Department of Civil Engineering

FE Semester I

Program Outcomes (PO)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
PO 6. The Engineer and Society	**PO 12.** Life-long Learning

Program Specific Outcomes (PSOs)
PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
PSO2: Plan, survey, map and mark layouts for structures; estimate material quantities; manage construction; and design transportation systems.
PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - FEC101 **Course: -** Engineering Mathematics-I

CO1: Apply the concepts of complex numbers to engineering problems.

CO2: Apply the knowledge of complex numbers to solve problems in hyperbolic functions and logarithmic functions.

CO3: Illustrate the basic principles partial differentiation.

CO4: Illustrate the knowledge of Maxima, Minima and Successive differentiation

CO5: Apply principles of basic operations of matrices, rank and echelon form of matrices to solve simultaneous equations.

CO6: Solve transcendental equations & system of linear equations using numerical methods and scilab programming

Department of Civil Engineering

FE Semester I

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Course Outcome

Course Code: - FEC102 **Course: -** Engineering Physics-I

CO1: Recall and apply quantum mechanical ideas to the motion of the particles.

CO2: Identify different types of crystal structures based on various parameters.

CO3: Identify types of semiconducting materials by Hall Effect and their various applications

CO4: Compare interference of light in various thin films and recognize applications in science and

CO5: Recalls the behaviour and types of Superconductors and Supercapacitors.

CO6: Identify different engineering materials and their applications.

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FE Semester I

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Course Outcome

Course Code: - FEC103 **Course: -** Engineering Chemistry-I

CO1: Explain the concept of microscopic chemistry in terms of atomic and molecular orbital theory and relate it to diatomic molecules.

CO2: Describe the concept of aromaticity and interpret it with relation to specific aromatic systems.

CO3: Illustrate the knowledge of various types of intermolecular forces and relate it to real gases.

CO4: Interpret various transformations using thermodynamics.

CO5: Apply the knowledge of various polymers, fabrication methods, conducting polymers in various industrial fields.

CO6: Determine the quality of water and suggest suitable methods of treatment

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FE Semester I

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Course Outcome

Course Code: - FEC104 **Course: -** Engineering Mechanics

CO1: Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two- and three-dimensional system with the help of (FBD)

CO2: Demonstrate the understanding of centroid and its significant and locate the same

CO3: Correlate real life application to specific type of friction and estimate required force to overcome friction **CO4:** Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation between them

CO5: Illustrate different types of motion and establish kinematic relations for rigid body

CO6: Analyse body in motion using force and acceleration, work-energy, impulse-momentum principles.

Department of Civil Engineering

FE Semester I

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Course Outcome

Course Code: - FEC105 **Course: -** Basic Electrical Engineering

CO1: students will be able to explain fundamentals of DC circuits and apply knowledge for analysing network theorems in DC circuits

CO2: students will be able to explain fundamentals and analyse single phase AC circuits.

CO3: students will be able to explain the fundamentals and analyse three phase AC circuits.

CO4: students will be able to explain the basic operation and analyse the performance of single-phase transformer.

CO5: students will be able to explain the construction and basic operation of DC motors and generators

Department of Civil Engineering

FE Semester I

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Course Outcome

Course Code: - FEL101 **Course: -** Engineering Physics-I

CO1: Perform the experiments based on interference in thin films and analyse the results.

CO2: Verify the theory learned in the module crystallography.

CO3: Perform the experiments on various semiconductor devices and analyse their characteristics.

CO4: Students will be able to present Idea and flow of mini project based on literature survey.

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FE Semester I

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Course Outcome

Course Code: - FEL102 **Course: -** Engineering Chemistry-I

CO1: Determine Chloride content and hardness of water sample.

CO2: Determine free acid pH of different solutions.

CO3: Synthesize polymers, biodegradable plastics.

CO4: Determine viscosity of oil.

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FE Semester I

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Course Outcome

Course Code: - FEL103 **Course: -** Engineering Mechanics

CO1: Apply the fundamental knowledge of software engineering.

CO2: Analyse requirements and prepare models.

CO3: Plan, schedule and track the progress of the projects.

CO4: Apply various software design principles.

CO5: Identify risks, manage the change to assure quality in software projects.

CO6: Apply testing principles on software project and understand the maintenance concepts.

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FE Semester I

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Course Outcome

Course Code: - FEL104 **Course: -** Basic Electrical Engineering

CO1: students will be able to explain fundamentals of DC circuits and apply knowledge for analysing network theorems in DC circuits

CO2: students will be able to explain fundamentals and analyse single phase AC circuits.

CO3: students will be able to explain the fundamentals and analyse three phase AC circuits.

CO4: students will be able to explain the basic operation and analyse the performance of single-phase transformer.

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Course Outcome

Course Code: - FEL105 **Course: -** Basic Workshop practice-I

CO1: Interpret the drawings for different geometrical tolerances on the given part, use marking tool for marking on given part and develop the necessary skills required to handle/use different fitting tools for different operation(L3)

CO2: Develop skill required for hardware maintenance, develop skill to install and operating system and system drives and develop to identify the network components and perform basic networking crimping. (L3)

CO3: Develop the necessary skill required to handle/ use different plumbing tools. (L1)

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FE Semester II

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Course Outcome

Course Code: - FEC201 **Course: -** Engineering Mathematics-II

CO 1: Solve various types of First Order differential equation

CO 2: Solve various types of Higher Order Differential equation

CO 3: Illustrate the concepts of Beta and Gamma function, DUIS and rectification

CO 4: Apply the concepts of Double integral

CO 5: Apply the concept of Triple integral

CO 6: Apply the principles of Numerical Method for solving differential equation and numerical integration analytically and using Scilab also

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FE Semester II

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Course Outcome

Course Code: - FEC202 **Course: -** Engineering Physics-II

CO1: Comprehend the concepts of Diffraction of light and its applications.

CO2: Illustrate the principle, construction and working of various lasers & optical fibres and their applications.

CO3: Identify different coordinate systems and use of Maxwell's equations in telecommunication system.

CO4: Differentiate between frames of reference and transformations.

CO5: Comprehend the synthesis, characterization and applications of nanomaterials.

CO6: Identify different sensors in Engineering applications.

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FE Semester II

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Course Outcome

Course Code: - FEC203 **Course: -** Engineering Chemistry-II

CO1: Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

CO2: Illustrate the concept of emission spectroscopy and describe the phenomenon of fluorescence and phosphorescence in relation to it.

CO3: Explain the concept of electrode potential and nernst theory and relate it to electrochemical cells.

CO4: Identify different types of corrosion and suggest control measures in industries.

CO5: Illustrate the principles of green chemistry and study environment impact.

CO6: Explain the knowledge of determining the quality of fuel and quantify the oxygen required for combustion of fuel.

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FE Semester II

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Course Outcome

Course Code: - FEC204 **Course: -** Engineering Graphics

CO1: Apply the basic principles of projections in Projection of Lines and Planes

CO2: Apply the basic principles of projections in Projection of Solids.

CO3: Apply the basic principles of sectional views in Section of solids.

CO4: Apply the basic principles of projections in converting 3D view to 2D drawing.

CO5: Read a given drawing.

CO6: Visualize an object from the given two views.

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FE Semester II

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Course Outcome

Course Code: - FEC205 **Course: -** C programming

CO 1: Formulate simple algorithms for arithmetic, logical problems and implement them to programs in C language.

CO 2: Implement, test and execute programs comprising of control structures.

CO 3: Apply the concept of functions and synthesize a complete program.

CO 4: Demonstrate the use of arrays and strings in C language.

CO 5: Demonstrate the use of structures in C language.

CO 6: Apply the concept of pointer implementation in C

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FE Semester II

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Course Outcome

Course Code: - FEC206 **Course: -** Professional Communication and Ethics- I

CO1: Eliminate barriers and use verbal/non-verbal cues at social and workplace situations.

CO2: Employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures, tone and pronunciation.

CO3: Prepare effectively for speaking at social, academic and business situations.

CO4: Use reading strategies for faster comprehension, summarization and evaluation of texts.

CO5: Acquire effective writing skills for drafting academic, business and technical documents.

CO6: Successfully interact in all kinds of settings, displaying refined grooming and social skills.

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Course Outcome

Course Code: - FEL201 **Course: -** Engineering Physics-II

CO1: Perform the experiments based on diffraction through slits using Laser source and analyse the result.

CO2: Perform the experiments using optical fibre to measure its Numerical Aperture and study of data transmission.

CO3: Perform the experiments on various sensors and analyse the result.

CO4: Students will be able to present a working model of a mini project.

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FE Semester II

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Course Outcome

Course Code: - FEL202 **Course: -** Engineering Chemistry-II

CO1: To be able to apply the knowledge of symmetric cryptography to implement simple ciphers.

CO2: To be able to analyse and implement public key algorithms like RSA and El Gamal.

CO3: To analyse and evaluate performance of hashing algorithms.

CO4: To explore the different network reconnaissance tools to gather information about networks.

CO5: To explore and use tools like sniffers, port scanners and other related tools for analysing packets in a network.

CO6: To be able to set up firewalls and intrusion detection systems using open source technologies and to explore email security.

CO7: To be able to explore various attacks like buffer-overflow, and web-application attacks.

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FE Semester II

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Course Outcome

Course Code: - FEL203 **Course: -** Engineering Graphics

CO1: Apply basic Principles of projections in projection in 2D drawing using a CAD software

CO2: Create, Annotate, Edit and Plot drawing using basic Auto CAD commands & Features

CO3: apply the concept of layers to create drawing

CO4: Apply basic Auto CAD skills ti draw different view of a 3D objects

CO5: Apply Basic Auto CAD skills to draw the Isometric view from the given two views.

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FE Semester II

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Course Outcome

Course Code: - FEL204 **Course: -** C programming

CO 1: Implement given algorithms to a program & Correct syntax and logical errors

CO 2: Apply the Concept of looping and Branching Statement programs.

CO 3: Apply data in arrays, strings manipulate them through a Program

CO 4: Demonstrate the Concept of function in C programming.

CO 5: Demonstrate structures and manipulate them through a Program

CO 5: Demonstrate the Concept of pointers and implement call by reference concept

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FE Semester II

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Course Outcome

Course Code: - FEL205 **Course: -** Professional Communication and Ethics-I

CO1: Eliminate barriers and use verbal/non-verbal cues at social and workplace situations.

CO2: Employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures, tone and pronunciation.

CO3: Prepare effectively for speaking at social, academic and business situations.

CO4: Use reading strategies for faster comprehension, summarization and evaluation of texts.

CO5: Acquire effective writing skills for drafting academic, business and technical documents.

CO6: Successfully interact in all kinds of settings, displaying refined grooming and social skills.

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SE Semester IV

Program Outcomes (PO)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
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PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
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PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - FEL206 **Course: -** Basic Workshop practice-II

CO 1: Design and model useful prototype such as stool in the carpentry trade

CO 2 Student able to interpret the wiring diagrams and perform various basic wiring techniques such as household, staircase, godown,3 phase etc.

CO 3 Interpret the drawings and model the prototype in sheet metal trade viz. Dustpan

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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Course Outcome

Course Code: - CEC301 **Course: -** Engineering Mathematics-III

CO1: Apply the concept of Laplace transform to solve the real integrals in engineering problems.

CO2: Apply the concept of inverse Laplace transform of various functions in engineering problems.

CO3: Expand the periodic function by using Fourier series for real life problems and complex engineering problems.

CO4: Find orthogonal trajectories and analytic function by using basic concepts of complex variable theory.

CO5: Apply Matrix algebra to solve the engineering problems.

CO6: Solve Partial differential equations by applying numerical solution and analytical methods for one dimensional heat and wave equations.

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
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Program Specific Outcomes (PSOs)
PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
PSO2: Plan, survey, map and mark layouts for structures; estimate material quantities; manage construction; and design transportation systems.
PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC302 **Course: -** Mechanics of Solids

CO1: Calculate the problems related to Stress, Strain in the materials and thin cylindrical and spherical shells.

CO2: Calculate Axial Force, Shear Force & Bending Moment for statically determinate beams and portal frames, with and without internal hinge & to plot AFD, SFD & BMD.

CO3: Derive the Bending stress & Shear stress equation. Determine and plot the bending stresses and shear stresses in the given structural element using the concept of Area Moment of Inertia.

CO4: Derive the Torsional equation and calculate the torsional stresses of solid and hollow circular shafts, power transmitted by a circular shaft. Also Calculate direct and bending stresses using Euler and Rankine's theories for columns

CO5: Calculate the principal stresses and strains as well as strain energy in structural element.

CO6: Determine Slope and Deflection in statically determinate beams using double integration method and energy Principles.

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
PO 6. The Engineer and Society	**PO 12.** Life-long Learning

Program Specific Outcomes (PSOs)
PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
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Course Outcome

Course Code: - CEC303 **Course: -** Engineering Geology

CO1: Apply the principles of Geology to build safe and stable Civil Engineering structures.

CO2: Distinguish various rock types based on physical characteristics to give their suitability for various Civil Engineering works

CO3: Differentiate between various geological structures in relation to their tectonic setting to give engineering considerations for a site.

CO4: Calculate RQD from the given borehole data and based on the obtained result assign a quality to the rock.

CO5: Calculate the RMR value using six components of geomechanics classification and rate the rock mass for tunneling condition.

CO6: Determine the role of underlying geological conditions in occurrence of natural hazards.

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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Course Outcome

Course Code: - CEC304 **Course: -** Architectural Planning & Design of Buildings

CO1: Apply principles of planning & building bye-laws for design & drawing of plans, elevations and sections of residential and public buildings

CO2: Explain site plan, foundation plan and roof plan of buildings

CO3: Classify buildings, explain sun path diagram, wind rose diagram & sun shading devices and calculate set back distances, carpet area, built-up area and FSI

CO4: Classify and explain various components of a building like staircase, foundation etc.

CO5: Draw perspective views of buildings

CO6: Explain town planning, architectural planning, built environment, green buildings and computer aided drawing (CAD)

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
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Course Outcome

Course Code: - CEC305 **Course: -** Fluid Mechanics- I

CO1: Determine various properties of fluid like mass density, Surface tension etc.

CO2: Calculate Total Pressure and pressure intensity and its Location for plane surfaces under hydrostatic condition

CO3: Compute force of buoyancy on a partially or fully submerged body and analyze the stability of a floating body.

CO4: Describe flow patterns and Apply continuity equation to the system at a given location in a fluid flow.

CO5: Apply equations of motion to various pressure measuring devices like - Venturi meter, Orifice meter, nozzle meter, pitot tube & Orifices and mouthpieces, Notches and weirs.

CO6: Explain basic equation of flow & determine velocity of sound, mach no.

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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Course Outcome

Course Code: - CEL301 **Course: -** Mechanics of Solids

CO1: Analyse stress - strain behaviour of materials and assess the structural behaviour by the virtue of stresses developed and deformation of elastic members.

CO2: Analyze the material response under the action of shear and the effect of flexure (bending).

CO3: Predict the angle of twist and shear stress developed in torsion.

CO4: Analyze the beams to determine slope and deflection for simply supported, cantilever and loaded in different ways.

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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Course Outcome

Course Code: - CEL302 **Course: -** Engineering Geology

CO1: Determine the nature of given minerals based on their physical properties

CO2: Determine the type and suitability of Igneous Rock based on texture and structure for Civil Engineering works.

CO3: Determine the type and suitability of Sedimentary Rock based on texture and structure for Civil Engineering works.

CO4: Determine the type and suitability of Metamorphic Rock based on texture and structure for Civil Engineering works.

CO5: Estimate the Rock Quality Designation form the given borehole data and give suitability of rock for civil engineering works

CO6: Determine the suitability of a site for Dam, groundwater and tunnel construction on the given map by drawing geological cross section

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL303 **Course: -** Architectural Planning & Design of Buildings

CO1: Design and draw plans, elevation and sectional views of residential buildings manually by applying principles of planning & building bye-laws

CO2: Design and draw plans, elevation and sectional views of public buildings using CAD by applying principles of planning & building bye-laws

CO3: Draw one point perspective of a building manually

CO4: Draw two-point perspective of a building using CAD

CO5: Classify buildings, explain sun path diagram, wind rose diagram & sun shading devices and calculate set back distances, carpet area, built-up area and FSI

CO6: Explain town planning, architectural planning, built environment and green buildings

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
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Course Outcome

Course Code: - CEL304 **Course: -**Fluid Mechanics- I

CO1: Compute the metacentric height and explain floating conditions.

CO2: Verify the Bernoulli's theorem

CO3: Determine fluid flow characteristics using various devices for closed conduits

CO4: Determine the hydraulic coefficients of an orifice/ Mouthpiece (Cc, Cv, Cd)

CO5: Determine the discharge coefficients for Notches and weir for open Channel Flow

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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Course Outcome

Course Code: - CEL305 **Course: -** Skill Based Lab Course-I

CO1: Apply principles of planning & building bye-laws for design & drawing for drawing a line plan of residential building CADD tool

CO2: Apply principles of planning & building bye-laws for design & drawing for drawing a double line plan of residential building using CADD tool

CO3: Apply principles of planning & building bye-laws for design & drawing for drawing a double line plan of commercial building

CO4: Create a 3D model of residential building using BIM tool

CO5: Create a walkthrough of interior design using BIM Tools.

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SE Semester III

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEM301 **Course: -** Mini Project – 1 A

CO1: Identify the topic based on Societal Problems/ gap in Literature

CO2: Formulate objectives and solution strategy to work on identified Problems.

CO3: Apply theoretical concept to real world problems and demonstrate Experimental procedure to acquire results

CO4: Draw inferences from the results through theoretical/ experimental /simulations

CO5: Provide Solutions to the real-world problems and criticize any past solutions

CO6: Develop communications and technical report writing skill through Project presentations and project reports

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SE Semester IV

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 401 **Course: -** Engineering Mathematics - IV

CO1: Apply the concept of Vector calculus to evaluate line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence theorem

CO2: Apply the concepts of Complex Integration for evaluating integrals, computing residues & evaluating various contour integrals.

CO3: Apply the concept of Correlation, Regression, and curve fitting to the engineering problems in data science.

CO4: Apply the concepts of Probability and expectations for getting the spread of the data and distribution of probabilities

CO5: Apply the concept of probability distribution to solve problems & testing hypothesis of small samples using sampling theory.

CO6: Apply the concepts of parametric and nonparametric tests for analysing practical problems

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SE Semester IV

Program Outcomes (PO)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 402 **Course: -** Structural Analysis

CO1: Apply the concept of Vector calculus to evaluate line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence theorem

CO2: Apply the concepts of Complex Integration for evaluating integrals, computing residues & evaluating various contour integrals**.**

CO3: Apply the concept of Correlation, Regression, and curve fitting to the engineering problems in data science.

CO4: Apply the concepts of Probability and expectations for getting the spread of the data and distribution of probabilities

CO5: Apply the concept of probability distribution to solve problems & testing hypothesis of small samples using sampling theory.

CO6: Apply the concepts of parametric and nonparametric tests for analyzing practical problems

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SE Semester IV

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
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Course Outcome

Course Code: - CEC 403 **Course: -** Surveying

CO1: apply principles of surveying for linear and angular Measurements for civil engineering works.

CO2: Perform levelling operation using conventional & modern levelling instruments to arrive at reduce level

CO3: calculate horizontal and vertical angles for civil engineering works using theodolite

CO4: demonstrate advantages of modern surveying tools over conventional instruments.

CO5: perform plane tabling operation, calculate areas and volumes using site specific data for various projects.

CO6: design different type of curves for setting out in the field.

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SE Semester IV

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 404 **Course: -** Building Materials & Concrete Technology

CO1: To introduce the importance of construction materials with a special impetus on Concrete.

CO2: imparts the technical knowledge of basic properties, uses and different types of materials utilized in the construction industry.

CO3: To understand the basic properties of various concrete ingredients and illustrate their interaction with each other.

CO4: To illustrate the vital properties of concrete such as workability, strength and durability.

CO5: To design the proper concrete mixes for various grades as per IS codes.

CO6: To understand the working of RMC plant and to interpret the results of Non-destructive Tests on concrete.

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SE Semester IV

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PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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Course Outcome

Course Code: - CEC 405 **Course: -** Fluid Mechanics-II

CO1: Illustrate various losses in pipes, pipe network, water hammer and derive equations for transmission of power through nozzles.

CO2: Derive equations and solve numerical on pipes and plates subjected to laminar flow.

CO3: Establish Prandtl's mixing theory and solve turbulent flow problems

CO4: Derive and apply momentum and moment of momentum principles

CO5: Describe concept of boundary layer theory and compute drag and lift forces

CO6: Understand dimensional terms and methods with application on different model laws

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SE Semester IV

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PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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Course Outcome

Course Code: - CEL 401 **Course: -** Structural Analysis

CO1: Students will be able to find Axial forces in Trusses by applying method of joints and Sections and will also be able to calculate Bending Moment, Normal Thrust and Radial Shearin three hinged Arches by using Static Equilibrium Method.

CO2: Students will be able to draw influence line for reactions, shear force and bending moment at any section of cantilever beam, simply supported beam and overhanging beam without internal hinges by applying static equilibrium conditions and also able to calculate shear force at any section, absolute shear force, bending moment at any section, absolute bending moment under rolling load by using Influence line diagram

CO3: Students will be able to classify between statical and kinematical determinacy and indeterminacy by applying static equilibrium conditions and also will be able to find degree of it by applying same concept.

Students will also be able to calculate displacement of rigid jointed frames and simple pin jointed frames by applying Energy concept.

CO4: Students will be able to find internal forces developed in fixed beam and continuous beam by applying three moment equations and also will be able to find flexib4ility co-efficient and analyses Propped cantilever, fixed beam, continuous beam and simple rigid jointed frame by applying flexibility method (compatibility conditions)

CO5: Students will be able to find internal forces developed in indeterminate structures by applying stiffness method and also be able to find stiffness co-efficient by using compatibility concepts

CO6: Students will be able to find internal forces developed in Indeterminate structures by applying Moment distribution method and will also be able to calculate collapse load and plastic moment by applying Mechanism conditions.

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SE Semester IV

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 402 **Course: -** Surveying

CO1: Calculate bearing by using prismatic compass.

CO2: Performed different types of levelling and calculate RL

CO3: Measure horizontal and vertical angle using theodolite

CO4: Measure distances, bearings and area using total station.

CO5: Calculate area of irregular figure using a conventional planimeter and verify it using a digital planimeter.

CO6: Set out different types of curves and foundation plans.

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SE Semester IV

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 403 **Course: -** Building Material Concrete Technology

CO1: To study various physical properties of Ordinary Portland Cement

CO2: To study various physical properties of Fine Aggregates & Coarse Aggregates

CO3: To conduct various tests on burnt clay bricks to assess their feasibility as a sound engineering material.

CO4: To determine the effect of water/cement ratio and admixtures on workability & strength of concrete.

CO5: To assess the concrete quality through conduction of Non-Destructive Tests such as Rebound Hammer & Ultrasonic Pulse Velocity

CO6: To carry out the concrete mix design using mini-mixer available in the laboratory.

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SE Semester IV

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 404 **Course: -** Fluid Mechanics-II

CO1: Verify the Reynold's experiment

CO2: Estimate the viscosity of fluid

CO3: Calculate the losses in pipes

CO4: Assess the flow pattern and velocity distribution in pipe flow

CO5: learn the water hammer phenomenon through demonstration

CO6: learn the wind tunnel testing through demonstration

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SE Semester IV

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
PO 6. The Engineer and Society	**PO 12.** Life-long Learning

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PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
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Course Outcome

Course Code: - CEL 405 **Course: -** Skill Based lab Course – II

CO1: Operate a Total Station for traversing an open field (L3)

CO2: Perform various operations like computing height of a structure, computing area of plot, subdividing area, demarcating boundaries, etc. using Total Station (L4)

CO3: Set out foundation plan of a building using Total Station (L3)

CO4: Compute the point, line and area features using Global Navigation Satellite System (GPS) (L3)

CO5: Plot various existing features in a geographic area on a GIS platform (L3)

CO6: Add attribute and perform various statistical operations in GIS (L4)

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SE Semester IV

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
PSO2: Plan, survey, map and mark layouts for structures; estimate material quantities; manage construction; and design transportation systems.
PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEM401 **Course: -** Mini Project – 1 B

CO1: Identify the topic based on Societal Problems/ gap in Literature

CO2: Formulate objectives and solution strategy to work on identified Problems.

CO3: Apply theoretical concept to real world problems and demonstrate Experimental procedure to acquire results

CO4: Draw inferences from the results through theoretical/ experimental /simulations

CO5: Provide Solutions to the real-world problems and criticize any past solutions

CO6: Develop communications and technical report writing skill through Project presentations and project reports

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TE Semester V

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
PO 6. The Engineer and Society	**PO 12.** Life-long Learning

Program Specific Outcomes (PSOs)
PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
PSO2: Plan, survey, map and mark layouts for structures; estimate material quantities; manage construction; and design transportation systems.
PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 501 **Course: - Theory of Reinforced Concrete Structure**

CO 01: Apply the concept of Working Stress Method to Propose c/s and R/f for the beams using IS 456-2000.

CO 02: Illustrate the concepts of characteristic loads, characteristic strength, partial safety factors, the limit states using IS 456-2000.

CO 03: Apply the concept of LSM to Propose c/s and R/f for the Beams using IS 456-2000.

CO 04: Apply the concept of LSM to Propose c/s and R/f for the Slabs using IS 456-2000.

CO 05*:* Apply the concept of LSM to Propose c/s and R/f for the Columns using IS 456-2000.

CO 06*:* Apply the concept of LSM to Propose c/s and R/f for the Footings using IS 456-2000.

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TE Semester V

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
PO 6. The Engineer and Society	**PO 12.** Life-long Learning

Program Specific Outcomes (PSOs)
PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
PSO2: Plan, survey, map and mark layouts for structures; estimate material quantities; manage construction; and design transportation systems.
PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 502 **Course: - Applied Hydraulics**

CO 01: Describe impact of jet on stationary, moving, hinged and series of plates also solve the numerical based on forces acting on it.

CO 02: Distinguish various types of turbines, Characteristic curves and its components.

CO 03: Draw velocity triangle diagram of centrifugal pumps.

CO 04: Describe the working mechanism of various Hydraulic machines.

CO 05*:* Identify the hydraulic behaviour of open channel flow and design the most economical section of channels.

CO 06*:* Explain mathematical relationships for hydraulic jumps, surges, and critical, uniform, and gradually-varying flows.

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TE Semester V

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 503 **Course: - Geotechnical Engineering-I**

CO 01: Explain the basic concepts of the physical and engineering properties of soil and apply the relationships among various unit weights & other parameters

CO 02*:* Explain clay mineralogy, plasticity behaviour of clay.

CO 03: Analyse grain size distribution of soil and categorize the soil as per IS code.

CO 04: Compute the coefficient of permeability of different types of soils and sketch the flow net diagram to estimate seepage discharge.

CO 05: Compute the effective stress and pore water pressure inside the soil mass under different geotechnical conditions.

CO 06: Calculate the compaction parameters; summarize different methods of soil exploration

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TE Semester V

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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 504 **Course: - Transportation Engineering**

CO 01: Design the technical aspects associated with railways, airways and waterways using IRC and ICAO Specification

CO 02: Design horizontal and vertical geometrical elements of highways using IRC 86:2018, IRC 073:1990 and IRC 052:2019

CO 03: Analyse basic parameters required for efficient planning and control of traffic using IRC SP 12: 2015

CO 04: Design flexible and rigid pavement as per relevant IRC 37:2012 and IRC 058:2015

CO 05: Construction Practices involved in different types of pavements, concepts of soil stabilization and highway drainage using MORTH specification

CO 06: Explain mathematical relationships for hydraulic jumps, surges, and critical, uniform, and gradually-varying flows.

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TE Semester V

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEDO 501 **Course: - Advance Concrete Technology**

CO 01: Able to use the various concrete materials and evaluate the fresh properties of concrete by rheology.

CO 02*:* Able to evaluate different testing methods of concrete using destructive and non-destructive method.

CO 03: Able to explain the durability of concrete and evaluate durability in extreme weather concreting.

CO 04: Able to design the concrete mix for field application by different standard methods.

CO 05*:* Able to select the special concrete for various field application.

CO 06*:* Able to assess the quality of concrete at site and laboratory according to Indian standards acceptance criteria.

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TE Semester V

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEDO 501 **Course: - Building Services & Repairs**

CO 01: Explain the working & installation of mechanical utilities in building services and **classify** mechanical utilities based on driving system.

CO 02*:* Classify electrical supply materials, supply lines, safety devices and **explain** the working principle of electrical utilities in building services.

CO 03: Illustrate the layout for service connection and drainage in building services as well as **Explain** the working and components in detail.

CO 04: Analyse the structural deterioration & **test** the damaged structures using NDT techniques.

CO 05*:* Classify methods and materials for structural repair and **Explain** building repairing work

CO 06*:* Interpret cause of accidents & safety norms during structural repair work and **estimate** the repair work.

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TE Semester V

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Course Outcome

Course Code: - CEL 501 **Course: - Theory of Reinforced Concrete Structure**

CO 01: Analyse the beams using Working Stress Method and Propose c/s and R/f for the beams using IS 456-2000

CO 02: Demonstrate the concepts of characteristic loads, characteristic strength, partial safety factors, the limit states using IS 456-2000

CO 03: Analyse the beams using Limit State Method and Propose c/s and R/f for the beams using IS 456-2000

CO 04: Analyse slabs using LSM to Propose c/s and R/f for the Slabs using IS 456-2000

CO 05: Analyse columns using LSM to Propose c/s and R/f for the Columns using IS 456-2000

CO 06: Analyse footings using LSM to Propose c/s and R/f for the Footings using IS 456-2000

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Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 502 **Course: - Applied Hydraulics**

CO 01: Calculate the efficiencies and discuss the working of various pumps and turbines

CO 02: Apply impulse momentum principle to hydraulic machines

CO 03: Determine the rate of flow through open channel.

CO 04: Evaluate Gradually varied flow (GVF) and Rapid varied Flow (RVF) in open channel flow.

CO 05: Compute the Chezy's Constant through tilting flume.

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TE Semester V

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 503 **Course: - Geotechnical Engineering -I**

CO 01: Calculate (determine) the physical and engineering properties of soil

CO 02*:* Determine the plasticity characteristics of soil

CO 03: Classify the soils using IS classification, conduct sieve analysis of soil, and plot grain size distribution curve

CO 04*:* Calculate coefficient of permeability of soils.

CO 05*:* Compute the compaction characteristics of soils.

CO 06: Demonstrate the field SPT 'N' value and prepare the bore log.

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Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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Course Outcome

Course Code: - CEL 504 **Course: - Transportation Engineering**

CO 01: INTERPRET class and suitability of bitumen on basis of Penetration and Viscosity grade by using Standard Pentameter and Viscometer

CO 02*:* EVALUATE Bitumen suitability on basis of Softening point and Ductility value using Ring ball apparatus and Ductility machine

CO 03: DETERMINE suitability of aggregate on basis of Impact value, Abrasion value and Crushing value using Los Angles Abrasion machine and UTM

CO 04: ESTIMATE percentage of Elongated and Flaky aggregates on basis of Shape test using length gauge and thickness gauge

CO 05*:* COMPUTE per hour volume for different classes of vehicle and arrive at peak volume for design considerations using mobile devices by recording passing vehicles on site

CO 06*:* PLOT speed profile curve (S-Curve) at mid-block section using data (vehicles passing for a particular time) collected on site.

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Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 505 **Course: - Business Communication and Ethics**

CO 01: Plan and prepare effective business /technical document which will provide solid foundation for their future

CO 02*:* Strategize their personal and professional skills to build a professional image and meet the demand of industry.

CO 03: Emerge successful in group discussions, meetings and result oriented agreeable solutions in group communication situations.

CO 04: Deliver persuasive and professional presentations.

CO 05*:* Develop creative thinking and interpersonal skills required for effective professional.

CO 06*:* Apply codes of ethical conduct, personal integrity and norms of organisational behaviour.

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TE Semester V

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEM 501 **Course: - Mini Project – 2A**

CO 01: Apply Knowledge and skills to solve societal /research needs in a group.

CO 02*:* Draw the proper inferences from available results through theoretical/ experimental/ simulations.

CO 03: Develop interpersonal skills to work as member or leader of group.

CO 04: Analyse the impact of solution in societal and environmental context for sustainable development.

CO 05*:* Use standard norms of applicable software engineering practices

CO 06*:* Demonstrate and excel in written, oral communication and project management skills.

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TE Semester VI

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
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PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 601 **Course: - Design and Drawing of Steel Structure**

CO1: Outline the Properties of Structural Steel, Indian Standard Specifications of Sections, Design Requirements as per LSM

CO2: Calculate and determine design capacity of bolted and welded connections using IS code

CO3: Determine capacity and design, Steel tension and compression member using angle sections.

CO4: Select and design a Column, Column Bases and Built-up column using standard IS code

CO5: Student will be able to Design appropriate member subjected to bending like Beam and Plate Girder by IS specifications

CO6: Student will be able to analyze and design 2D Determinate truss with Wind Loads calculations.

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PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 602 **Course: - Water Resources Engineering**

CO1: Describe National water Policy, Calculate Crop water requirement and classify various types and methods of irrigation

CO2: Estimate flood discharge and Runoff by traditional and modern usage tools for planning and management of water resources projects

CO3: Apply knowledge on ground water, well hydraulics to estimate the safe yield and ground water potential

CO4: Analyze and design gravity dams and earthen dams with spillways for sustainable development

CO5: Compare different silt theories related to irrigation channel and design the same.

CO6: Classify and explain various canal structures and suggest remedial measures for water logging to save fertile irrigation.

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TE Semester VI

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 603 **Course: - Geotechnical Engineering-II**

CO1: Compute settlement due to 1D consolidation soil

CO2: Evaluate the shear strength characteristics of the soil and apply the knowledge for solving the related problems.

CO3: Analyze stability of slopes using different method of analysis

CO4: Calculate and evaluate lateral earth pressure.

CO5: Evaluate SBC of soil using different method.

CO6: Analysis of single and group pile capacity.

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TE Semester VI

Program Outcomes (PO)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 604 **Course: - Environmental Engineering**

CO1: Explain types of intake structures and distribution systems diagrammatically or by network sketch for various situations.

CO2: Demonstrate the various units of water treatment processes along with the layout especially for cities or towns.

CO3: Explain service connection of building water supply and building drainage for various plumbing systems.

CO4: Design the sewer lines using Manning's constant for running full condition.

CO5: Calculate the various parameters of sewage treatment by secondary treatment methods for disposable effluent as per MPCB.

CO6: Calculate the sound level of any two same or different magnitude using logarithmic scale.

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Program Outcomes (PO)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEDO 601 **Course: -** Transportation Engineering Management

CO1: ILLUSTRATE the different characteristics of the road users and vehicles for mixed traffic.

CO2: CONDUCT different traffic surveys and interpreting it with the help of the different statistical models for Indian Conditions.

CO3: DESIGN the features of island and intersections as per the IRC code.

CO4: DETERMINE the road capacity using Speed-Flow-Density relationships for different level of road service and solve traffic flow problems for study state conditions.

CO5: EXPLAIN the aspects associated with road safety and Highway Lighting, its audit and different TSM measures for any Ongoing Road Projects.

CO6: DERIVE the effectiveness and efficiency of transportation systems through advanced technologies in Information systems and communication all around the world.

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TE Semester VI

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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 601 **Course: -** Design and Drawing of Steel Structure

CO1: Calculate dead, live and wind loads on the structure using IS 875

CO2: Analyze the forces acting on the structure by analytical/graphical method

CO3: Select the appropriate section using steel table.

CO4: Design the members for various load combinations as per IS 875.

CO5: Design the bolted and welded connection as per IS800 Code specifications

CO6: Prepare the detailed fabrication drawing and design report as per standards.

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Program Outcomes (PO)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
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PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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PSO2: Plan, survey, map and mark layouts for structures; estimate material quantities; manage construction; and design transportation systems.
PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 602 **Course: -** Water Resources Engineering

CO1: Classify various techniques of water distribution and compute water requirement of crops

CO2: Discuss in detail about hydrological process and interpret plotting of hydrographs.

CO3: Apply their knowledge on well hydraulics and compute discharge from an aquifer

CO4: Classify and describe various hydraulic structures such as dams and carry out its analysis for structural stability

CO5: Compare different silt theories related to irrigation channel and design the same.

CO6: Identify and classify different canal head works - its distribution system and canal structures

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TE Semester VI

Program Outcomes (PO)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 603 **Course: -** Geotechnical Engineering-II

CO1: Determine consolidation parameters such as coefficient of compressibility, coefficient of volume change, coefficient of consolidation.

CO2: Calculate cohesion and angle of shearing resistance for various soil types.

CO3: Determine the CBR value of soil for pavement design.

CO4: Calculate swelling pressure of soil.

CO5: Draw stress distribution diagram in soils due to vertically applied load.

CO6: Modelling problems using geotechnical software.

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TE Semester VI

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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Course Outcome

Course Code: - CEL 604 **Course: -** Environmental Engineering

CO1: To test for water and wastewater sample.

CO2: To interpret the required treatment for water and wastewater as per IS

CO3: To test for quality of solid waste sample

CO4: To measure the levels of noise and interpret the results.

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TE Semester VI

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEL 605 **Course: -** Skill based lab Course-III

CO1: Analyze Steel and RCC structure using Structural design software

CO2: Plan & Design G+3 RCC building using Structural design software

CO3: Plan & Design steel roof truss using Structural design software

CO4: Prepare Concrete Mix using Spreadsheet software

CO5: Estimate the quantity of materials used in RCC with the help of spreadsheet

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TE Semester VI

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEM 601 **Course: -** Mini Project – 2B

CO 01: Apply Knowledge and skills to solve societal /research needs in a group.

CO 02*:* Draw the proper inferences from available results through theoretical/ experimental/ simulations.

CO 03: Develop interpersonal skills to work as member or leader of group.

CO 04: Analyse the impact of solution in societal and environmental context for sustainable development.

CO 05*:* Use standard norms of applicable software engineering practices

CO 06*:* Demonstrate and excel in written, oral communication and project management skills.

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Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
PO 5. Modern Tool Usage	**PO 11**. Project Management and Finance
PO 6. The Engineer and Society	**PO 12.** Life-long Learning

Program Specific Outcomes (PSOs)
PSO1: Handle building materials; deal with geotechnics; analyse and design structures for safety, economy and quality.
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Course Outcome

Course Code: - CEC701 Course: - Design and Drawing of Reinforced Concrete Structure

CO 01: To analyse and design various elements of a building including dog-legged staircase & open well staircase, using limit state method.

CO 02: To analyse and design cantilever & counterfort type retaining walls using limit state method.

CO 03: To analyse and design Circular & rectangular water tanks using Working Stress Method.

CO 04: To explain the concept of structural dynamics.

CO 05: To explain the concept of earthquake & apply the theory to simple problems using IS 13920.

CO 06: To explain the pre-stressing concept and calculate the losses in pre-stress using IS 1343.

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Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
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Course Outcome

Course Code: - CEC702 **Course: - Quantity Survey, Estimation and valuation**

CO 01: Apply the measurement systems to various civil engineering items of work

CO 02*:* Draft the specifications for various items of work & Determine unit rates of items of works

CO 03: Estimate approximate cost of the structures by using various methods & prepare detailed estimates of various civil engineering structures by referring drawings

CO 04: Assess the quantities of earthwork & Construct mass haul diagrams

CO 05*:* Draft tender notice & demonstrate the significance of the tender as well as contract process

CO 06*:* Determine the present fair value of any constructed building at stated time

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Program Outcomes (PO)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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Course Outcome

Course Code: - CEDO 701 **Course: - Prestressed Concrete**

CO 01: Describe and Analyse prestressed concrete sections subjected to working load.

CO 02*:* Explain and Calculate the various losses incurred in prestressed concrete using IS 1343

CO 03: Design and Analyse PCS elements in limit state of serviceability: Deflection using IS 1343

CO 04: Design and Analyse PCS section for limit state of collapse for shear and flexure using IS 1343

CO 05*:* Design and Analyse PCS section for limit state of collapse for cracking using IS 1343

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Course Outcome

Course Code: - CEDO701 **Course: - AIPP**

CO 01: Classify the projects and describe the phases involved in project formulation.

CO 02*:* Identify the phases in project development cycle and get acquainted with the process of project report preparation.

CO 03: Decide the worth of a project after performing market survey.

CO 04: Verify the technical & managerial viability of a project & identify the resources required for it.

CO 05*:* Determine the probability of a project through financial economic appraisal

CO 06*:* Select the appropriate source of finance for the project and overcome the issue involved in project implementation.

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Course Outcome

Course Code: - CEIO 702 **Course: -** SHWM

CO 01: Apply knowledge of basics of Solid waste management for selecting and applying suitable technique for achieving specific goals/aims of solid waste management (L3)

CO 02*:* Calculate the solid waste characteristics for knowing best treatment method for any kind of SW (L3)

CO 03: Illustrate solid waste collection system, techniques, transfer station for optimum cost of transportation by route optimization (L3)

CO 04: Compare and **analyse** the best methods of waste processing techniques for given solid waste (L2, L4)

CO 05*:* Compare the disposal methods for given Municipal solid waste with minimum cost and environmental Impact (L4)

CO 06*:* Recommend the best waste management technique to be used for assorted solid waste for its safe disposal (Industrial Solid Waste, Hazardous Waste, B biomedical Waste, plastic and Electronic Waste (L5)

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Course Outcome

Course Code: - CEIO 702 **Course: -** Green Building Constructions

CO 01: Explain environmental impact of buildings by discussing the concepts of sustainable development & green buildings and overview the features of green buildings

CO 02*:* Explain site selection, planning and designing of green buildings

CO 03: Explain water conservation and energy efficiency in green buildings

CO 04: Explain green building materials and indoor environmental quality

CO 05: Explain green building rating systems by comparing various GBRSs

CO 06: Explain green retrofitting by referencing green audits

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Course Outcome

Course Code: - CEIO 701 **Course: - DMMM**

CO 01: Comprehend the effects of disasters and climate change on human life.

CO 02*:* Evaluate impact of industrialization, overpopulation and changing lifestyle on increasing frequency of disasters, potency of various past and contemporary local and global disasters, approaches of Disaster Risk Reduction

CO 03: Justify the inclusions of disaster management acts, policies and guidelines in India along with role of various stakeholders during disasters w.r.t medical and psycho-social response.

CO 04: Discuss the institutional framework and modern tool usage like ICT, GIS, GPS, RS for Disaster Management in India

CO 05*:* Suggest various sources of local and global financial relief measures in the advent of particular type of disasters and ways to raising them

CO 06*:* Recommend structural and non-structural mitigation measures during various phases of disaster management cycle, dos and don'ts in specific disasters

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Course Outcome

Course Code: - CEL701 Course: - Design and Drawing of Reinforced Concrete Structures

CO 01: To analyse and design various elements of a building including dog-legged staircase & open well staircase, using limit state method.

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Course Outcome

Course Code: - CEL 702 **Course: -** Quantity Surveying, Estimation and valuation

CO 01: Apply the measurement systems to various civil engineering items of work

CO 02*:* Draft the specifications for various items of work & Determine unit rates of items of works

CO 03: Estimate approximate cost of the structures by using various methods & prepare detailed estimates of various civil engineering structures by referring drawings

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BE Semester VII

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Course Outcome

Course Code: - CEP 701 **Course: - Major Project -I**

CO1: Review & Comprehend literature in the selected domain

CO2: Articulate Problem Statement & identify the objectives

CO3: Identify existing methods or solutions to solve identified problem

CO4: Identify modern engineering tools & other resources to solve the problem.

CO5: Formulate methodology to solve the identified problem

CO6: Effectively communicate their project work by writing reports & presentations

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Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
PO 4. Conduct Investigations of Complex Problems	**PO 10.** Communication
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEC 801 **Course: - Construction Management**

CO 01: explain the concept of management & describe various functions of Construction Management

CO 02*:* categorize construction projects & illustrate their role in the development of construction Industry

CO 03: develop plans & schedules of various construction projects using manual using techniques

CO 04: apply resource management & allocation techniques for various construction projects

CO 05*:* implement measures for time & cost optimisation of construction projects

CO 06*:* utilize quality, safety & labour welfare measures on construction sites

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BE Semester VIII

Program Outcomes (POs)	
PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
PO 2. Problem Analysis	**PO 8.** Ethics
PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEDO 801 **Course: -** Bridge Engineering

CO 01: Design RC Deck slab bridge with IRC Loading specification for both tracked and wheeled loading using Limit State Method

CO 02*:* Design Balanced cantilever bridge with IRC Loading specification for both tracked and wheeled loading using Limit State Method

CO 03: Design PSC deck slab bridge with IRC Loading specification for both tracked and wheeled loading using Limit State Method

CO 04: Design PSC I girder bridge with IRC Loading specification for both tracked and wheeled loading using Limit State Method

CO 05*:* To analyse steel lattice girder bridge for broad gauge Railway using IRS loading and codes.

CO 06*:* To apply various methods of erection of a bridge superstructure based on their suitability.

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PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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PO 3. Design/Development of Solutions	**PO 9.** Individual and Team Work
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PSO3: Engineer water treatment, water supply and sewage/ industrial/ solid waste disposal systems; and design efficient water resources and irrigation systems.

Course Outcome

Course Code: - CEDO 801 **Course: - Industrial Waste Treatment**

CO 01: Demonstrate the impact of industrial wastewater characteristics on natural streams. (L3)
CO 02: Analyze various stream protections measures to protect the natural streams from industrial waste water. (L4)
CO 03: Illustrate waste minimization techniques for industrial wastewater for volume/strength reduction (L4)
CO 04: Demonstrate biological treatment concept and **summarize** various treatments along with advance technologies. (L3)
CO 05: Describe waste water generated during manufacturing process and decide the suitable treatment for effluents for specific industry. (L5)
CO 06: Evaluate legislative framework for the remediation of industrial wastewater through environmental audit, environmental impact assessment and common effluent treatment plant. (L5)

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PO 1. Engineering Knowledge	**PO 7**. Environment and Sustainability
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Course Outcome

Course Code: - CEDO 802 **Course: -** Transportation System Engineering

CO 01: Compare different modes of transportation and describe National Urban Transport Policies. (L1&L2)

CO 02*:* Plan and design different elements of Airports, movements of aircrafts and helicopters. (L3 & L4)

CO 03: Plan and design geometric elements of railway system and explain the elements of modern trains. L3 & L4)

CO 04: Explain different components of water transport. L2

CO 05*:* Plan different public transport system, routing, scheduling and estimating transit capacity of the system. L3 & L4)

CO 06*:* Explain different elements of bridge and analyse various hydrological elements of bridge. L2& L3

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Course Outcome

Course Code: - CEDO 802 **Course: - Smart Building Materials**

CO 01: Explain the importance of smart building materials and components of smart building systems (L2)

CO 02*:* Classify smart materials and explain their working principles (L2)

CO 03: Describe energy efficient materials (L2)

CO 04: Compare smart structural health monitoring systems (L2)

CO 05*:* Discuss different types of smart concrete (L2)

CO 06*:* Describe the applications of smart materials and technology (L2)

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Course Outcome

Course Code: - CEIO 801 **Course: -** Project Management

CO 01: Explain the fundamental concepts of Projects and their management & their applications in various organization structures. (L1)

CO 02*:* Apply selection criteria and select an appropriate project from different options (L3)

CO 03: Prepare work break down structure for a project and Develop project networks to arrive at optimum duration for completing the Project. (L4)

CO 04: Describe the techniques of managing various resources & implement appropriate method of allocating the resources to various activities. (L2)

CO 05*:* Identify opportunities and threats to the project and finalise on approaches like Earned value technique to determine & predict status of the project. (L2)

CO 06*:* Elaborate various methods project Termination to make project closure successful. (L2)

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Course Outcome

Course Code: - CEIO 801 **Course: - Environmental Management**

CO 01: Apply an integrative approach to environmental issues in India with a focus on sustainability (L3)

CO 02*:* Interpret the transitional character of environmental problems and give ways of addressing them (L3).

CO 03: Co-relate the links between human and natural systems for stability/instability within the ecosystem L4)

CO 04: Co-relate key concepts from economic, environment and social aspects and appreciate the role of government in environment management, (L4)

CO 05*:* Apply systems concepts and methodologies to achieve an organization's environmental goals (L3)

CO 06*:* Interpret various Environmental legislations and their implementation to protect environment(L3).

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Course Outcome

Course Code: - CEL 802 **Course: - Construction Management**

CO 01: explain the concept of management & describe various functions of Construction Management

CO 02*:* categorize construction projects & illustrate their role in the development of construction Industry

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Course Outcome

Course Code: - CEP801 **Course: -** Major Project-Part II

CO1: Perform on analytical, experimental or numerical method to solve identified problem

CO2: Produce alternative design solution to meet the functional requirements of the defined problem

CO3: Represent the data in tabular form or graphical forms so as to facilitate analysis & explain of the data

CO4: Express Engineering principles & manage the finance required for the execution of the Project

CO5: Infer at results, conclusion with its validation & also propose the future scope of work on the identified problem.

CO6: Communicate effectively their project work by writing reports and publishing technical papers based on entire project work.