DAV University, Jalandhar

Course Outcomes of B. Tech. in Civil Engineering

SEMESTER 3

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED201**
Course Title	**Building Materials & Construction Technology**
Course Outcomes	CO1: Comprehend construction materials and their properties for building durability and stability. CO2: Comprehend the production, characteristics, and application of cement, aggregates, and concrete in construction. CO3: Explore various architectural elements including foundations, walls, lintels, arches, and their design principles. CO4: Gain insights into techniques for addressing dampness issues, roof and floor classifications, and finishing processes like plastering and pointing.

In hours			
L	T	P	Credit
3	1	2	5

Course Code	**CED203**
Course Title	**STRENGTH OF MATERIALS**
Course Outcomes	CO1: Comprehend stress and strain concepts, elasticity-plasticity differentiation, Hooke's law, and stress-strain diagrams for various materials. CO2: Analyze bending moments, shear forces, and their diagrams in beams, calculating maximum values and points of contraflexure. CO3: Apply principles of flexural stresses, determining bending equations, neutral axis, and section moduli for different cross-sections. CO4: Evaluate deformation and strain, analyze statically determinate trusses, explore material properties, and multiaxial stress-strain relationships in structures.
Course Title	**STRENGTH OF MATERIALS LABORATORY**
Course Outcomes	CO1: Evaluate the importance of physical properties of steel , Identify and comprehend code provisions for testing different properties of steel ,Develop stress-strain curve for axial compression, axial tension and shear, Assess hardness and impact strength of steel , Assess flexural strength of a given material , Evaluate fatigue and impact strength of steel

In hours			
L	T	P	Credit
3	0	2	4

Course Code	**CED205**
Course Title	**Surveying & Geomatics**
Course Outcomes	CO1: Develop competence in employing diverse surveying methods and principles for accurate data collection and analysis. CO2: Apply leveling techniques, theodolite measurements, and control methods to achieve precision in surveying tasks and map creation. CO3: Master curve layout, modern field survey systems, and GPS technology for efficient and precise spatial data acquisition. CO4: Acquire proficiency in photogrammetry, remote sensing fundamentals, and digital image processing for spatial data interpretation and mapping.
Course Title	**SURVEYING LABORATORY**
Course Outcomes	CO1: Apply basic fundamentals of surveying in various civil engineering applications related experiments.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED207**
Course Title	**Environment Engineering-1**
Course Outcomes	CO1: Analyze water sources, demand, quality, and treatment processes, comprehend water distribution systems, and comprehend plumbing fixtures. CO2: Evaluate sewage systems, design parameters, and disposal methods, and explain sewage treatment techniques and effluent standards. CO3: Assess air composition, quantify pollutants, examine air pollution sources, standards, and control methods, and describe noise pollution measurements. CO4: Examine solid waste types, characteristics, segregation, collection, transportation, disposal, and hazardous waste management in accordance with Indian norms.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED209**
Course Title	**Introduction to Civil Engineering**
Course Outcomes	CO1: Comprehend Civil Engineering's historical evolution, disciplines, and career prospects, acknowledging significant achievements of eminent engineers. CO2: Analyze the nexus between construction industry, architecture, and town planning, including smart city development and sustainable building practices. CO3: Evaluate diverse construction methods, modern project management systems, and the significance of contracts management while considering environmental sustainability. CO4: Examine various structural types, transportation infrastructure, and rehabilitation techniques, addressing challenges and advancements in sustainable engineering and urban development.

In hours			
L	T	P	Credit
0	0	0	2

Course Code	**CED213**
Course Title	**Summer Internship**
Course Outcomes	CO1: learn soft skill training or any other MOOC course of same credit.

B. Tech. in Civil Engineering
SEMESTER 4

In hours			
L	T	P	Credit
3	1	2	5

Course Code	**CED202**
Course Title	**Structural Engineering-I**
Course Outcomes	CO1: Comprehend energy principles, stability, and design safety in structures, emphasizing the role of engineers, architects, and users. CO2: Apply analysis techniques to trusses, beams, and frames, employing energy theorems and virtual work for structural systems. CO3: Evaluate influence lines for shear, bending moment, and reactions, and comprehend the behavior of structures under rolling loads. CO4: Analyze arches and cable structures, focusing on their stability, moment, shear, and normal thrust distributions for different configurations.
Course Title	**Structure Engineering Lab**
Course Outcomes	CO1: Apply various methods to test engineering structures types under different loading conditions.

In hours			
L	T	P	Credit
3	1	2	5

Course Code	**CED204**
Course Title	**Introduction to fluid mechanics**
Course Outcomes	CO1: Analyze fluid properties & distinctions between phases, fluid behavior, viscosity, surface tension, and cavitation phenomena. CO2: Examine fluid kinematics, particle motion, flow classification. Evaluate velocity, streamlines, continuity equation, and potential functions. CO3: Investigate fluid dynamics using Bernoulli's equation & Euler's equation. Explore energy changes, impulse-momentum, vortex motion, and steady flows. CO4: Apply dimensional analysis, similarity laws, and Pi method. Explore drag, lift on bodies, and flow measurement techniques including manometers and meters.
Course Title	**INTRODUCTION TO FLUID MECHANICS LABORATORY**
Course Outcomes	CO1: Apply basic fundamentals of fluid mechanics in various applications related experiments.

In hours			
L	T	P	Credit
3	1	0	4

Course Code	**CED206**
Course Title	**Engineering geology**
Course Outcomes	CO1: Explore geological time scales, earth structure, and surface processes, emphasizing their relevance to Civil Engineering projects. CO2: Examine minerals, rocks, and their properties in connection with Civil Engineering applications and differentiate various rock types and their significance. CO3: Analyze rock deformation, structural elements, and geological hazards, emphasizing their impact on engineering operations and mitigation measures. CO4: Evaluate the characteristics of rock masses as construction materials, assess factors influencing rock properties, and geological considerations for dam and reservoir site selection.

In hours			
L	T	P	Credit
3	0	2	4

Course Code	**CED208**
Course Title	**Material testing and evaluation**
Course Outcomes	CO1: Identify and analyze diverse engineering materials, including concrete, ceramics, polymers, and composites, focusing on properties and applications. CO2: Evaluate mechanical behaviors like elasticity, plasticity, hardness, and deformation through tests and principles of materials' mechanical characteristics. CO3: Apply practical knowledge gained from laboratory tests on materials, covering elastic and plastic deformation, impact, fracture mechanics, fatigue, and creep. CO4: Conduct comprehensive testing on various construction materials such as concrete, metals, polymers, and composites, assessing their quality and performance in engineering applications.
Course Outcomes	CO1: Apply basic material testing methods to identify various engineering properties of engineering materials.

In hours			
L	T	P	Credit
3	1	0	4

Course Code	**CED210**
Course Title	**BUILDING PLANNING**
Course Outcomes	CO1: Develop insight into building planning's significance and grasp fundamental concepts in civil engineering design and architectural drawings. CO2: Analyze site selection factors, site features, and energy-efficient building orientation, adhering to Indian building codes and regulations. CO3: Comprehend functional aspects of residential, commercial, and industrial design, applying principles of space allocation and universal accessibility. CO4: Acquire knowledge of plumbing, electrical, HVAC systems, and sustainable practices, integrating renewable energy sources for holistic building solutions.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED212**
Course Title	**Concrete Technology**
Course Outcomes	CO1: Analyze cement, aggregates, and additives; comprehend IS codes; assess concrete behavior, cracking, and durability mechanisms. CO2: Demonstrate concrete production, compaction, and handling; manage extreme environments; grasp concrete mix design principles. CO3: Evaluate concrete defects, deterioration; conduct strength and durability tests; employ destructive and non-destructive concrete testing. CO4: Differentiate special concrete types; explain reinforced, polymer, lightweight, high strength, pre-stressed, self-compacting, pervious, and self-healing concretes.

B. Tech. in Civil Engineering
Semester-5

In hours			
L	**T**	**P**	**Credit**
3	1	2	5

Course code	**CED301**
Course Title	**GEOTECHNICAL ENGINEERING**
Course Outcomes	CO1: Comprehend the different types of soil based on their formation mechanism, particle size distribution and index properties CO2 : Determine the permeability of soil, its effective stress and the compactive effort required to obtain necessary degree of compaction in-situ CO3: Evaluate the consolidation process of soil and its difference from compaction. CO4 : Evaluate the stiffness of soil using shear strength parameters
Course Title	**Geotechnical Engineering Laboratory**
Course Outcomes	CO1: Evaluate fundamental soil properties and their determination techniques. CO2: Analyze and interpret soil particle characteristics and their engineering significance. CO3: Gain practical knowledge of geotechnical testing methods for soil mechanics analysis.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED303**
Course Title	**HYDROLOGY AND WATER RESOURCE ENGINEERING**
Course Outcomes	CO1: Comprehend hydrologic processes, precipitation measurement, and water abstractions, including evaporation, evapotranspiration, and infiltration. CO2: Learn runoff estimation, hydrograph analysis, and groundwater principles, including aquifer properties and well hydraulics. CO3: Explore water usage, irrigation methods, and crop water requirements, along with canal and dam design considerations. CO4: Gain knowledge of canal systems, dam types, their forces, failures, and site selection, addressing water management and engineering challenges.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED305**
Course Title	**ENGINEERING ECONOMICS, ESTIMATION & COSTING**
Course Outcomes	CO1: Analyze fundamental economic principles, supply-demand dynamics, market structures, macroeconomic concepts, and government policies' impact. CO2: Develop skills in estimating, planning, and analyzing construction projects, including building, road, and irrigation works. CO3: Learn to formulate accurate cost estimates, interpret rates, and create effective construction specifications. CO4: Grasp the essentials of contracts, accounts division, and arbitration procedures within the context of construction management.

In hours			
L	T	P	Credit
3	1	0	4

Course Code	**CED307**
Course Title	**Design of Concrete Structures-I**
Course Outcomes	CO1: Apply design methods (LSDM, WSM) for structural elements, compute moment of resistance, and analyze characteristic values. CO2: Analyze shear, torsion, and serviceability in structural design, ensuring safe and stable performance of components. CO3: Design singly and doubly reinforced beams, flanged beams, and slabs, considering various failure modes and load conditions. CO4: Formulate compression member designs using axial load, bending, and charts, ensuring stability and load-carrying capacity.

In hours			
L	**T**	**P**	**Credit**
3	0	2	4

Course Code	**CED309**
Course Title	**TRANSPORTATION ENGINEERING**
Course Outcomes	CO1: Comprehend transportation modes, historical road development, and highway economics for effective transportation system management. CO2: Learn highway geometric design principles, aligning roads, ensuring safe sight distances, and designing smooth horizontal and vertical alignments. CO3: Comprehend highway materials, construction techniques, drainage importance, maintenance, and pavement evaluation for durable road infrastructure. CO4 Gain knowledge of pavement design, elementary traffic engineering, traffic studies, road safety elements, intersections, and traffic management essentials.
Course Title	**TRANSPORTATION ENGINEERING LABORATORY**
Course Outcomes	CO1: To Evaluate the mechanical properties of aggregates and their suitability for use in construction. CO2: To analyze the properties of bitumen and assess its quality for road construction. CO3: To assess the geometric properties of aggregates and their impact on the performance of road materials.

In hours			
L	**T**	**P**	**Credit**
0	0	0	2

Course Code	**CED311**
Course Title	**Survey camp**
Course Outcomes	CO1: Students gain practical hands-on experience in applying surveying techniques, tools, and equipment to real-world situations.

B. Tech. in Civil Engineering
Semester-6

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED302**
Course Title	**Environment Engineering-II**
Course Outcomes	CO1: Analyze soil and groundwater contamination sources, movement of contaminants, and waste containment principles. CO2: Comprehend groundwater contamination behavior, measurement methods, and remediation techniques for soil and groundwater. CO3: Explore hazardous waste management, solid waste disposal, engineered landfill design, and regulatory guidelines. CO4: Gain insights into waste handling criteria, disposal techniques, and practical case studies in environmental geo-technology.

In hours			
L	**T**	**P**	**Credit**
3	1	0	4

Course Code	**CED304**
Course Title	**Design of Steel Structures-I**
Course Outcomes	CO1: Analyze riveted, bolted, and welded connections, analyzing stresses, strengths, and failures in joints for effective structural design. CO2: Grasp the design principles of tension and compression members, considering axial loads, bending, and empirical formulas. CO3: Learn the intricacies of column bases, foundations, and industrial building design, including gantry girders and column brackets. CO4: Acquire the skills to design plate girders and roof trusses, accounting for loads, forces, and joint calculations in structural systems.

In hours			
L	**T**	**P**	**Credit**
3	1	0	4

Course Code	**CED306**
Course Title	**Foundation Engineering**
Course Outcomes	CO1: Comprehend soil investigation methods, sampling techniques, and borehole logging for structural design. CO2: Analyze earth pressure theories, stresses in soils, and influence factors for retaining walls and loaded areas. CO3: Learn about shallow foundation types, bearing capacity, settlement calculations, plate load tests, and SPT. CO4: Gain knowledge of pile foundations, caissons, and wells including types, load tests, stability analysis, and group behavior.

In hours			
L	**T**	**P**	**Credit**
0	0	2	1

Course Code	**CED308**
Course Title	**Computer Aided Drawing**
Course Outcomes	CO1: Produce accurate concrete and steel drawings using AutoCAD. CO2: Apply design principles for efficient structural detailing. CO3: Create annotated plans for common building components. CO4: Demonstrate proficiency in interpreting architectural and engineering drawings

B. Tech. in Civil Engineering
Semester-7

In hours			
L	**T**	**P**	**Credit**
3	1	0	4

Course Code	**CED401**
Course Title	**Design of Steel Structures-II**
Course Outcomes	CO1: Comprehend plate girder elements, design principles, flange curtailment, and various stiffener types in structural steel systems. CO2: Develop expertise in designing steel foot bridges with welded joints, parallel booms, wooden decking, and safe load-bearing capacities. CO3: Master the design aspects of an industrial shed encompassing gantry girders, column brackets, bents, and bracing for stability. CO4: Gain proficiency in designing single-track railway bridges, including lattice girders, welded joints, girders, bracings, and bearing systems.

In hours			
L	**T**	**P**	**Credit**
1	0	4	3

Course Code	**CED403**
Course Title	**Engineering Project-I**
Course Outcomes	CO1: Apply appropriate techniques and tools to solve complex structural problems. CO2: Exhibit good communication skill to the engineering community and society. CO3: Demonstrate professional ethics and work culture. CO4: Contribute in efficient technology transfer to the society.

In hours			
L	**T**	**P**	**Credit**
0	1	0	2

Course Code	**CED405**
Course Title	**Software Training**
Course Outcomes	CO1: Apply appropriate software, techniques and tools to solve complex structural problems. CO2: Exhibit good communication skill to the engineering community and society. CO3: Demonstrate professional ethics and work culture. CO4: Contribute in efficient technology transfer to the society.

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Semester-8

In hours			
L	**T**	**P**	**Credit**
0	0	18	9

Course Code	**CED402**
Course Title	Capstone Project /DSE
Course Outcomes	CO1: Apply appropriate techniques and tools to solve complex structural problems. CO2: Exhibit good communication skill to the engineering community and society. CO3: Demonstrate professional ethics and work culture. CO4: Contribute in efficient technology transfer to the society.

DEPARTMENTAL ELECTIVES

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED350**
Course Title	**FOUNDATION ENGINEERING**
Course Outcomes	CO1: To determine the depth of exploration and method of explorations for soil investigation. CO2: To determine the earth pressures and stresses in soils under different types of foundation loads. CO3: To calculate the bearing capacity of soil under shallow foundations. CO4: To comprehend the need of deep foundations like piles and well foundations and also to analyze the allowable load.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED351**
Course Title	**OFFSHORE ENGINEERING**
Course Outcomes	CO1: Introduce offshore structures, their construction stages, constructability principles, and relevant codes of practice. CO2: Explore offshore project management, site investigations, deep-sea construction, materials properties, and related considerations. CO3: Examine in-situ testing, geological aspects, and the development of design stratigraphies for offshore projects. CO4: Investigate methods and equipment for underwater exploration, instrumentation in soil engineering, and practical field visits for data collection and reporting.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED352**
Course Title	**SOIL DYNAMICS**
Course Outcomes	CO1: Analyze dynamic load effects and vibrations in structures, applying theory of vibrations and dynamic earth pressures. CO2: Evaluate dynamic bearing capacity and foundations under dynamic earth pressure, considering shallow foundation design principles. CO3: Investigate wave propagation in soil, liquefaction phenomena, and compute dynamic soil properties for engineering applications. CO4: Design machine foundations for diverse machinery types, implement vibration isolation techniques, and comprehend vibration control strategies in engineering practice.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED353**
Course Title	**BIOLOGICAL PROCESSES FOR CONTAMINATS REMOVAL**
Course Outcomes	CO1: Analyze the various waste water constituents and also the design principles of bio reactors. CO2: Evaluate the design process of waste water treatment systems. CO3: Investigate the phenomenon of aeration in the biological treatment. CO4: Comprehend the anaerobic processes of waste water treatment.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED354**
Course Title	**ENVIRONMENT LAWS AND POLICIES**
Course Outcomes	CO1: Analyze the Indian legal system, judiciary, and environmental law principles including precautionary and sustainable development. CO2: Evaluate wildlife and biodiversity laws, their evolution, and statutory frameworks, including the Biological Diversity Act and Forest Rights Act. CO3: Examine air, water, and marine laws, covering pollution prevention, water management, judicial remedies, and coastal zone regulations. CO4: Appraise the Environment (Protection) Act 1986, its genesis, powers delegation, EIA notification, waste management, and roles of stakeholders.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED355**
Course Title	**ENVIRONMENT IMPACT ASSESSMENT AND LIFE CYCLE ANALYSIS**
Course Outcomes	CO1: Acquire comprehension of the principles, process and the necessary techniques foe EIA. CO2: Assess the environment impact of the proposed project on the surrounding environment with the help of different EIA Tools. CO3: Identify, predict and evaluate the economic, environmental and social impact of developmental activities. CO4: Promote sound and sustainable development through LCA and the identification of appropriate alternatives and mitigation measures.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED356**
Course Title	**INTELLIGENT TRANSPORTATION SYSTEMS**
Course Outcomes	CO1: Define ITS and its objectives, trace historical development, and elucidate benefits and data collection techniques. CO2: Explain the significance of telecommunications in ITS, explore TMCs, and analyze vehicle-roadside communication and positioning systems. CO3: Explore various ITS functional areas like ATMS, ATIS, CVO, AVCS, APTS, ARTS, and analyze user needs and services. CO4: Examine advanced vehicle safety systems, Information Management, Automated Highway Systems, and global ITS implementations and trends.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED357**
Course Title	**RAILWAY AND AIRPORT ENGINEERING**
Course Outcomes	CO1: Comprehend permanent way components and technicalities of rails. CO2: Design the geometry of railway track and explain the types and functions of sleepers and ballast. CO3: Know the necessity and functionality of points and crossings along with signaling and interlocking. CO4: Analyze different components and laws governing the site selection of airport and also to design various components of airport.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED358**
Course Title	**TRANSPORTATION ECONOMICS**
Course Outcomes	CO1: Develop skills in transportation project development, budgeting, and financial planning for effective decision-making in transportation projects. CO2: Analyze transportation costs, user costs, and cost functions, and assess road pricing strategies for efficient transportation systems. CO3: Evaluate vehicle operating costs, economic impact of congestion, and apply economic analysis methods to transportation projects for informed decision-making. CO4: Examine indirect costs/benefits, financing methods, PPP, risk analysis, and real-world case studies for road project viability assessment.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED359**
Course Title	**INDUSTRIAL STRUCTURES**
Course utcomes	CO1: Analyze the planning and functional requirements of Industrial steel structures like crane girders, communication towers etc. CO2: Learn the design of chimneys by considering all the forces like earthquake, wind load and temperature effect etc. CO3: Design the Silos and bunkers by various theories. CO4: Evaluate the design of shell structures and machine foundation design.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED360**
Course Title	**EARTHQUAKE RESISTANCE DESIGN**
Course Outcomes	CO1: Analyze seismic principles, damage patterns, and design criteria for reliable earthquake-resistant structures with diverse structural forms. CO2: Apply lateral load analysis methods, seismic force estimation, and response spectrum analysis to ensure seismic stability in structures. CO3: Evaluate seismic behavior and design aspects of concrete, steel, and masonry structures in adherence to relevant code provisions (IS 4326, IS 13920). CO4: Execute seismic design, detailing, and reinforcement techniques for reinforced concrete and masonry structures, emphasizing flexural strength, ductility, and joint performance.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED361**
Course Title	**STRUCTURAL DYNAMICS**
Course Outcomes	CO1: Analyze dynamic loading and idealize structures for free and forced vibrations, including damping effects. CO2: Formulate equations of motion, solve for free vibrations of single degree of freedom systems using stiffness methods. CO3: Examine damped vibrations, identify damping types, and analyze critically-damped and under-damped systems, considering logarithmic decrement. CO4: Evaluate structural earthquake response, focusing on behavior of Concrete and Steel structures under varying loadings.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED362**
Course Title	**RELAIBILITY ANALYSIS OF STRUCTURES**
Course Outcomes	CO1: Analyze structural safety concepts, design methods, and basic statistics for engineering applications. CO2: Assess resistance distributions, probabilistic load analysis, and basic structural reliability methods for practical engineering design. CO3: Apply Monte Carlo simulation, Level 2 reliability methods, and reliability-based design in complex structural engineering scenarios. CO4: Evaluate reliability-based design criteria, safety factors, and their application to structural systems conforming to Indian standards.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED363**
Course Title	**PRE-STRESSED CONCRETE**
Course Outcomes	CO1: Analyze materials & systems for pre-stressed concrete. Examine high strength concrete, tensile steel, & pre-stressing methods. CO2: Evaluate prestress effects & stresses. Analyze bending stresses, load balancing, loss of prestress & beam deflection in structures. CO3: Assess strength in flexure, shear & torsion. Apply strain compatibility, IS: 1343 code, & limit state design to prestressed sections. CO4: Design prestressed beams & slabs. Develop transfer methods, anchorage reinforcement, cable profiles & slabs in various configurations.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED364**
Course Title	**DESIGN OF STRUCTURAL SYSTEMS**
Course Outcomes	CO1: Develop skills in structural planning, material selection, and design criteria formulation in construction processes. CO2: Apply knowledge of loads, safety, and functional requirements to choose optimal structural schemes effectively. CO3: Utilize computer-aided tools for preliminary design and proportioning, incorporating formulated design criteria. CO4: Analyze structural response, cost, and value to make informed decisions in the construction and design field.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED450**
Course Title	**MASONARY STRUCTURES**
Course Outcomes	CO1: Analyze masonry materials and construction, including defects and errors, to ensure structural integrity and quality. CO2: Apply stress analysis techniques to determine permissible stresses and design considerations for different masonry wall types. CO3: Evaluate load considerations and design masonry walls under various axial load scenarios, including walls with openings and supports. CO4: Formulate designs for masonry walls exposed to concentrated axial and eccentric loads, ensuring stability and load distribution.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED451**
Course Title	**SUSTAINABLE CONSTRUCTION METHODS**
Course Outcomes	CO1: Explore sustainability principles, environmental challenges, global warming, and green building concepts for sustainable urban development. CO2: Examine energy conservation, HVAC systems, energy audits, and the shift from fossil fuels to renewables for efficient building practices. CO3: Investigate green materials, indoor environmental quality, and building commissioning to enhance sustainable construction and occupant well-being. CO4: Analyze economics of green construction, life-cycle analysis, and feasibility assessment for informed decision-making in green building projects.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED452**
Course Title	**CONSTRUCTION EQUIPMENT AND AUTOMATION**
Course Outcomes	CO1: Compare conventional and mechanized construction methods, highlighting mechanization's advantages. CO2: Identify diverse construction equipment for tasks like earthmoving, concreting, and material transport, emphasizing their roles. CO3: Examine heavy machinery like cranes and hoists, discussing their functions, productivity, and material transportation equipment. CO4: Explore advanced surveying techniques: aerial surveying, GIS, GPS, drones, and robots, emphasizing their applications in construction.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CED453**
Course Title	**CONSTRUCTION COST ANALYSIS**
Course Outcomes	CO1: Apply scientific principles to construction costs and analyze factors affecting them in engineering contexts. CO2: Analyze direct and overhead costs, markups, and profits, employing statistical measures for informed decision-making.

	CO3: Calculate project funds, manage cash flow, and evaluate contract-based cash inflow/outflow, aligning with project expectations. CO4: Master cost recording, cash custody, and payment types for effective construction cost accounts and financial controls.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED454**
Course Title	**ECOLOGICAL ENGINEERING**
Course Outcomes	CO1: Define ecology, analyze ecosystem types, explore biotic-abiotic interactions, examine population dynamics, and comprehend community structure. CO2: Analyze eco technology classification, assess environmental system interactions, and evaluate human impacts on environmental systems. CO3: Investigate ecological engineering processes, study energy concepts, and apply ecological engineering in agro ecosystems and disaster scenarios. CO4: Comprehend the soil infiltration, wetlands, source separation, aqua cultural, and detritus-based systems, and their applications in ecological engineering for marine environments.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED455**
Course Title	**AIR AND NOISE POLLUTION CONTROL**
Course Outcomes	CO1: Analyze air pollution's global significance, effects, and atmospheric composition for informed environmental engineering decisions. CO2: Apply meteorological concepts, dispersion modeling, and plume behavior to assess air quality and make effective engineering choices. CO3: Evaluate air pollution through stack monitoring, indoor models, and control measures for stationary and mobile sources. CO4: Examine noise pollution's impact, prediction, control, and health effects, considering criteria, factors, and monitoring techniques.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED456**
Course Title	**SOLID WASTE MANAGEMENT**
Course Outcomes	CO1: Identify solid waste types, sources, and related laws, integrated waste management concepts. CO2: Analyze waste characteristics, reduction strategies, recycling, and waste handling systems. Evaluate hazardous waste management practices. CO3: Examine waste processing technologies: composting, thermal conversion, energy recovery, and hazardous waste treatment. Assess biomedical waste treatment methods. CO4: Evaluate landfill disposal processes: site selection, design, operation, leachate management, and landfill closure, environmental monitoring and remediation techniques.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED457**
Course Title	**DESIGN OF CONCRETE STRUCTURES-II**
Course Outcomes	CO1: Analyze moment redistribution in RC beams, apply limit analysis, and interpret moment-curvature relationships in structural elements. Design of staircases. CO2: Apply RCC footing theories to design isolated, combined, and raft footings, considering various geometric configurations and loadings. CO3: Design curved plan beams, including semi-circular and circular beams, and analyze building frames for critical loads using SP16 guidelines. CO4: Design different types of retaining walls (cantilever and counterfort), water tanks, and staging structures, applying relevant design criteria and principles.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED458**
Course Title	**MATRIX METHODS FOR STRUCTURAL ANALYSIS**
Course Outcomes	CO1: Develop comprehending of matrices, determinants, and their applications in solving linear equations and systems. CO2: Analyze pin-jointed frames using the flexibility method, considering temperature effects and displacements in indeterminate structures. CO3: Master the stiffness method for structural analysis, handling relative displacements, and analyzing indeterminate pin-jointed frames. CO4: Apply computer tools like MS Excel to perform matrix-based structural analysis on various types of beams, trusses, and frames.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED459**
Course Title	**ENVIRONMENTAL GEOTECHNOLOGY**
Course Outcomes	CO1: Comprehend soil formation, composition, and structure's influence on engineering behavior for effective geotechnical applications. CO2: Grasp mechanisms of subsurface contamination, its detection, monitoring, and the impact of contaminants on soil properties. CO3: Gain proficiency in comprehensive site investigation techniques, including geophysical and hydro-geological methods for environmental assessment. CO4: Develop knowledge of waste containment concepts, remediation strategies, and real-world case studies related to geo-environmental challenges.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED460**
Course Title	**PORT AND HARBOUR ENGINEERING**
Course Outcomes	CO1: Comprehend the principles and significance of water transportation and its various components, including inland waterways, harbours, and ports. CO2: Analyze the impact of natural phenomena such as wind, tides, waves, and sediment transport on harbour design, structure, and coastal protection. CO3: Comprehend the design, construction, and functionality of different harbour infrastructures, including breakwaters, docks, piers, and navigational aids. CO4: Develop the skills to plan and evaluate port facilities for efficient cargo and passenger handling, considering regional connectivity, economic viability, and environmental impacts.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED461**
Course Title	**DESIGN OF HYDRAULIC STRUCTURES**
Course Outcomes	CO1: Comprehend head work components, seepage theories, and silt control mechanisms in hydraulic engineering projects. CO2: Gain expertise in designing weirs, barrages, and energy dissipation structures for effective water flow management. CO3: Develop skills in regulating canal flows through cross-drainage works, falls, and escape mechanisms for optimized water distribution. CO4: Master the design principles of canal outlets, aqueducts, and siphons, focusing on efficiency, modularity, and hydraulic behavior.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED462**
Course Title	**REPAIR AND REHABLITATION OF STRUCTURES**
Course Outcomes	CO1: Comprehend maintenance, repair, and rehabilitation strategies for structures, including inspection, assessment, and causes of deterioration.

	CO2: Comprehend concrete strength, durability, cracks, and effects of environmental factors, corrosion, and cover thickness. CO3: Familiarize with special concretes, repair techniques, and protection methods using NDT, epoxy injection, corrosion inhibitors, and innovative materials. CO4: Gain insight into reinforcement coatings, cathodic protection, structural rehabilitation, strengthening methods, and demolition techniques through case studies.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED463**
Course Title	**MATERIAL CHARACTERIZATION**
Course Outcomes	(CO1): Introduce fundamental techniques (calorimetry, X-ray diffraction) for comprehending construction materials' properties and structures. (CO2): Develop proficiency in analyzing construction materials through thermal, surface area measurement, optical, and electron microscopy techniques. (CO3): Enhance skills in image analysis and spectroscopic techniques for advanced characterization of construction materials. (CO4): Gain expertise in utilizing methods like mercury intrusion porosimetry and impedance analysis for assessing porosity and material behavior.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED464**
Course Title	**STRUCTURAL ENGINEERING-II**
Course Outcomes	CO1: Comprehend classical methods (Slope Deflection, Moment Distribution) for analyzing statically indeterminate structures and their applications. CO2: Gain proficiency in matrix methods (stiffness and flexibility) to analyze skeletal structures including beams, trusses, and plane frames. CO3: Apply energy principles (Castigliano's theorems) to analyze framed structures, both statically determinate and indeterminate, under various loads. CO4: Develop skills in creating influence line diagrams (ILD) for determinate and indeterminate structures to evaluate support reactions and internal forces.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CED465**
Course Title	**FLUID MECHANICS**
Course Outcomes	CO1: Comprehend fundamental principles of fluid mechanics, including laminar and porous media flow, boundary layer theory, and transition to turbulent flow. CO2: Comprehend the characteristics of turbulent flow, velocity distribution, drag and lift forces on immersed bodies, and resistance diagrams. CO3: Gain knowledge of open channel flow principles, including resistance equations, flow classifications, velocity distribution, Energy and Momentum principles and critical flow, and efficient flow sections. CO4: Develop expertise in gradually varied flow analysis, water surface profiles, hydraulic jumps, and surge phenomena in open channels.

OPEN ELECTIVES

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CIV801**
Course Title	**CONSTRUCTION MATERIALS AND TECHNIQUES**
Course Outcomes	CO1: Analyze building materials' properties, selection, and deterioration mechanisms for informed construction decision-making. CO2: Comprehend cement and concrete production, characteristics, workability, and factors influencing concrete strength. CO3: Learn masonry techniques, damp proofing methods, and their importance in building durability and structural integrity. CO4: Gain insights into plastering, pointing, foundation types, and their roles in creating functional and stable structures.

In hours			
L	T	P	Credit
3	0	0	3

Course Code	**CIV802**
Course Title	**RAILWAY AND TUNNEL ENGINEERING**
Course Outcomes	CO1: Comprehend the historical evolution of railways, permanent way construction, and basic points and crossing layouts. CO2: Comprehend station and yard site selection, track laying, signaling principles, and interlocking systems for safe railway operations. CO3: Gain insights into tunnel construction necessities, design for highways and railways, and ventilation/drainage methods for tunnels. CO4: Grasp the significance of tunnel ventilation, drainage, and lighting systems for operational safety and efficiency in underground transportation infrastructure.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CIV803**
Course Title	**METRO SYSTEMS AND ENGINEERING**
Course Outcomes	CO1: Comprehend the fundamental concepts of metro systems, their necessity, routing considerations, planning, and financial aspects. CO2: Gain insights into the construction of metro stations, elevated structures, tunnels, depots, ventilation, safety systems, and building infrastructure. CO3: Learn about the preliminary surveys, construction management, quality, safety, environmental and social aspects, track systems, and facilities management in metro projects. CO4: Acquire knowledge about signaling, fare collection, control centers, SCADA systems, and platform screen doors for efficient metro operation and management.

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CIV804**
Course Title	**DISASTER PREPAPREDNESS AND PLANNING**
Course Outcomes	After completing this course the student must demonstrate the knowledge and ability to: CO1: Identify various types of disasters, their causes, effects & mitigation measures. CO2: Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps. Understand the use of emergency management system to tackle the problems CO3: Discuss the role of media, various agencies and organizations for effective disaster management. Design early warning system and understand the utilization of advanced technologies in disaster management CO4: Compare different models for disaster management and plan & design of infrastructure for effective disaster management

In hours			
L	**T**	**P**	**Credit**
3	0	0	3

Course Code	**CIV805**
Course Title	**ROAD SAFETY**
Course Outcomes	After completing this course: CO1: Student will be able to learn causes of road accidents with various influence on traffic safety. CO2: Student will gain insight on various road safety measure to decrease road crash frequency. CO3: Students will become familiarize with road safety audit and its procedure, ITS importance in implementation of road safety. CO4: Student will be able to acknowledge various parameters to ensure traffic safety in road operation.