B. TECH – CIVILENGINEERING

Department Vision

To Lead Academics and Research in Civil Engineering Globally.

Department Mission

- To provide high quality education and make the students as ethical, world class professionals.
- To improve the skills of both staff and students with opportunities to innovate and explore knowledge through research projects and consultancy.
- To inculcate the feeling of present needs in students and evoke in them a responsibility to serve the society better.

Program Educational Objectives (PEOs):

PEO1	Graduate will be able to succeed in diversified fields of industry/higher studies by acquiring technical knowledge and contribute to the sustainable development of infrastructure.
PEO2	Graduate will be able to exhibit professionalism and ethics and show ability to accept modern trends by engaging in lifelong learning.
PEO3	Graduate will be able to apply innovative ideas and succeed as a researcher/entrepreneur to serve societal needs.

Program Specific Outcomes (PSO's):

PSO1:	Develop critical aptitude skills and become professional to address any problem of the society.
PSO2:	Acquire practical knowledge by field visits and function effectively with the training of software by means of curriculum.
PSO3:	Effectively communicate with the stakeholders and execute engineering projects with high proficiency.

Program Out comes(POs):

Engineering Graduates will be able to:

1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis:** Identify, formulate, reviewer search literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments ,analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustain able development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes for First Year First Semester Course (2023-24) :

Course Name: Communicative English	Course code: B23HS1101	Course Year: **First Year**

Items	
CO-1	Identify the context, topic, and thematic information from social or transactional dialogues and texts and construct textual discourses.
CO-2	Analyze diverse literary genres from both semantic and syntactic perspectives, enhance vocabulary and develop proficiency in various writing styles.
CO-3	Analyze grammatical structures to formulate sentences which helps better summarization of the texts.
CO-4	Integrate an essay, a resume, a letter, and an E-mail message.
CO-5	Appraise reading/listening texts, draft an essay, and write summaries based on global comprehension of the texts.

Course Name: LINEAR ALGEBRA & CALCULUS	Course code: B23BS1101	Course Year: **First Year**

Items	
CO-1	Solve a given system of linear algebraic equations
CO-2	Develop the matrix algebra techniques that are needed by engineers for practical applications
CO-3	Utilize mean value theorems for real life problems
CO-4	Apply the concept of partial differentiation in various engineering applications
CO-5	Evaluate double, triple integrals and their applications.

Course Name: ENGINEERING CHEMISTRY	Course code: B23BS1106	Course Year: **First Year**

Items	
CO-1	Apply the knowledge of electrochemistry principles to design energy storage devices and understanding the principle, mechanism of corrosion and utilization of various techniques to control corrosion.
CO-2	Apply the knowledge about quality of water and its treatment methods for domestic and industrial applications. Analyze the water quality parameters by different chemical analytical methods
CO-3	Design and construct engineering products like refractories, composites, building materials for societal applications. Also, can apply the knowledge of lubrication
CO-4	Develop polymer composites, synthetic polymers and formulation of polymers and their use in design for sustainable development. Develop the analytical knowledge of fuels and their economics, advantages, and limitations
CO-5	Develop the knowledge of nanomaterials and colloids for societal application and develop the ability to manufacture nanomaterials by chemical and environmental benign methods

Course Name: BASIC CIVIL ENGINEERING	Course code: B23CE1101	Course Year: **First Year**

Items	
CO-1	Identify various sub-divisions within Civil Engineering, recognize their contributions to society, and utilize their understanding of the fundamental properties and attributes of Civil Engineering Materials to experiment with and apply prefabricated technology
CO-2	Apply their understanding of the fundamental concepts of surveying by effectively utilizing the knowledge of measuring distances, angles, and levels as integral components in the surveying process
CO-3	Identify the significance of Transportation in a nation's economy, recognize the engineering measures associated with it, and appreciate the importance of Water Storage and Conveyance Structures, fostering an understanding of social responsibilities related to

	water conservation		
Course Name: BASIC MECHANICAL ENGINEERING		Course code: B23CE1101	Course Year: **First Year**
Items			
CO-1	Apply the use of engineering materials and importance of Mechanical Engineering in diverse sectors and industries		
CO-2	Apply the Working of basic thermal engineering systems and different manufacturing processes.		
CO-3	Illustrate the basic operation of power plants and fundamentals of different mechanical power transmission systems, robotics, and their applications.		

Course Name: ENGINEERING GRAPHICS		Course code: B23ME1101	Course Year: **First Year**
Items			
CO-1	Utilize the fundamentals of drawing to Sketch polygons and engineering curves		
CO-2	Apply principles of Orthographic projections to Draw the projections of points and lines		
CO-3	Utilize the fundamentals of Orthographic projections to Draw the projections of planes.		
CO-4	Utilize the fundamental principles of Orthographic projections to Sketch projections of three-dimensional objects.		
CO-5	Apply principles of drawing to Construct sectional views and pictorial views of simple solids		

Course Name: IT WORKSHOP		Course code: B23IT1101	Course Year: **First Year**
Items			
CO-1	Identify various hardware components of a personal computer and perform assembly and disassembly		
CO-2	Install Windows and Linux Operating Systems and configure basic network, internet and security settings		
CO-3	Demonstrate skill in usage and basic security configurations of browsers.		
CO-4	Create documents and presentations, use spreadsheet applications for data storage and analysis		
CO-5	Use Chat GPT to Create stories, translate languages, and prompt engineering features.		

Course Name: COMMUNICATIVE ENGLISH LAB		Course code: B23HS1102	Course Year: **First Year**
Items			
CO-1	Develop English language proficiency with emphasis on LSRW skills.		
CO-2	Develop communication skills through various language learning activities.		
CO-3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.		
CO-4	Analyze and apply professionalism in participating in debates and group discussions actively.		
CO-5	Deduce the employability related strategies to become industry-ready.		

Course Name: ENGINEERING CHEMISTRY LAB		Course code: B23BS1107	Course Year: **First Year**
Items			
CO-1	Apply the theoretical knowledge to perform experiments and techniques used in chemistry laboratory for volumetric analysis; redox titrations with different indicators		
CO-2	Justify choice of chemicals and materials in corrosion and energy storage systems		
CO-3	Develop nanomaterials and polymers for sustainable development		
CO-4	Analyze the properties of water (pH) and lubricants viz. Flash & fire point, viscosity, and their significance by instrumental analysis		

Course Name: ENGINEERING WORKSHOP	Course code: B23ME1102	Course Year: **First Year**
Items		
CO-1	Observe safety precautions, select suitable tools and practice on preparing various components in Wood working & Fitting Trades.	
CO-2	Analyze the dimensions to be marked and prepare the sheet metal components.	
CO-3	Examine the tools and equipment used in Foundry & Arc welding methods.	
CO-4	Choose various tools and accessories to prepare pipe joints, change of two wheeler tyre etc.…	

Course Name: HEALTH AND WELLNESS, YOGA AND SPORTS	Course code: B23HS1104	Course Year: **First Year**
Items		
CO-1	Understand the importance of yoga and sports for Physical fitness and sound health.	
CO-2	Demonstrate health-related fitness components	
CO-3	Compare and contrast various activities that help enhance their health.	
CO-4	Assess current personal fitness levels.	
CO-5	Develop Positive Personality	

Course Outcomes for First Year Second Semester Course (2023-24):

Course Name: DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	Course code: B23BS1201	Course Year: **First Year**
Items		
CO-1	Apply the knowledge in simple applications such as Newton's law of cooling, orthogonal trajectories and simple electrical circuits	
CO-2	Solve linear ordinary differential equations of second order and higher order and applications related to various engineering fields	
CO-3	Identify the methods of solution for partial differential equations that model physical processes.	
CO-4	Interpret the physical meaning of different operators such as gradient, curl and divergence.	
CO-5	Evaluate the work done against a field, circulation and flux using vector calculus	

Course Name: ENGINEERING PHYSICS	Course code: B23BS1202	Course Year: **First Year**
Items		
CO-1	Analyze the intensity variation of light due to polarization, interference and diffraction.	
CO-2	Familiarize with the basics of crystals and their structures	
CO-3	Summarize various types of polarization of dielectrics and classify the magnetic materials	
CO-4	Apply the basic concepts of Quantum mechanics, free electron theory and fermi energy	
CO-5	Classify the type of semiconductor using Hall effect.	

Course Name: BASIC ELECTRICAL ENGINEERING	Course code: B23EE1201	Course Year: **First Year**
Items		
CO-1	Apply the circuit laws for the analysis of simple DC and AC Circuits.	
CO-2	Illustrate the working of major power generating plants and measuring instruments.	
CO-3	Apply the basic principles of energy conversion to understand the working of various electric motors and illustrate electric safety measures.	
Course Name: BASIC ELECTRONICS ENGINEERING	Course code: B23EE1201	Course Year: **First Year**

Items	
CO-1	Illustrate construction and working of Diodes & BJT.
CO-2	Apply the knowledge of semiconductor devices to understand the working of rectifiers, voltage regulators and electronic instruments.
CO-3	Implement simple digital logic circuits

Course Name: ENGINEERING MECHANICS	Course code: B23ME1203	Course Year: **First Year**
Items		
CO-1	Solve for the resultant of the given force systems & Analyse force systems using equations of equilibrium.	
CO-2	Determine centroid, centre of gravity and moment of inertia of areas and bodies	
CO-3	Analyse the forces of the members in trusses and solve problems on frictional force	
CO-4	Apply the General equation of motion principles to solve the problems of rectilinear and curvilinear motion of a particle	
CO-5	Determine the displacement, velocity and acceleration relations and apply the kinetics on rigid bodies	

Course Name: INTRODUCTION TO PROGRAMMING	Course code: B23CS1201	Course Year: **First Year**
Items		
CO-1	Explain fundamentals of computer, programming languages. Use appropriate data types for storing data and choose the operators for writing complex expressions in C.	
CO-2	Make use of Decision Making and Looping statements to Solve various problems in C	
CO-3	Solve problems using Arrays and Strings for efficiently accessing homogenous data.	
CO-4	Develop programs using pointers, structures and unions.	
CO-5	Develop programs to handle functions for reusability and redundancy. Apply file-handling functions to read/write data to files.	

Course Name: ENGINEERING PHYSICS LAB	Course code: B23BS1204	Course Year: **First Year**
Items		
CO-1	Get hands on experience in setting up experiments and using the instruments/equipment individually and conduct experiments.	
CO-2	Get introduced to using new/advanced technologies and understand their significance	

Course Name: ELECTRICAL ENGINEERING WORKSHOP	Course code: B23EE1202	Course Year: **First Year**
Items		
CO-1	Demonstrate Kirchhoff ’s laws and solar power generation with changing irradiance.	
CO-2	Examine the functioning of safety equipment in electrical systems.	
CO-3	Use electrical instruments for measuring electrical quantities.	
CO-4	Analyze the Magnetization Characteristics to find the critical field resistance of DC Shunt generator and examine the transformation ratio of 1-Φ transformer.	
Course Name: ELECTRONICS ENGINEERING WORKSHOP	Course code: B23EE1202	Course Year: **First Year**
Items		
CO-1	Analyze the v-i Characteristics of PN junction Diode and Zener diode	
CO-2	Demonstrate the Input – Output characteristics of transistor and its working as a switch.	
CO-3	Use CRO to measure amplitude and frequency of given signal and display the output of full wave rectifier with and without filter.	
CO-4	Illustrate the working of the logic gates and flip flops by verifying their truth tables.	

Course Name: ENGINEERING MECHANICS & BUILDING PRACTICES LAB	Course code: B23CE1202	Course Year: **First Year**
Items		
CO-1	Examine the Law of Parallelogram of forces and Law of Moment using force polygon and bell crank lever.	
CO-2	Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.	
CO-3	Determine the Centre of gravity different configurations	
CO-4	Apply the Quality Testing, Assessment Procedures and principles of Non Destructive Testing	
CO-5	Demonstrate the safety practices in the construction industry.	

Course Name: COMPUTER PROGRAMMING LAB	Course code: B23CS1202	Course Year: **First Year**
Items		
CO-1	Develop C Programs with utilize memory efficiently using various programming constructs.	
CO-2	Select appropriate control structure to Solve real world problems.	
CO-3	Solve various complex problems using Modular Programming skills	
CO-4	Develop, Debug and Execute programs that demonstrate the applications of arrays, functions, basic concepts of pointers in C.	

Course Name: NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE	Course code: B23HS1203	Course Year: **First Year**
Items		
CO-1	Understand the importance of discipline, character and service motto	
CO-2	Solve some societal issues by applying acquired knowledge, facts, and techniques	
CO-3	Explore human relationships by analyzing social problems.	
CO-4	Determine to extend their help for the fellow beings and downtrodden people.	
CO-5	Develop leadership skills and civic responsibilities.	

Course Outcomes for Second Year First Semester Course (2024-25) :

Course Name: Numerical Techniques and Statistical Methods	Course code: B23BS2104	Course Year: **Second Year**
Items		
CO-1	Apply Numerical methods to find an approximate root of an algebraic or transcendental equations.	
CO-2	Predict appropriate interpolation technique to interpolate or extrapolate a given data with equal and unequal intervals.	
CO-3	Solve Ordinary differential equation with initial conditions (IVP's) by using different Numerical techniques.	
CO-4	Solve real time problems using discrete and continuous probability distributions.	
CO-5	Apply appropriate tests of hypothesis to draw the inferences on Parameters based on Statistics and the maximum error of the estimate using the concepts of Sampling theory.	

Course Name: UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	Course code: B23HS2101	Course Year: **Second Year**
Items		
CO-1	Explain the role of value education in achieving basic human aspirations.	
CO-2	Summarize needs to obtain harmony in self(I).	
CO-3	Describe criteria for human-human relationship and harmony in society	
CO-4	Explain four orders of nature and our existence	
CO-5	Interpret significance of harmony in holistic development	

Course Name: SURVEYING	Course code: B23CE2101	Course Year: **Second Year**
Items		
CO-1	Apply Principles and methods of surveying for measuring the distances and angles using instruments.	
CO-2	Determine the levels for the contouring along with areas and volumes.	
CO-3	Determine the working principles of Theodolite and measurement of horizontal and vertical angles along with identifying source of errors and rectification methods	
CO-4	Determine the principles of tachometry and setting of curves	
CO-5	Use of modern surveying techniques and instruments for accurate results.	

Course Name: STRENGTH OF MATERIALS	Course code: B23CE2102	Course Year: **Second Year**
Items		
CO-1	Predict the behaviour of a material under the influence of different external loading conditions.	
CO-2	Plot the Shear Force (SF) and Bending Moment (BM) diagrams for cantilever and simply supported beams under different loading conditions.	
CO-3	Calculate the bending and shear stresses in beam sections.	
CO-4	Determine the principal stresses and strains using mathematical methods and engineering principles and apply the basic methods to find slope and deflection of determinate beams.	
CO-5	Determine the critical loads for columns to assess their stability against buckling and calculate the torsional stresses in shafts.	

Course Name: FLUID MECHANICS	Course code: B23CE2103	Course Year: **Second Year**
Items		
CO-1	Compute the various properties of fluids.	
CO-2	Apply the laws of fluid statics.	
CO-3	Apply the concept of fluid kinematics to fluids flowing under atmospheric pressure.	
CO-4	Apply the Principles of equation of motion to flowing fluids under forces.	
CO-5	Determine the losses and fluid discharge in the pipes.	

Course Name: SURVEYING FIELD WORK	Course code: B23CE2104	Course Year: **Second Year**
Items		
CO-1	Perform chain surveying to find the linear measurements in simple boundaries	
CO-2	Perform the compass surveying to determine the direction of any line using compass surveying	
CO-3	Perform the fly levelling surveys to find the levels	
CO-4	Perform the theodolite and tachometric surveys to find linear and angular measurements	
CO-5	Perform the survey by using the modern equipment like total station to find areas, contouring by interpreting the data from surveying activities.	

Course Name: STRENGTH OF MATERIALS LAB	Course code: B23CE2105	Course Year: **Second Year**
Items		
CO-1	Conduct tensile strength test and draw stress-strain diagrams for ductile metals	
CO-2	Perform bending test and determine load-deflection curve of steel/wood	
CO-3	Conduct torsion test and determine torsion parameters	
CO-4	Perform hardness, impact and shear strength tests and calculate hardness numbers, impact and shear strengths	
CO-5	Conduct tests on closely coiled and open coiled springs and calculate deflections	

Course Name: BUILDING PLANNING AND DRAWING	Course code: B23CE2106	Course Year: **Second Year**
Items		
CO-1	Plan various buildings as per the building by-laws	
CO-2	Distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings	
CO-3	Draw signs and bonds	
CO-4	Draw different building units	
CO-5	Learn the skills of drawing building elements and plan the buildings as per requirements	

Course Name: BUILDING MATERIALS AND CONSTRUCTION	Course code: B23MC2104	Course Year: **Second Year**
Items		
CO-1	Interpret the quality of stones, bricks and clay products.	
CO-2	Explain function of various materials like wood, glass, paints and building components.	
CO-3	Interpret the properties of lime, cement, and aggregates and their use in concrete production.	
CO-4	Illustrate the importance of masonry, finishing and form woks.	
CO-5	Explain various sustainable and smart building materials	

Course Outcomes for Second Year Second Semester Course (2024-25):

Course Name: MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	Course code: B23HS2201	Course Year: **Second Year**
Items		
CO-1	Interpreting the importance of Managerial Economics, demand analysis and methods of demand forecasting	
CO-2	Describe about the usefulness of Cost Analysis and Break Even Analysis	
CO-3	Apply the principles of accounting to convert the transactions and events into Journal, Ledger and Trail balance	
CO-4	Compute the results of Business by preparing Final Accounts	
CO-5	Illustrate the nature of markets and pricing theories	
CO-6	Explain the Types of capital, their sources and importance &estimation of Depreciation	

Course Name: ENGINEERING GEOLOGY	Course code: B23CE2201	Course Year: **Second Year**
Items		
CO-1	Describe earth-atmospheric processes and their impact on civil engineering works.	
CO-2	Summarize characteristics of minerals and rocks	
CO-3	Explain structural geological conditions of the site	
CO-4	Illustrate geophysical methods and its use in site investigations	
CO-5	Interpret site suitability for engineering project on the basis of geological conditions	

Course Name: CONCRETE TECHNOLOGY	Course code: B23CE2202	Course Year: **Second Year**
Items		
CO-1	Use appropriate materials for enhancing the performance of concrete	
CO-2	Predict the behaviour of fresh concrete by conducting workability tests.	
CO-3	Apply destructive and non-destructive testing methods for determining properties of hardened concrete.	
CO-4	Predict long-term behaviour of concrete by understanding the effect of various factors influencing it.	
CO-5	Calculate concrete mix proportions by using IS and ACI standards and select suitable special concrete based on real time situations.	

Course Name: STRUCTURAL ANALYSIS	Course code: B23CE2203	Course Year: **Second Year**
Items		
CO-1	Calculate the deformations of the determinate beams, rigid frames and trusses by Unit load method and for beams by geometrical method.	
CO-2	Compute the member end moments of statically indeterminate single span and two span beams subjected to different loads using law of Reciprocal Deflection and theorem of least work.	
CO-3	Solve the member end moments for continuous beams and for rigid frames by method of consistent deformation.	
CO-4	Determine the member end moments for continuous beams and rigid frames by slope deflection method	
CO-5	Find reactions, BM and SF in beams subjected to moving loads using ILD	

Course Name: HYDRAULICS AND HYDRAULIC MACHINERY	Course code: B23CE2204	Course Year: **Second Year**
Items		
CO-1	Solve the characteristics of laminar and turbulent flow in pipes, the physical phenomenon of a fluid problem and boundary layer theory.	
CO-2	Calculate geometrical parameters of open channels to address the uniform flow problems.	
CO-3	Solve behaviour of non-uniform flow in open channels.	
CO-4	Compute the performance of the impact of jets on plates and analysis and design of turbines	
CO-5	Determine the performance of the pumps.	

Course Name: CONCRETE TECHNOLOGY LAB	Course code: B23CE2205	Course Year: **Second Year**
Items		
CO-1	Outline importance of testing cement and its properties	
CO-2	Assess different properties of Aggregates	
CO-3	Assess fresh concrete properties and their relevance to hardened concrete	
CO-4	Assess hardened concrete properties	

Course Name: ENGINEERING GEOLOGY LAB	Course code: B23CE2206	Course Year: **Second Year**
Items		
CO-1	Determine minerals using physical properties	
CO-2	Find the rocks according to mega-scopic properties	
CO-3	Demonstrate geomorphological and structural geology models	
CO-4	Infer the terrain slope by using strike-dip problems	

Course Name: REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS	Course code: B23CE2207	Course Year: **Second Year**
Items		
CO-1	Describe the basic concepts of Remote sensing	
CO-2	Interpret the various types of satellite data.	
CO-3	Summarize the concepts of GIS and its applications.	
CO-4	Compute the geometry of physical features using GIS software	
CO-5	Determine hydrological characteristics of a site using geospatial analysis	

Course Name: DESIGN THINKING & INNOVATION	Course code: B23CE2208	Course Year: **Second Year**
Items		
CO-1	Define the concepts related to design thinking.	
CO-2	Explain the fundamentals of Design Thinking and innovation.	
CO-3	Apply the design thinking techniques for solving problems in various sectors.	
CO-4	Analyse to work in a multidisciplinary environment.	
CO-5	Evaluate the value of creativity.	

Course Name: ENVIRONMENTAL SCIENCE	Course code: B23MC2202	Course Year: **Second Year**
Items		
CO-1	Describe natural resources and their interaction	
CO-2	Illustrate ecosystem types, biodiversity and conservation strategies	
CO-3	Summarize contaminants of environment and preventive methods	
CO-4	Explain protection of environment by employing constitutional provisions	
CO-5	Explain global scenario of surroundings and social conditions	

Course Name: ENGLISH PROFICIENCY	Course code: B23MC2201	Course Year: **Second Year**
Items		
CO-1	Interpret IELTS & TOEFL listening comprehension texts.	
CO-2	Demonstrate essential speaking skills in academic, professional, and real-life contexts.	
CO-3	Interpret the written discourse by applying effective reading strategies.	
CO-4	Construct coherent and cohesive paragraphs, e-mails, letters, and essays.	

Course Outcomes for Third Year First Semester Course (2025-26):

Course Name: DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES	Course code: B23CE3101	Course Year: **Third Year**
Items		
CO-1	Find the moment capacity of reinforced concrete sections given the material properties, cross-sectional dimensions and area of steel.	
CO-2	Determine the required flexural steel for reinforced concrete sections given the material properties and moment capacities.	
CO-3	Calculate the required shear reinforcement for reinforced concrete beams subjected to shear alone and to the combined action of shear and torsion.	
CO-4	Predict the required flexural and torsional reinforcement for uniformly loaded and simply supported unrestrained and restrained rectangular slabs.	
CO-5	Compute the longitudinal reinforcement for axially loaded short columns and for short columns subjected to combined axial load and uniaxial and biaxial moments by using design handbook SP:16.	

Course Name: ENGINEERING HYDROLOGY	Course code: B23CE3102	Course Year: **Third Year**
Items		
CO-1	Apply key concepts to several practical areas of engineering hydrology & related design aspects	
CO-2	Compute the runoff characteristics using unit hydrograph methods for hydrological modeling.	
CO-3	Apply canal systems using Kennedys and Lacey‘s theories and utility of gravity dams.	
CO-4	Calculate storage capacity & life of reservoirs.	
CO-5	Determine the irrigation needs of crops.	

Course Name: GEOTECHNICAL ENGINEERING-I	Course code: B23CE3103	Course Year: **Third Year**
Items		
CO-1	Predict different types of soils to enable effective utilization in various engineering applications.	
CO-2	Apply the concept of soil hydraulics to estimate the effective stresses and permeability of soils.	
CO-3	Predict stress distribution in soil to understand the behavior of soil under different loading conditions.	
CO-4	Use the processes of compaction and consolidation to solve real world problems	
CO-5	Apply the concept of shear strength of soils to understand the strength characteristics in different field conditions.	

Course Name: REPAIR AND REHABILITATION OF STRUCTURES	Course code: B23CE3104	Course Year: **Third Year**

Items	
CO-1	Describe the reasons for deterioration in the concrete structures
CO-2	Interpret the damage of concrete structures using various techniques like destructive and non-destructive tests
CO-3	Explain various parameters influencing the serviceability and durability of structures
CO-4	Explain the suitability of certain materials for a specific type of repair
CO-5	Illustrate suitable techniques for repair and retrofitting.

Course Name: ARCHITECTURE AND TOWN PLANNING	Course code: B23CE3105	Course Year: **Third Year**

Items	
CO-1	Explain the evolution and key features of Western, Indian, and Indo-Saracenic architectural styles with reference to notable examples and cultural influences.
CO-2	Apply fundamental principles of architectural design and planning to create basic residential layouts that balance aesthetics and functional requirements.
CO-3	Apply the design philosophies and concepts of modern master architects to interpret contemporary architectural styles and practices.
CO-4	Apply fundamental principles of historical town planning to interpret and compare the spatial and functional organization of ancient Indian and Western cities.
CO-5	Apply the fundamental components and standards of town planning to propose organized, functional, and sustainable landscaping.

Course Name: CLIMATE CHANGE IMPACT ON ECO-SYSTEM	Course code: B23CE3106	Course Year: **Third Year**

Items	
CO-1	Explain earth's climate system, atmospheric structure, radiation processes, and temperature variations.
CO-2	Describe the hydrologic cycle, global water balance, and water cycling on land using simple water balance models.
CO-3	Interpret climate variables affecting precipitation and hydrological processes including evaporation and surface runoff.
CO-4	Explain climate variability including floods, droughts, heat waves, and climate extremes.
CO-5	Describe climate change causes, modeling approaches, and IPCC scenarios.

Course Name: ADVANCED SURVEYING	Course code: B23CE3107	Course Year: **Third Year**

Items	
CO-1	Understand the principles of hydrographic surveying including tides, tide gauges, soundings, and shoreline methods.
CO-2	Apply mine surveying techniques using instruments and control methods for tunnelling and underground surveys.
CO-3	Apply terrestrial and aerial photogrammetry techniques to determine position, scale, elevation, and angles.
CO-4	Apply field astronomy concepts and spherical trigonometry to compute coordinates and solve survey-related problems.
CO-5	Understand advanced mapping methods including UAV surveys, 3D scanning, and GIS/BIM-based data integration

Course Name: GEOTECHNICAL ENGINEERING LAB	Course code: B23CE3109	Course Year: **Third Year**

Items	
CO-1	Classify various types of soil based on the properties identified
CO-2	Analyze the compaction and settlement characteristics of soil by conducting laboratory and field compaction and consolidation tests
CO-3	Analyze the permeability of soil by conducting permeability tests
CO-4	Analyze the shear strength parameters of soils by using shear tests
CO-5	Analyze the pavement subgrade characteristics of soil by conducting California Bearing Ratio (CBR) test.

Course Name: FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	Course code: B23CE3110	Course Year: **Third Year**

Items	
CO-1	Analyze discharge coefficient through pipes, tanks and channels using different measuring devices.
CO-2	Analyze coefficient of loss of head and friction factor under sudden contraction.
CO-3	Apply Bernoulli‘s principle to analyze and solve engineering problems involving fluid flow.
CO-4	Analyze the effect of fluid jets on stationary and moving vanes.
CO-5	Analyze the construction, working principles, and performance characteristics of various types of pumps and turbines.

Course Name: ESTIMATION, SPECIFICATION AND CONTRACTS	Course code: B23CE3111	Course Year: **Third Year**

Items	
CO-1	Apply long-wall and short-wall, and center line methods to estimate quantities for building construction.
CO-2	Apply standard specifications to identify the materials and workmanship required for various building components.
CO-3	Calculate the cost of different building items using rate analysis techniques.
CO-4	Compute steel quantities needed for beams, columns, slabs, and footings in RCC construction.
CO-5	Apply various methods of contracts for participation in bidding

Course Name: TINKERING LAB	Course code: B23CE3112	Course Year: **Third Year**

Items	
CO-1	Explain various sensor function and their applications.
CO-2	Analyze series and parallel circuit configurations by designing and assembling applications on a breadboard.
CO-3	Examine automated systems like traffic lights and streetlights to determine how sensors influence circuit behavior.
CO-4	Investigate workflows involved in designing and producing functional prototypes through sensors.
CO-5	Assess the design thinking process to propose innovative improvements for structural elements.

Course Name: EMPLOYABILITY SKILLS -I	Course code: B23MC3102	Course Year: **Third Year**
Items		
CO-1	Interpret the essence of key soft skills such as creativity & problem solving, emotional intelligence, leadership qualities, etc.	
CO-2	Outline interview essentials for graduate-job prospects.	
CO-3	Apply writing skills in academic and professional settings.	
CO-4	Apply presentation skills in examinations like CAT, GRE, GATE, IBPS	
CO-5	Demonstrate knowledge about domain specific industry and the prospective workplace	

Course Outcomes for Third Year First Semester Course (2025-26):

Course Name: DESIGN AND DRAWING OF STEEL STRUCTURES	Course code: B23CE3201	Course Year: **Third Year**
Items		
CO-1	Predict the number of bolts, pitch, gauge and strength of the joint for bolted connections.	
CO-2	Model the size of weld, length of weld, and strength of the joint for welded connections.	
CO-3	Find a suitable section as a tension member and calculate the number of bolts and strength of the tension member.	
CO-4	Find a suitable section as a compression member and determine the strength of the axially loaded compression members as built-up column with lateral supporting system.	
CO-5	Find a suitable rolled steel section as a flexural member and determine its flexural and shear strength, then check the safety of the beam.	

Course Name: HIGHWAY ENGINEERING	Course code: B23CE3202	Course Year: **Third Year**
Items		
CO-1	Explain principles of highway planning and alignment, including surveys, alignment factors, and preparation of drawings and reports for road projects.	
CO-2	Apply geometric design criteria to design elements such as sight distances, horizontal and vertical curves, super elevation, and cross-sectional features of highways.	
CO-3	Apply traffic engineering methods to analyze traffic characteristics, perform traffic studies, and design intersections and traffic signal systems using established standards.	
CO-4	Apply procedures for evaluating highway materials and designing flexible and rigid pavements using relevant tests and established design methods.	
CO-5	Apply appropriate construction techniques and maintenance practices for various types of highways, and evaluate pavements to recommend strengthening measures.	

Course Name: ENVIRONMENTAL ENGINEERING	Course code: B23CE3203	Course Year: **Third Year**
Items		
CO-1	Find a source based on quality and quantity and calculate design population and water demand	
CO-2	Apply the principles of water treatment methods and design unit operations	
CO-3	Explain the collection, conveyance and distribution aspects of water	
CO-4	Explain sewerage, house plumbing, preliminary and primary treatment concepts of wastewater	
CO-5	Demonstrate sewage treatment methods and design secondary treatment unit operations	

Course Name: STRUCTURAL ANALYSIS II	Course code: B23CE3204	Course Year: **Third Year**
Items		
CO-1	Calculate the axial forces in the statically indeterminate trusses using method of consistent deformation of unit load method and Castigliano'stheorm – II	
CO-2	Compute the member end moments and shears due to applied loads and yielding of supports for continuous beams and statically indeterminate rigid frames by Moment distribution method.	
CO-3	Find the member end moments and shears due to applied loads and yielding of supports for continuous beams and statically indeterminate rigid frames by Kani's Method.	
CO-4	Determine the horizontal thrust and vertical reactions at the supports, as well as the orthogonal components axial thrust, radial shear and the resultant force at any point for three hinged and two hinged arches.	
CO-5	Predict the shape of the cable, horizontal component of the axial tension in the cable and the length of the cable as well as the shear force and bending moment for three hinged and two hinged stiffening girder.	
Course Name: SUSTAINABLE MATERIALS AND METHODS FOR CONSTRUCTION	Course code: B23CE3205	Course Year: **Third Year**
Items		
CO-1	Apply the concept of sustainability and its significance to civil engineering.	
CO-2	Appraise sustainability practices in the building and construction industry.	
CO-3	Select and assess sustainable construction materials based on environmental and international norms.	
CO-4	Implement innovative and sustainable construction practices on project sites.	
CO-5	Examine green building rating systems and their role in sustainable development	

Course Name: B23CE3206	Course code: BUILDING SERVICES	Course Year: **Third Year**
Items		
CO-1	Identify the functional requirements of various types of buildings and rooms in buildings.	
CO-2	Apply the significance of fire safety systems and their regular audit in buildings.	
CO-3	Develop the Layout of plumbing and drainage systems for different types of buildings	
CO-4	Integrate lighting, ventilation, and acoustic design elements to optimize occupant comfort and building performance.	
CO-5	Formulate resource conservation strategies appropriate for sustainable building operations.	

Course Name: VALUATION AND QUANTITY SURVEY	Course code: B23CE3207	Course Year: **Third Year**
Items		
CO-1	Use various methods to find out the valuation of a property & contracts	
CO-2	Explain various components, estimations and units of measurement for different works	
CO-3	Apply the method of building estimate to find out the quantities of various items of work	
CO-4	Determine the rate per unit of various items of work and their specifications	
CO-5	Calculate the estimation of various roads and related items	

Course Name: GROUND IMPROVEMENT TECHNIQUES	Course code: B23CE3209	Course Year: **Third Year**
Items		
CO-1	Understand the principles and applications of in-situ densification techniques for improving both granular and cohesive soils.	

CO-2	Understand the types, procedures, and field applications of grouting methods used in ground improvement.
CO-3	Understand the functions, types, and uses of geosynthetics such as geotextiles and geogrids in soil stabilization.
CO-4	Understand the concept and components of reinforced soil systems and their relevance in geotechnical engineering.
CO-5	Understand various soil stabilization techniques including mechanical, cement, lime, and bituminous methods for improving soil properties.

Course Name: AIR POLLUTION AND CONTROL	Course code: B23CE3210	Course Year: **Third Year**
Items		
CO-1	Describe the pollutants of atmosphere based on various criteria	
CO-2	Explain the different meteorological conditions and phenomena that influence the dispersion of the pollutants and plume behavior	
CO-3	Summarize the effects of air pollution on plants, animals, human beings and built environment	
CO-4	Explain the processes of sampling and monitoring of air pollution	
CO-5	Explain various pollution control equipment or methods to control emissions	

Course Name: RAILWAYS, AIRPORT AND HARBOUR ENGINEERING	Course code: B23CE3211	Course Year: **Third Year**
Items		
CO-1	Explain and compare the various modes of transportation with their relative merits and demerits.	
CO-2	Design the geometric elements of a railway track	
CO-3	Assess the suitable location for an airport and design the landing area	
CO-4	Explain design guidelines for the various elements within the harbor	
CO-5	Explain the need of urban mass transportation in developing countries and compare the various modes of urban mass transportation systems.	

Course Name: FINITE ELEMENT METHODS	Course code: B23CE3212	Course Year: **Third Year**
Items		
CO-1	Understand the fundamental concepts, methods, and finite element analysis procedures to solve engineering problems.	
CO-2	Analyze one-dimensional bar elements by formulating and assembling the global stiffness matrix using shape functions and applying boundary conditions.	
CO-3	Analyze trusses by formulating and assembling the global stiffness matrix using shape functions and applying boundary conditions.	
CO-4	Analyze beam elements by formulating and assembling the global stiffness matrix using shape functions and applying boundary conditions	
CO-5	Implement the formulation techniques to solve two-dimensional problems using triangle elements (CST)	

Course Name: ENVIRONMENTAL ENGINEERING LAB	Course code: B23CE3214	Course Year: **Third Year**
Items		
CO-1	Determine the physical characteristics of water through standard lab techniques.	
CO-2	Analyze the chemical characteristics of water relevant to environmental and public health.	
CO-3	Determine the optimum coagulant dosage using the jar test method for sedimentation.	
CO-4	Estimate the total, dissolved, and settleable solids present in water samples.	

Course Name: HIGHWAY ENGINEERING LAB	Course code: B23CE3215	Course Year: **Third Year**
Items		
CO-1	Analyze the strength, toughness, shape, and durability characteristics of road aggregates through standard laboratory tests.	
CO-2	Evaluate the physical properties and performance characteristics of bituminous materials using penetration, softening point, ductility, and related tests.	
CO-3	Assess the quality and stability of bituminous mixes through bitumen extraction and Marshall Stability tests.	

Course Name: CAD LAB	Course code: B23CE3216	Course Year: **Third Year**
Items		
CO-1	Analyze determinate and indeterminate structures, including beams, frames, space frames, and trusses using structural analysis software.	
CO-2	Apply design tools for structural components such as steel beams, built-up members, and foundations using software and spreadsheets.	
CO-3	Analyze structural detailing requirements for RCC and steel members as per relevant design standards.	

Course Name: TECHNICAL PAPER WRITING & IPR	Course code: B23AC3201	Course Year: **Third Year**
Items		
CO-1	Construct grammatically sound and concise technical write-ups.	
CO-2	Prepare the outline and structure of a technical paper with essential sections.	
CO-3	Develop a project proposal and dissertation framework aligned with academic conventions.	
CO-4	Use a word processor effectively for document formatting, citations, and version control.	
CO-5	Identify appropriate IPR mechanisms for protecting various types of intellectual creations.	

Course Name: EMPLOYABILITY SKILLS - II	Course code: B23MC3202	Course Year: **Third Year**
Items		
CO-1	Match various vocabulary items that appear in competitive examinations with their contextual meanings accurately.	
CO-2	Identify grammatical and ungrammatical usage of English language in all the grammar related questions asked in various competitive examinations like CAT, GRE, IBPS.	
CO-3	Infer meaning from complex texts that are set as questions in different competitive examinations held for higher education or employment	
CO-4	Find solutions to complex arithmetic problems set as questions in the competitive examinations held for employment or higher education	
CO-5	Apply logical thinking abilities in solving the problems of reasoning that appear in the examinations like CAT, GRE, GATE, IBPS.	