	√				√	√	√				√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Ability to solve for internal flow in pipes and channels through simple solutions of the Navier-Stokes equations, Moody chart and head-loss equations.		√	√	√		√	√	√		√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 5: Ability to solve for external flow, evaluate lift and drag, know when there is possibility of flow separation, apply streamlining concepts for drag reduction by using experimental correlations	√		√		√		√		√		√		√		√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: An understanding of how fluid mechanics applies to Civil, biological and environmental systems	√		√	√		√		√		√		√		√		Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-302: Rock Mechanics & Engineering Geology

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Students will be able to critically review the importance of Engg. Geology and their applications to Civil Engineering practices.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Students will be able to identify and classify common minerals and rocks using basic geological classification system.		√		√		√		√		√		√		√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Students will be able to know about Geological structures (Joint, veins, crack, faults, and fold), reasons of formation for each type and their side effects on the engineering projects.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 4: Students will be able to know the characteristics of earthquake and measures taken to construct structures like tunnels, highways, dams etc. in rocks.		√		√		√		√		√		√		√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Students will be able to determine physical and Civil properties of rock in term of density, porosity, permeability, and hardness.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 6: Students will have knowledge of Field and laboratory test procedures and be able to interpret test results needed to estimate intact and rock mass properties.		√		√		√		√		√		√		√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 7: Students will be to identify problems in rock mass and able to provide improvement in the properties of rock mass.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 8: Students will be able to understand the role of Geology in the design and construction process of underground opening in Rock.		√		√		√		√		√		√		√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 9: Students will be able to apply geological concepts and approaches on rock engineering projects	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-303: Strength of Materials

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Concepts of free body diagrams of structures and to check stability (Beams and frames)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 2: Concepts of stress and strain of axially loaded members, Civil and thermal properties.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Concepts of shear force and bending moment diagrams of different beams with different loading conditions and relation between loads, shear force and bending moment	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 4: Concepts of straight beams, bending stress of beams, flitched beams, shear stress formula for beams and shear stress distribution in beams.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Concepts of crippling load of an axially loaded column under different end conditions.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Concepts of torsion and failure theories		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE-304: Surveying

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Understand the principles and objective of surveying.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Calculate the horizontal distance on plane and sloping surface.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Do angular and elevation measurements with different types of equipments.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Analyze the closed traverse and will be able to balance it.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Design simple circular curves for horizontal and vertical alignments.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Plot the topographical map of an area	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-305: Building Materials and Construction

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	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Students will have sufficient knowledge of materials in construction	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Students will be able to design the concrete mixes according to the situations		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Students will have sufficient knowledge to think critically in terms of achieving the goals of "Shelter for all".	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Students will have knowledge of the revolutionary materials in construction		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
																		Minor Exams, Quiz, End Term Exams

BTCE-306: Fluid Mechanics Lab

Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO 1: Predict the metacentric height of floating vessel and appreciate its utility in vessel design.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Calibrate various flow measuring devices (venturimeter, orifice meter and notches).	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Authenticate the Bernoulli's theorem experimentally.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Assess the discharge of fluid over broad crested weir	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 5: Compute various losses and velocity in pipe flow in field																Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Compare good understanding of concepts and their applications in the laboratory.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-307: Strength of Material Lab

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Understand the importance of physical properties of steel.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 2: Identify and comprehend code provisions for testing different properties of steel.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Develop stress –strain curve for axial compression, axial tension and shear.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Evaluate fatigue and impact strength of steel using suitable equipment.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Assess hardness of steel using Rockwell and Brinell apparatus.	√			√			√			√			√			Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Compute load carrying capacity of a leaf spring.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Get a brief idea about history of Photogrammetry and its advancement in the field of surveying	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: To aware students the different methods of survey measurements using EDM		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 3: To aware students to different types of Total station and make them able to use it in field.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: To aware students the different components, uses, and operations involved in Remote Sensing		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: To introduce the concept of GIS, Its different Components and application in the field of Civil Engineering field.	√		√	√		√	√		√	√		√	√		√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: To aware students to different types of GPS Recivers.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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BTCE 402: Construction Machinery and Works

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Design the bar charts and milestone charts for residential construction buildinigs.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Apply the PERT and CPM techniques to the various complex civil engineering projects			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Solve the optimistic time and minimum cost for the various projects by applying various methods.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Design and use the different construction machinery in order to get the maximum output.	√			√			√			√			√			Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: 5Understand the operations of concrete batching and bitumen plants	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-403: DESIGN OF CONCRETE STRUCTURES -1

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Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO 1: Identify and utilize the cement, steel, aggregates and admixtures to obtain the desired reinforced cement concrete.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Prepare concrete mixture having desired properties and assess its quality in fresh and hardened state using Indian standard methods.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Ability to understand difference between Working stress and Limit State Philosophy by calculating various design parameters.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 4: Analyze a reinforced concrete member under flexure, shear and torsion using limit state design philosophy.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Design the reinforced concrete beams and slabs using limit state design guidelines of Indian standards.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Access the structural safety and serviceability of reinforced concrete beams and slabs as per Indian standards for Limit state design	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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BTCE- 404:
Fluid
Mechanics-II

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Distinguish and identify different types of fluid flow.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Formulate equation of flow through different media/obstructions for a laminar and turbulent flow.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Apply the principles of conservation of energy and momentum in the flow studies in open channels and simple pipe network.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Design pipe network and open channels for passing a given discharge.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Evaluate the effect of channel shapes on the discharge parameters.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Understand and apply the theory of hydraulic jumps and surges.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-405: IRRIGATION ENGINEERING –I

Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO 1: Identify the basic understanding of soil water plant relationship.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Understand different irrigation techniques and the related theories.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Apply different theories/methods to design lined and unlined canals.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

CO 4: Estimate the yield of tube-well using different formulae.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Design different hydraulic structures required for effective river training works.	√			√			√			√			√			Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Demonstrate the knowledge related to the water logging, losses, economics of lining, etc.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE- 406: STRUCTURAL ANALYSIS-I

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Differentiate between determinate and indeterminate structures.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill development	Minor Exams, Quiz, End Term Exams
CO 2: Evaluate deflections in structures using various methods. (Beams, frames and trusses)	√	√		√	√		√	√		√	√		√	√		Good	Skill development	Minor Exams, Quiz, End Term Exams
CO 3: Examine the causes for additional stresses in arches, trusses and cables.		√	√		√	√		√	√		√	√		√	√	Good	Skill development	Minor Exams, Quiz, End Term Exams
CO 4: Draw ILD for various forces in determinate structural systems	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill development	Minor Exams, Quiz, End Term Exams

BTCE-407: CONCRETE TECHNOLOGY LAB

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Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO 1: Evaluate properties of various building materials, such as cement, aggregates, bricks and tiles.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Conduct experiments and check the acceptance criteria (if any).		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Design concrete mixes by relevant code provisions.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Analyze the properties of concrete in fresh and hardened state.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Create a well-organized document and present the results appropriately.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-408: Structural Analysis Lab

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Verify theoretical formulas by conducting experiments.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill development	Minor Exams, Quiz, End Term Exams
CO 2: Predict the behavior of statically determinate beams and trusses.		√			√			√			√			√		Good	Skill development	Minor Exams, Quiz, End Term Exams
CO 3: Understand two hinged arch and three hinged arch structures.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill development	Minor Exams, Quiz, End Term Exams
CO 4: Demonstrate the influence lines for statically determinate and indeterminate beams.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill development	Minor Exams, Quiz, End Term Exams

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CO 5: Observe and compute deflections of simply supported beams, curved beams and frames using classical methods.		√			√			√			√			√		Good	Skill development	Minor Exams, Quiz, End Term Exams
CO 6: Outline the deflected shapes of columns and struts with different end conditions	√		√	√		√	√		√	√		√	√		√	Good	Skill development	Minor Exams, Quiz, End Term Exams

BTCE-501: DESIGN OF STEEL STRUCTURES -1

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Recognize the properties of structural steel and permissible stresses under different types of loading conditions as per Indian standards for limit state design.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Estimate safe load carrying capacity and efficiency of different steel fasteners like rivets, bolts & welds.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Select safe and economical steel sections for different structural members under various loading/stress conditions.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Analyze forces and stresses in tension, compression, flexural members and roof truss members of structural steel.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 5: Design steel structural members i.e. ties, struts, beams, columns, bases, roof trusses, other associated components and connections under different conditions of limit states.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Evaluate structural safety, stability and economy of various steel structural members to achieve sustainability	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE – 502: Geotechnical Engineering

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	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Comprehend the various geotechnical field challenges and understand their fundamental, index and engineering properties and then use (apply) the soil as an engineering material.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Apply the various specifications of compaction of soils in the construction of highways and earthen dams.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Able to apply the knowledge of consolidation, soil deformation parameters, and calculate settlement magnitude and rate of settlement.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 4: Investigate and write the laboratory reports for soil design properties and parameters by apply the concept of total and effective stress approaches in soil strength determination		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Design the embankment slopes and check the stability of finite slopes.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-503: STRUCTURAL ANALYSIS-II

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	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Identify determinate and indeterminate structures and compute the indeterminacies of those structures.	√	√		√	√		√	√		√	√		√	√		Good	Skill development	Minor Exams, Quiz, End Term Exams

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CO 2: Predict the response of structures ((Beams, frames and trusses) in terms of bending moments, shear forces and displacements using classical methods.		√	√		√	√		√	√		√	√		√	√	Good	Skill development	Minor Exams, Quiz, End Term Exams
CO 3: Apply methods for analysis to indeterminate structures i.e. conventional methods and approximate methods to various structures.	√		√	√		√	√		√	√		√	√		√	Good	Skill development	Minor Exams, Quiz, End Term Exams

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CO 4: Understand the causes of additional stresses in beams, arches, trusses & frames and draw the ILD of various force quantities.		√			√			√			√			√		Good	Skill development	Minor Exams, Quiz, End Term Exams
CO 5: Suggest suitable method for analysis of different types of multistoried frames.	√		√	√		√	√		√	√		√	√		√	Good	Skill development	Minor Exams, Quiz, End Term Exams

BTCE-504: Transportation Engineering–I

Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

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CO 1: Appreciate the importance of different modes of transportation and characterize the road transportation.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Align and design the geometry of pavement as per Indian Standards according to topography.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Assess the properties of highway materials in laboratory.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 4: Understand the importance of drainage, construction methods for various roads, pavement failure and its maintenance.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Compute the transportation cost of highway project and outline the sources of highway financing.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Interpret the traffic data after conducting traffic survey and describe the traffic characteristics, traffic safety and traffic environment interaction.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-505: Environment Engineering-I

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Understand the different water demands their estimation and forecasting.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Understand sources of water and their development.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Analyze water quality parameters.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 4: Understand and design water treatment processes.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Design Water conveyance systems.																Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Develop and design drinking water system for rural areas	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-506: Transportation Engineering Lab

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Characterize the pavement materials as per the Indian Standard guidelines.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Evaluate the strength of subgrade soil by CBR test.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Conduct experiments to evaluate aggregate properties.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Determine properties of bitumen material and mixes	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Evaluate the pavement condition by rough meter and Benkelman beam test.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams

CO 6: Create a well-organized report and present the results appropriately	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-507: Geotechnical Engineering Lab

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Understand the procedure for classifying coarse grained and fine grained soils.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Evaluate the index properties of soil.																Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Determine the engineering properties of soil.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Interpret the results of compaction test for relative compaction in the field.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 6: Conduct experiments, analyze and interpret results for geotechnical engineering design.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-508: Computer Aided Structural Drawing

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Create, dimension and sketch a plot/plan for representation /expression of civil engineering designs.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Draft construction/design drawings including structural drawings for civil engineering projects.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Produce structural drawing of reinforced concrete elements such as beams, slabs and staircases.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Develop structural drawing of steel elements such as connections, tension members, compression members, beams, column base and roof trusses.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 5: Understand various connection details.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Gain proficiency in CAD software.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE 601: Design of Concrete Structures-2

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Analyze and Design different types of R.C.C Stair Case.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Analyze and Design different types of R.C.C Foundation Systems.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Analyze and Design different types of R.C.C Compression Members.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Analyze and Design different types of R.C.C Continuous and Curved Beams.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Analyze and Design different types of R.C.C Domes.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 6: Analyze and Design different types of RCC Retaining Wall and Water Tanks.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE 602: Elements of Earthquake Engineering

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Understand the phenomenon of occurrence and history of earthquakes and classify their kinds and effects.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Recognize source and types of structural vibrations.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Evaluate and analyze Degree of Freedom, Spring action, Damping, Equations of motions, Lateral Force analysis, Floor Diaphragm action, Moment resisting frames and Shear walls.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Design structure for seismic forces having adequate Lateral Strength, Stiffness, and ductility.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 5: Appraise and implement provisions of IS1893-2002(Part-I), IS 13920 and IS 4326.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Understand and apply the theory of hydraulic jumps and surges.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-603: FOUNDATION ENGINEERING

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Apply fundamental concept of mathematics, statics and mechanics to understand the essentials of the methods of soil exploration and stability analysis.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Analyze and design a variety of geotechnical engineering structures including foundations, piles, retaining walls, slopes and interpret data.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Recognize behavior of soils in slopes, behind retaining structures and phenomena affecting foundation capacity and settlement.	√		√		√		√	√		√	√		√		√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Determine allowable bearing pressures and load carrying capabilities of different foundation systems.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 5: Evaluate appropriate bearing capacity correction factors and apply related equations in design. Evaluate effects of water and layered soil systems on foundation performance.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Specify pile material types for single and group for various load capacity by calculating side, tip capacity of driven piles in clay and sands.	√		√		√		√		√		√		√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 7: Identify the appropriate deep well/Cassion foundation type for different soil profiles.	√		√		√		√		√		√		√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-604: NUMERICAL METHODS IN CIVIL

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Demonstrate the concept of approximations and errors in the implementation and development of numerical methods.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 2: Select an appropriate solution to an engineering problems dealing with the roots of equations through numerical methods.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Execute the solution using of problems involving linear algebraic equations and appreciate the application of these problems in fields of engineering.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 4: Apply the techniques to fit curves to data and be capable of choosing the preferred method for any particular problem.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Evaluate the solution of the problems through the numerical integration and differentiation and solve ordinary and partial differential equations and eigen value problems through various techniques.	√		√	√		√	√		√	√		√	√		√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 6: Able to use New Marks Method for civil engineering problems.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE 605: Professional Practice

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: On completion of the course, the students will be able to:	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Apply different types of estimates in order to estimate any type of structure.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Calculate unit cost per cubic meter of a reinforced concrete structure, earthen embankment and unit cost per square meter for a given highway project.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Carry out the analysis of rates and bill preparation for different materials and components of the project.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Develop a detailed quantity survey reports and abstract summary of the project.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 6: Prepare a bid analysis and invite contractors through tender notices.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-606: ENVIRONMENTAL ENGINEERING – II

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Demonstrate a firm understanding of various sanitation systems and their suitability.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Design sewer and drainage systems layout for communities.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams

CO 3: Evaluate the waste water characteristics to determine the degree of treatment required.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Explain the physical, chemical and biological techniques of wastewater treatment.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Compare the applicability of treatment technologies under different conditions																Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Design the treatment units and assess the efficacy of an entire treatment system	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 7: Ability to make decisions regarding the treatment plant site selection, operation and maintenance and the need of advanced treatment.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE -607: ENVIRONMENTAL ENGINEERING LABORATORY

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Conduct experiments as per standard methods of sampling and analysis.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Demonstrate the expertise to characterize water and wastewater samples.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Record the experimental observations and interpret the analysis results.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Use the analysis results for making informed decisions about the drinkability of water and disposal of wastewater.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 6: Evaluate and compare different techniques of experimental analysis	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-608: COMPUTER AIDED STRUCTURAL DRAWING –

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Create, dimension and sketch a plot/plan for representation /expression of civil engineering designs.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 2: Draft construction/design drawings including structural drawings for civil engineering projects.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Produce structural drawing of reinforced concrete elements such as beams, slabs and staircases.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Develop structural drawing of steel elements such as connections, tension members, compression members, beams, column base and roof trusses.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 5: Understand various connection details.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Gain proficiency in CAD software.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE 801: Design of Steel Structures – II

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Demonstrate knowledge of basic concepts for analysis and design of various structural steel elements like ties, struts, beams, columns and fasteners.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Identify importance of various elements of a plate girder and their design.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Compile various loads for a foot bridge, and thereby design its elements including wooden deck, cross beam and main girder	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 4: Plan structural framing of industrial building for given design data and design various elements like gantry girder, column bracket, mill bent and bracings.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Identify various loads and load combinations for design of different components of a railway bridge as per the railway code.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Design various elements of a railway bridge for given design data.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE 802 DISASTER MANAGEMENT

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Identify various types of disasters, their causes, effects & mitigation measures.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 3: Understand the use of emergency management system to tackle the problems.	√	√		√		√	√		√	√		√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Discuss the role of media, various agencies and organisations for effective disaster management & preparedness for future through various case studies.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Design early warning system and understand the utilization of advanced technologies in disaster management.	√	√		√		√	√		√	√		√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 6: Compare different models for disaster management and plan & design of infrastructure for effective disaster management.	√	√		√	√		√		√		√		√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-803 IRRIGATION ENGINEERING-II

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Understand the functioning and design consideration of various components of Diversion Head Work.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Analyze the various parameters of hydraulic structures for seepage and uplift pressure.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Recognize the concept and principles of silt control devices.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Design water distribution systems, regulators, canal falls, outlets, cross drainage works, weirs and barrages of irrigation network.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 5: Apply knowledge to select best canal fall, outlet and cross drainage works according to real time situation.			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Identify appropriate energy dissipation devices suitable for hydraulic structures as per site condition.	√		√	√		√	√		√	√		√	√		√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-804 Transportation Engineering – II

Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

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CO 1: Understand the importance of railway infrastructure planning and design.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Identify the functions of different component of railway track.		√			√			√			√			√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Apply existing technology to design, construction and maintenance of railway track.		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Apprehend the advanced international technology being used in the field of railway engineering.	√			√			√			√			√			Good	Employability	Minor Exams, Quiz, End Term Exams

CO 5: Outline the importance of Airport Infrastructure planning and design.																Good	Employability	Minor Exams, Quiz, End Term Exams
CO 6: Evaluate the major issues and problems of current interest to airport engineering	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-805 PROJECT

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Identify a suitable problem after conducting a thorough literature survey .	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 2: Prepare hypothesis and select a suitable method to obtain the solution.	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 3: Design and conduct experiment		√	√		√	√		√	√		√	√		√	√	Good	Employability	Minor Exams, Quiz, End Term Exams
CO 4: Record observations, data, and results and their interpretation	√	√		√	√		√	√		√	√		√	√		Good	Employability	Minor Exams, Quiz, End Term Exams
CO 5: Use software applications effectively to write technical reports and oral presentations			√			√			√			√			√	Good	Employability	Minor Exams, Quiz, End Term Exams

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CO 6: Applying modern engineering tools for the system design, simulation and analysis	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Employability	Minor Exams, Quiz, End Term Exams

BTCE-806 DYNAMICS OF STRUCTURES

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Demonstrate the fundamental theory of dynamic equation of motion for dynamic systems.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 2: Identify the concepts of mathematics, science, and engineering by developing the equations of motion for vibratory systems and solving for the free and forced response.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Model the response of single-degree-of-freedom (SDOF) systems to pulse and harmonic and periodic excitations and discrete lumped mass multi-degree-offreedom (MDOF) systems.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 4: Understand the response spectrum concept.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Evaluate the solution of the problem through the concepts of viscous damping, coulomb damping (by friction) and equivalent damping.	√		√	√		√	√		√	√		√	√		√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Analyze dynamic analysis of various structures using Numerical Methods.	√		√	√		√	√		√	√		√	√		√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 7: Analyze dynamic analysis of various structures using Numerical Methods.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Demonstrate the knowledge of theory of elasticity, solution of simultaneous equations by different techniques.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Understand the concept and terminology related to the concept of finite element analysis.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 3: Apply different methods, such as Stationary principles, Rayleigh-Ritz, weighted residual method in the analysis.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Develop various types of matrix, such as element stiffness matrix, load vector, and equilibrium and compatibility conditions for different types of problems using different types of elements.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 5: Analyze the determinate and indeterminate problems related to beams, frames, trusses, plates.	√		√	√		√	√		√	√		√	√		√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Execute the solution using a logic and structured approach offered by the finite element method	√		√	√		√	√		√	√		√	√		√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE-808 ADVANCED REINFORCED CONCRETE DESIGN

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Demonstrate the fundamental theory design of RC elements.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Apply the design principles to the large span concrete roofs as per IS code.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Analyze the behaviour of slabs for different loading and boundary conditions.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Design the components of chimney.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Analyze and design the different type of retaining systems as per requirements.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 6: Design the water tanks of different shapes and capacities		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE – 809 PRESTRESSED CONCRETE

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Understand the material characteristics of structural materials, such as high strength concrete and high strength steel, etc.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 2: Understand and apply the concept and terminology related to the prestressed concrete.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Analyze the beam sections carrying the prestressed force, external loads and timedependant effects, such as creep, shrinkage and other losses.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Evaluate and interpret the use of different prestressing systems on the PSC beams.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 5: Design prestressed concrete beams and slabs for flexure, shear and torsion.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Apply various provisions prescribed by IS 1343 to the design of prestressed concrete members	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE-810 GROUND IMPROVEMENT TECHNIQUES

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Evaluate the existing characteristics of the soil to be improved.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Understand the mechanism of ground improvement.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Select a suitable type of ground improvement technique considering the existing soil.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Design various ground improvement techniques.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Monitor the efficiency of ground improvement methods.	√		√	√		√	√		√	√		√	√		√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 6: Apply the selected ground improvement methods at site.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE-812 EARTH AND EARTH RETAINING

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Design of earthen dams considering seepage analysis and seepage control.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 2: Analysis of earth retaining structures for their stability against earth pressure.		√	√	√	√		√	√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Prediction of lateral earth pressures associated with different earth systems.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Applying engineering knowledge for the designing of earth retaining structures in various site conditions.	√	√		√	√		√	√					√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 5: Evaluation of rigid retaining structures using appropriate design methods, factors of safety, earth pressure diagrams.	√	√	√	√	√	√		√	√			√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Evaluation of flexible retaining structures using appropriate design methods, factors of safety, earth pressure diagrams	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE-813 REINFORCED EARTH AND GEOTEXTILES

Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook

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Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO 1: Understand the principle of reinforced earth and different types of reinforcement techniques.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Identify the types and functions of geosynthetics.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Compare the different geosynthetics products for different construction projects.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Identify the testing methods for geosynthetics.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 5: Compare natural and artificial geosynthetics.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Design of paved and unpaved roads, embankments and retaining walls with different types of geosynthetics.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE-814 ENVIRONMENTAL IMPACT ASSESSMENT

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Understand the concepts of environmental impact analysis and legislations involving EIA.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Identify the factors for assessing the impacts of field projects.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Use the methodologies to set up environmental indices and quantify the impacts.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Assess the environmental, socio-economic and health impacts of different projects.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 5: Design an environmental proposal and evaluate the available alternatives.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Demonstrate knowledge of professional and ethical responsibilities.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE 815 ADVANCED ENVIRONMENTAL ENGG.

Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

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CO 1: Understand the basic concepts of inter-relationship between different ecosystems with environment.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Compute the causes of different types of pollution along with related regulations (local, national, and international).		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 3: Explain the mechanisms of air pollutants transport/dispersion in the atmosphere and select the systems to control them at different sources.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Prepare the life cycle assessment of Solid waste from its generation to disposal.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Evaluate different methods of solid waste management and identify the suitable disposal alternatives available.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 6: Explain different types of hazardous waste and correspondingly appropriate method for its treatment and disposal.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE 816 FLOOD CONTROL & RIVER ENGINEERING

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Appropriate the importance of river engineering and its social and environmental impacts.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 2: Compute and forecast flood by various methods.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Identify suitable flood control method and select one according to economical condition.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Evaluate suitable method for river training and channel improvement.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Predict sediment load carried by river and its impact on flow.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Understand the concept of River Regime theories.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE - 817 HYDROLOGY AND DAMS

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Understand the importance of hydrological data in water resources planning.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Design of rain gauge network according to requirement.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Compute depth of precipitation, run-off and infiltration over the basin by different methods.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

CO 4: Design peak flow and fix design floods.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Compare suitable type of dams according to site requirements.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Design different types of dams i.e; gravity dams, earthen dams, arch and buttress dams.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE-818 PAVEMENT DESIGN

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			

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CO 1: Identify the different types of pavement and factors affecting their design.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Design the flexible pavement using different methods and as per latest Indian Standard.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Understand the factors affecting Bitumen mix design and design procedure of bitumen mix	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Design the rigid pavement using different methods and as per latest Indian Standard.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 5: Evaluate the pros and cons of various other low cost pavements proposed by IRC.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Assess the need of overlay and design accordingly.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE-819 TRAFFIC ENGINEERING

Course Outcome	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Analysis and Design Skill	PSO-n Research and Innovation	PSO-o Sustainable Outlook	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

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CO 1: Understand the characteristics related to road user, vehicle, and traffic stream.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Conduct the various traffic studies to collect the data related to traffic.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Create the solution of the problem related to traffic regulation and control.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Design the traffic signal timing for pre-timed and traffic actuated signals.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 5: Outline the procedure to assess the road safety audit.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Access the need of modernization in traffic engineering.	√	√	√		√		√		√		√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

BTCE-820 BRIDGE ENGINEERING

Course Outcome	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	Learning Level	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
CO 1: Learn the basics of bridge classification, choice of bridge type, investigations for the bridges.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 2: Learn loadings on the bridge, IRC loadings, and load combinations for the specific problem.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 3: Understand the load distribution on a specific bridge system.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Analyze and design Steel and RCC bridge deck system.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 5: Conceptualize the design of bridge substructures.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			Minor Exams, Quiz, End Term Exams

BTCE-821 INFRASTRUCTURE DEVELOPMENT &

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	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Analysis and Design Skill	Research and Innovation	Sustainable Outlook			
Course Outcome	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**Learning Level**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO 1: Understand the impact of infrastructure development on the economic development of a country.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 2: Strategies the policy process for infrastructure development.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 3: Identify and compare the best tools for effective project evaluation, management and control.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 4: Demonstrate the construction components of various infrastructure sectors like highway, ports & aviation, oil & gas, power, telecom, railway and irrigation.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 5: Remember the necessary conceptual insights, perspectives and the tools required for effective infrastructure management.		√	√		√	√		√	√		√	√		√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 6: Choose the best financing option for a project.	√	√		√	√		√	√		√	√		√	√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 7: Develop a skill to retrieve lessons from case studies in International/ National project management.	√		√	√		√	√		√	√		√	√		√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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CO 8: Document the different phases in the life cycle of an infrastructure project.		√			√			√			√			√		Good	Skill Development	Minor Exams, Quiz, End Term Exams
CO 9: Gather background information and research regarding various infrastructure sectors and describe its impact on the project.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Good	Skill Development	Minor Exams, Quiz, End Term Exams

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