Course Outcomes (COs) of all courses

Program Name	Course code	Course name	Course Outcomes (COs)
S.E. (2019 Pattern)			
Civil Engineering	201001	**Building Technology and Architectural Planning**	1. Identify types of building and basic requirements of building components.
			2. Make use of Architectural Principles and Building byelaws for building construction.
			3. Plan effectively various types of Residential Building forms according to their utility,functions with reference to National Building Code.
			4. Plan effectively various types of Public Buildings according to their utility functions withreference to National Building Code.
			5. Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.
			6. Understand different services and safety aspects
Civil Engineering	201002	**Mechanics of Structures**	1. Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures.
			2. Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
			3. Explain the concept of shear and bending stresses in beams and demonstrate shear and bendingstress distribution diagram.
			4. Use theory of torsion to determine the stresses in circular shaft and understand concept ofPrincipal stresses and strains.
			5. Analyze axially loaded and eccentrically loaded column.
			6. Determine the slopes and deflection of determinate beams and trusses.
Civil Engineering	201003	**Fluid Mechanics**	1. Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy & floatation and its application for solving practical problems.
			2. Understand the concept of fluid kinematics with reference to Continuity equation and fluid dynamics with reference to Modified Bernoulli's equation and its application to practical problems of fluid flow

Program Name	Course code	Course name	Course Outcomes (COs)
			3. Understand the concept of Dimensional analysis using Buckingham's π theorem, Similarity & Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
			4. Understand the concept of laminar and turbulent flow and flow through pipes and its application to determine major and minor losses and analyze pipe network using Hardy Cross method.
			5. Understand the concept of open channel flow, uniform flow and depth-Energy relationshipsin open channel flow and make the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section.
			6. Understand the concept of gradually varied flow in open channel and fluid flow around submerged objects, compute GVF profile and calculate drag and lift force on fully submerged
Civil Engineering	207002	**Engg. Mathematics III**	1. Solve Higher order linear differential equations and its applications to modelling and analysing Civil engineering problems such as bending of beams, whirling of shafts and mass spring systems.
			2. Solve System of linear equations using direct & iterative numerical techniques and develop solutions for ordinary differential equations using single step & multistep methods applied to hydraulics, geotechnics and structural systems.
			3. Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.
			4. Perform Vector differentiation &integration, analyze the vector fields and apply to fluid flow problems.
			5. Solve Partial differential equations such as wave equation, one and two dimensional heat flow
Civil Engineering	207003	**Engineering Geology**	1. Explain about the basic concepts of engineering geology, various rocks, and minerals both in lab and on the fields and their inherent characteristics and their uses in civil engineering constructions.
			2. Exploring the importance of mass wasting processes and various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.
			3. Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.

Program Name	Course code	Course name	Course Outcomes (COs)
			4. Incorporate the various methods of survey, to evaluate and interpret geological nature of the rocks present at the foundations of the dams, percolation tanks, tunnels and to infer site / alignment/ level free from geological defects.
			5. Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
			6. Explain geological hazards and importance of ground water and uses of common building
Civil Engineering		**Audit Course I**	1. Describe functioning/working of different types of industries/sectors in Civil Engineering.
			2. Describe drawings and documents required and used in different Civil Engineering works.
			3. Understand the importance of Code of Ethics to be practiced by a Civil Engineer and alsounderstand the duties and responsibilities as a Civil Engineer.
			4. Understand different health and safety practices on the site.
Civil Engineering	201008	**Geotechnical Engineering**	1. Identify and classify the soil based on the index properties and its formation process
			2. Explain permeability and seepage analysis of soil by construction of flow net.
			3. Illustrate the effect of compaction on soil and understand the basics of stress distribution.
			4. Express shear strength of soil and its measurement under various drainage conditions.
			5. Evaluate the earth pressure due to backfill on retaining structures by using different theories.
			6. Analysis of stability of slopes for different types of soils.
Civil Engineering	201009	**Surveying**	**1.** Define and Explain basics of plane surveying and differentiate the instruments used for it**.**
			2. Express proficiency in handling surveying equipment and analyse the surveying data from theseequipment.
			3. Describe different methods of surveying and find relative positions of points on the surface ofearth.
			4. Execute curve setting for civil engineering projects such as roads, railways etc.
			5. Articulate advancements in surveying such as space based positioning systems
			6. Differentiate map and aerial photographs, also interpret aerial photographs.

Program Name	Course code	Course name	Course Outcomes (COs)
Civil Engineering	201010	**Concrete Technology**	1. Able to select the various ingredients of concrete and its suitable proportion to achieved desiredstrength.
			2. Able to check the properties of concrete in fresh and hardened state.
			3. Get acquainted to concreting equipments, techniques and different types of special concrete.
			4. Able to predict deteriorations in concrete and get acquainted to various repairing methods andtechniques.
Civil Engineering	201011	**Structural Analysis**	1. Understand the basic concept of static and kinematic indeterminacy and analysis ofindeterminate beams.
			2. Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bayframes.
			3. Implement application of the slope deflection method to beams and portal frames.
			4. Analyze beams and portal frames using moment distribution method.
			5. Determine response of beams and portal frames using structure approach of stiffness matrixmethod.
			6. Apply the concepts of plastic analysis in the analysis of steel structures.
Civil Engineering	201012	**Project Management**	1. **Describe** project life cycle and the domains of Project Management.
			2. **Explain** networking methods and their applications in planning and management
			3. **Categorize** the materials as per their annual usage and also **Calculate** production rate ofconstruction equipment
			4. **Demonstrates** resource allocation techniques and **apply** it for manpower planning.
			5. **Understand** economical terms and different laws associated with project management
			6. **Apply** the methods of project selection and **recommend** the best economical project.
Civil Engineering	201017	**Project Based Learning**	1. Identify the community/ practical/ societal needs and convert the idea into a product/ process/service.
			2. Analyse and design the physical/ mathematical/ ICT model in order to solve identifiedproblem/project.
			3. Create, work in team and applying the solution in practical way to specific problem.

Program Name	Course code	Course name	Course Outcomes (COs)
T.E. (2019 Pattern)			
Civil Engineering	301001	**Hydrology and Water Resource Engineering**	1. Understand government organizations, apply & analyze precipitation & its abstractions.
			2. Understand, apply & analyze runoff, runoff hydrographs and gauging of streams.
			3. Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.
			4. Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics.
			5. Understand water logging & water management, apply & analyze ground water hydrology
			6. Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement.
Civil Engineering	301002	**Water Supply Engineering**	1. Define identify, describe reliability of water sources, estimate water requirement for various sectors
			2. Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics
			3. Design various components of water treatment plant and distribution system.
			4. Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants.
			5. Design elevated service reservoir capacity and understand the rainwater harvesting.
			6. Understand the requirement of water treatment plant for infrastructure and Government scheme.
Civil Engineering	301003	**Design of Steel Structures**	1. Demonstrate knowledge about the types of steel structures, steel code provisions and design of the adequate steel section subjected to tensile force.
			2. Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening.
			3. Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.
			4. Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section.
			5. Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.

Program Name	Course code	Course name	Course Outcomes (COs)
			6. Understand the role of components of welded plate girder and design cross section for welded plate girder including stiffeners and its connections.
Civil Engineering	301004	**Engineering Economics and Financial Management**	1. Understand basics of construction economics.
			2. Develop an understanding of financial management in civil engineering projects.
			3. Prepare and analyze the contract account.
			4. Decide on right source of fund for construction projects.
			5. Understand working capital and its estimation for civil engineering projects.
			6. Illustrate the importance of tax planning & understand role of financial regulatory bodies
Civil Engineering	301005 c	**Elective I: Construction Management**	1. Understand the overview of construction sector.
			2. Illustrate construction scheduling, work study and work measurement.
			3. Acquaint various labor laws and financial aspects of construction projects.
			4. Explain elements of risk management and value engineering.
			5. State material and human resource management techniques in construction.
			6. Understand basics of artificial intelligence techniques in civil engineering.
Civil Engineering	301006	**Seminar**	1. Appraise the current civil engineering research / techniques / developments /interdisciplinary areas.
			2. Review and organize literature survey utilizing technical resources, journals etc.
			3. Evaluate and draw conclusions related to technical content studied.
			4. Demonstrate the ability to perform critical writing by preparing a technical report.
			5. Develop technical writing and presentation skills.
Civil Engineering	301011 a	**Audit Course I: Professional Ethics and Etiquettes**	1. Understand the basic perception of profession, professional ethics, various moral issues and uses of ethical theories
			2. Understand various social issues, industrial standards, code o ethics and role of professional ethics in engineering field.
			3. Follow ethics as an engineering professional and adopt good standards and norms of engineering practice.

Program Name	Course code	Course name	Course Outcomes (COs)
			4. Apply ethical principles to resolve situations that arise in their professional lives.
Civil Engineering	301012	**Waste Water Engineering**	1. Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams
			2. Design preliminary and primary unit operations in waste water treatment plant
			3. Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
			4. Understand and design suspended and attached growth wastewater treatment systems
			5. Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
			6. Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment
Civil Engineering	301013	**Design of Reinforced Concrete Structures**	1. Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete.
			2. Recognize mode of failure as per LSM and evaluate moment of resistance for singly,doubly rectangular, and flanged sections.
			3. Design & detailing of rectangular one way and two-way slab with different boundary conditions
			4. Design & detailing of dog legged and open well staircase
			5. Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.
			6. Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings.
Civil Engineering	301014	**Remote Sensing and Geographic Information System**	1. Articulate fundamentals and principles of RS techniques.
			2. Demonstrate the knowledge of remote sensing and sensor characteristics.
			3. Distinguish working of various spaces-based positioning systems.
			4. Analyze the RS data and image processing to utilize in civil engineering
			5. Explain fundamentals and applications of RS and GIS

Program Name	Course code	Course name	Course Outcomes (COs)
Civil Engineering	301015 e	**Elective II: Architecture and Town Planning**	1. Apply the principles of architectural planning and landscaping for improving quality of life
			2. Understand the confronting issues of the area and apply the acts.
			3. Evaluate and defend the proposals.
			4. Appraise the existing condition and to develop the area for betterment.
Civil Engineering	301016	**Internship**	1. To develop professional competence through industry internship
			2. To apply academic knowledge in a personal and professional environment
			3. To build the professional network and expose students to future employees
			4. Apply professional and societal ethics in their day to day life
			5. To become a responsible professional having social, economic and administrative considerations
			6. To make own career goals and personal aspirations
Civil Engineering	301021 a	**Audit Course II: Leadership and Personality Development**	1. Enhanced holistic development of students and improve their employability skills
B.E. (2019 Pattern)			
Civil Engineering	401001	**Foundation Engineering**	1. Perform subsurface investigations for foundations using different methods.
			2. Estimate the bearing capacity of shallow foundations.
			3. Calculate immediate and primary consolidation settlement of shallow foundations.
			4. Decide the capacity of a pile and pile group.
			5. Understand the steps in geotechnical design of shallow foundations and well foundations.
			6. Analyze problems related to expansive soil and overcome them using design principles,construction techniques in black cotton soil.
Civil Engineering	401002	**Transportation Engineering**	1. Understand principles and practices of transportation planning.
			2. Demonstrate knowledge of traffic studies, analysis and their interpretation.
			3. Design Geometric Elements of road pavement.
			4. Evaluate properties of highway materials as a part of road pavement.
			5. Appraise different types of pavements and their design.
			6. Understand the fundamentals of Bridge Engineering and Railway Engineering

Program Name	Course code	Course name	Course Outcomes (COs)
Civil Engineering	401003 f	**Elective III: Operation Research**	1. Correlate applications of Operations Research in Civil Engineering field
			2. Solve the problems related to stochastic programming
			3. Optimize transportation and assignment problems
			4. Optimize linear problems
			5. Optimize non-linear problems
			6. Suggest solution for the problems related to dynamic models, games theory and replacement of items
Civil Engineering	401004 f	**Elective IV: Formwork and plumbing Engineering**	1. Select appropriate material and type of formwork
			2. Analyze the formwork for various loadings.
			3. Illustrate the design aspects of formwork under various requirements.
			4. Understand requirement of plumbing in a building.
			5. Understand plumbing hydraulics and its components in plumbing system.
			6. Illustrate the design aspects as per the requirement of Indian Standards.