

Shri G.S. Institute of Technology and Science

Civil Engineering and Applied Mechanics Department

SUBJECT NAME	CO'S	DETAIL
CE10003 : FUNDAMENTALS OF CIVIL ENGINEERING & APPLIED MECHANICS	CO1	To identify and analyze a system of forces, determine forces in members of trusses and calculate support reactions for beam subjected to various types of loading.
	CO2	To determine the Center of Gravity and moment of Inertia of a given Plane Areas.
	CO3	Determine and analyze the Shear force, bending moment of beams and analyze the trusses and problems related to frictions
	CO4	Understand the working principles of chaining instruments and measuring distance, perpendicular and oblique offsets from the given reference line
	CO5	Apply the knowledge of surveying and leveling in different operations in civil engineering projects.
III SEM		
CE: 21007: BUILDING PLANNING AND ARCHITECTURE	CO1	Explain basics of building planning, building components and by-laws.
	CO2	Apply principles of planning in construction of buildings.
	CO3	Apply architectural consideration in the design of staircases.
	CO4	Discuss the role of architect in planning.
	CO5	Develop the plan of different type of buildings as per codal provisions.
CE:21002:GEODESY	CO1	Describe and explain the working principles of survey instruments.
	CO2	Illustrate modern instruments to determine the heights, distances, angles and elevations in surveying field.
	CO3	Measure the errors and apply corrections.
	CO4	Integrate the survey data and compute area and volume of the field.
	CO5	Apply the concept of trigonometric and Geodetic Survey.
	CO6	Design and implement the different types of curves for deviating type of alignments.
	CO7	Summarize the geodetic data to process and perform analysis for survey problems with the use of electronic instruments.
CE:21003 : STRENGTH OF MATERIALS	CO1	Explain elastic behavior of bodies and mechanical properties of materials.
	CO2	Determine shear force and bending moment at any section in determinate beam and frames.
	CO3	Calculate bending stresses at any section.
	CO4	Calculate shear stress at any section in beams subjected to shear force and torsion.
	CO5	Determine deflection at any section in beams by different methods.

CE:21004: MATERIAL TECHNOLOGY	CO1	Understanding the properties of lime, glasses, timber, plastics and clay products.
	CO2	Understanding the uses of laminates, heat insulating materials, decorative materials.
	CO3	Understanding the ingredients of concrete.
	CO4	Analyzing the properties of ingredients for the testing of fresh and hardened concrete.
	CO5	Evaluating the mix design methods for proportioning of concrete.
CE: 21513: GEOTECHNICAL ENGINEERING – I	CO1	Describe and explain the soil formation and soil structure.
	CO2	Classify the soils and identify the soil engineering properties
	CO3	Solve any practice problems related to soil stresses estimation, permeability, seepage including flow net diagram
	CO4	Evaluate any practical problems related to consolidation like consolidation settlement, time rate of settlement
	CO5	Analyse the stress distribution & shear failure by various methods.
IV SEM		
CE21502: CONSTRUCTION TECHNOLOGY-I	CO1	To outline the various available conventional and newer construction materials and techniques.
	CO2	To develop the concept of selection of suitable material for various structural elements.
	CO3	To describe the pros and cons of different materials and techniques.
	CO4	To identify the suitability of material and technique in various real-life problems.
	CO5	To measure the structural aspects of different materials and the technicalities involved in construction methods.
		To apply the concepts developed for the planning and construction of buildings
CE21504 : TRANSPORTATION ENGINEERING	CO1	To outline the basic history, need and planning of highways, general considerations in road planning.
	CO2	To develop typical cross sections of road and design of various types of curves.
	CO3	To illustrate the various elements of rail and wear and creep of rails.
	CO4	To demonstrate the concepts of geometric design for railways, types of signals, interlocking, stations and yards in railways.
	CO5	To plan and design the port and harbour facilities and demonstrate breakwater, jetty, groins, revetments & bulk heads etc.
CE: 21508: ENGINEERING GEOLOGY	CO1	Explain various type of Earth processes.
	CO2	Identify different type of minerals and rocks.
	CO3	Describe the Structural deformations and impacts.
	CO4	Explain various considerations for site selection for engineering projects.
	CO5	Predict ground water availability zones and flow in rocks.

CE: 21557: FLUID MECHANICS	CO1	Compute hydrostatic forces acting on submerged surfaces.
	CO2	Apply conservation laws to solve steady state fluid flow problems
	CO3	Apply the principles of dimensional analysis for design of experiments
	CO4	Analyse the characteristics of flow through pipes and Design simple pipe systems.
	CO5	Compute flow profiles in channel transitions and due to hydraulic structures
CE: 21554: STRUCTURAL MECHANICS	CO1	Determine the deflection of determinate structures using energy methods.
	CO2	Analyze axially loaded and eccentric columns and calculate buckling loads.
	CO3	Analyze curved flexural members, springs, shells and pressure vessels.
	CO4	Compute stresses in beams subjected to unsymmetrical bending.
	CO5	Analyze and interpret response of single degree of freedom systems subjected to harmonic loading.
III YEAR V SEMESTER		
CE 31004: TRANSPORTATION ENGINEERING	CO1	To outline the basic history, need and planning of highways, general considerations in road planning.
	CO2	To develop typical cross sections of road and design of various types of curves.
	CO3	To illustrate the various elements of rail and wear and creep of rails.
	CO4	To demonstrate the concepts of geometric design for railways, types of signals, interlocking, stations and yards in railways.
	CO5	To plan and design the port and harbour facilities and demonstrate breakwater, jetty, groins, revetments & bulk heads etc.
CE 31006/CE 31002: ENVIRONMENTAL ENGINEERING/ENVIRONMENTAL ENGINEERING I	CO1	Determination of types of sources, intake works and common impurities in water- causes and effects along with population forecasting methods and examination of physicochemical and bacteriological quality of water.
	CO2	Classification of pipes used in water supply scheme-types of joints, valves, fittings etc. including corrosion in pipes.
	CO3	Analyze water distribution network, leak detection aspects.
	CO4	Determination and analysis of wastewater/sewage quality. Significance of various parameter.
	CO5	Classification and types of sewerage system. Analysis and hydraulic design of sewers.
CE31003 DESIGN OF RCC STRUCTURES	CO1	To explain the behaviour of RCC Structures & apply the clauses of IS codes in design of reinforced concrete structures.
	CO2	To draw Reinforcement detailing of RCC structures.
	CO3	To analyse & design the RCC Beam, Slabs, Column & Footings.
	CO4	To analyse & design different types of RCC Staircases.
	CO5	To analyse & design RCC Retaining Wall.

CE31007: STRUCTURAL ANALYSIS I	CO1	To Outline the equilibrium of structure.
	CO2	To identify suitable method to solve a given problem.
	CO3	To analyze the results obtained by solving the given problem of arches, determinate and indeterminate structures.
	CO4	To describe the structural behavior based on the results of analysis.
	CO5	To determine the bending moment diagram and shear force diagram of determinate and indeterminate structures by the force method.
CE31010: WATER RESOURCES ENGINEERING	CO1	Understand the concepts of soil water plant relationship to generate the crop water requirements for estimation of quantity of water to be supplied to solve the question: When to Irrigate and How Much to Irrigate
	CO2	To Understand the concepts of different types of irrigation schemes and their layout.
	CO3	To know the different types of irrigation structures along with their components, functions and types.
	CO4	To understand various components of the hydrological cycle, understand concepts of runoff and floods etc., estimate runoff by different methods, Hydrograph analysis and flood estimation.
	CO5	To Study the Underground water hydrology and hydraulics for utilization.
VI SEMESTER		
CE31502 DESIGN OF STEEL STRUCTURES	CO1	Summarise the behaviour and design different types of steel connections.
	CO2	Compute the design loads for various types of structures.
	CO3	Illustrate the design of compression member, tension member and flexure members.
	CO4	Analyse & design the Plate girder.
	CO5	Develop complete drawings of steel structures including all details of members, sections and their connections.
CE 31505: STRUCTURAL ANALYSIS-II	CO1	To Identify suitable method to solve indeterminate structures.
	CO2	To calculate the forces in member by the displacement and force methods.
	CO3	To describe the structural behavior based on the results of analysis.
	CO4	To determine the bending moment diagram and shear force diagram of determinate and indeterminate structures.
	CO5	To assess the formation of plastic hinges in the structure.
CE31506 CONSTRUCTION TECHNOLOGY II	CO1	Analyse the different types of estimate, units of measurements in infrastructure projects.
	CO2	Calculate the quantity of different items of work for different specifications as per SOR.
	CO3	Assess the valuation of the property by various methods.
	CO4	Prepare the tender document and explain different departmental procedures.
	CO5	Apply the CPM and PERT technique to optimize construction project.

CE31601: ADVANCE HIGHWAY AND AIRPORT ENGINEERING	CO1	Understand the different properties of highway materials.
	CO2	To solve the problems for design of flexible and rigid pavement.
	CO3	Analyze the various factors affecting pavement design and its methods.
	CO4	Understand the step wise procedure of highway construction and its maintenance activities.
	CO5	Understand the aircraft characteristics and apply them in airport planning.
	CO6	Determine the airport layout and structural design of airport pavements.
CE 31602: Pavement Design Construction and Maintenance	CO1	To Understand the importance of engineering materials include soil, aggregates, asphalt in pavement designing.
	CO2	To Describe flexible pavement design methods, illustrate factors affecting design.
	CO3	To Apply theories of rigid pavement design.
	CO4	To Understand the use of various coat in flexible pavement.
	CO5	To Understand highway drainage and maintenance.
CE31701: Decentralized Waste Water Management	CO1	To define sanitation practices.
	CO2	To explain ecological sanitation.
	CO3	To identify suitable decentralized waste water treatment process based on characteristics of waste water.
	CO4	To enlist advanced treatment options for waste water treatment.
	CO5	To explain Financial and social Considerations about decentralized wastewater management
CE 31702: ENVIRONMENTAL AUDITING AND MANAGEMENT SYSTEMS	CO1	To understand basics of Environmental Auditing, its features and plannings.
	CO2	To determine data collections/sampling protocols for Environmental Auditing.
	CO3	To understand the concept of LCA- Life Cycle Assessment.
	CO4	To create and evaluate an environmental management system in line with Indian Standard Procedures.
	CO5	To understand different case studies related to Environmental Auditing.
CE 31703 : WATER AND WASTEWATER TREATMENT TECHNOLOGIES	CO1	To find out water treatment techniques, impact of raw water quality on health and mitigation. Principles of sedimentation theory, factors affecting settling, types of sedimentation and design of sedimentation tanks.
	CO2	To Classify coagulants, factors affecting coagulation. Design of Clariflocculator unit. Jar test.
	CO3	To understand application of free chlorine and combined chlorine, mechanism of chlorination. Methods of disinfection and their relative advantages and disadvantages.
	CO4	To design preliminary, primary and secondary treatment units of conventional sewage treatment plant.
	CO5	To design biological treatment units viz. Activated sludge plant. Methods of sludge treatment and disposal.

B.Tech IV Year		
CE 41001: DESIGN OF ADVANCED RCC STRUCTURES	CO1	To describe basic concepts of water tanks, and their classifications.
	CO2	To examine the analysis and design of various types of water tank (tank resting on ground, underground water tank & overhead water tank).
	CO3	To outline the analysis and design process for bunkers and silos.
	CO4	To evaluate the parameters of the steel water tanks under various conditions.
	CO5	To examine steel and timber formwork.
CE41006: DESIGN OF HYDRAULIC STRUCTURES	CO1	Analyze different types of hydraulic structures based on materials and the functions of each with the given site conditions.
	CO2	Apply the theories of stability analysis of dam structures to ensure a safe and serviceable design for execution
	CO3	Apply the theories of design of structures on pervious foundations and design the structures for safety and serviceability
	CO4	Develop design aspects of canal regulation structures suitable for different conditions of materials, site conditions and hydraulic aspects of flow
	CO5	Produce detailed drawings in executable form of the designed structures.
CE 41007 GEOTECHNICAL ENGG.-II	CO1	Analyse earth retaining structures in various types of soil medium.
	CO2	Estimate appropriate soil strength parameters with respect to the drainage conditions
	CO3	Analyse the bearing capacity of soil by IS code methods.
	CO4	Evaluate solutions for shallow and deep foundations for various structures.
	CO5	Discuss the importance of soil investigation for any civil engineering construction.
CE 41281: ADVANCED ANALYSIS OF STRUCTURES	CO1	Formulate the global flexibility and stiffness matrix by transforming single member.
	CO2	Analyse beams and frames using flexibility and stiffness methods.
	CO3	Analyse symmetric and unsymmetric space frames subjected to gravity loads and lateral loads.
	CO4	Explain the concept of finite element method.
CE41282: ADVANCED STRUCTURAL DESIGN (BUILDINGS)	CO1	To Analyse the building frames for lateral loads & R.C.C. Multi-storeyed Building Frames for wind loads and earthquake loads,
	CO2	Design of R.C.C. Portal Frames & Multi-storeyed Buildings in Steel.
	CO3	To Describe the various types of roofing structures & Design of R.C.C. Circular Cylindrical shells, R.C.C. Domes and R.C.C. Folded Plates
	CO4	To Describe gantry system & Design of Gantry Girders
	CO5	To Describe of steeped column, classifications of form work, Design of Stepped columns in steel & form work.

CE41283: ADVANCED GEOLOGY & ROCK MECHANICS	CO1	Explain various type of Earth processes.
	CO2	Identify different type of minerals and rocks.
	CO3	Describe the Structural deformations and impacts.
	CO4	Explain various considerations for site selection for engineering projects.
	CO5	Predict ground water availability zones and flow in rocks.
CE 41284: INDUSTRIAL WASTEWATER TREATMENT	CO1	To determine the sources, characteristics and learning of all terms related to general industrial wastewater treatment and have a better understanding of the effects of industrial waste on sewers.
	CO2	To enlist the objective and methodology of Environmental Auditing with case examples.
	CO3	To define the technical aspects about treatment methods, pharmaceutical industry and the chemical (phenol) facilities which produces from wastewater and their operational problems.
	CO4	To characterize different types of industrial waste and determine the appropriate treatment methods for them.
	CO5	To explain various aspects of common effluent treatment plant, their treatment and disposal.
CE41285: Transportation Planning	CO1	To understand the transportation planning and its process
	CO2	To analyze the travel demand and trip generation – distribution behavior
	CO3	To analyze the choice of urban area for the transportation modes
	CO4	To analyze the trips covering different routes of a zone under consideration
	CO5	To apply economical concepts to a transportation facility
CE41286 : PLANNING AND MANAGEMENT OF WATER RESOURCES	CO1	To explain the complex interaction and integration of different components of water resources systems related to natural processes, economics, and environmental values.
	CO2	To identify and assess risks and estimate reliability of predictions.
	CO3	To apply modelling techniques and simulation or optimization for the outcomes.
	CO4	To develop the ability to create, defining and select best solution from a suitable set of efficient alternatives solutions to water resources related engineering problems.
	CO5	To evaluate economic consideration for water resources systems.

CE. BRIDGE ENGINEERING	CO1	Identify investigation and site selection, define various specifications of IRC for planning, analysis & design of bridges in general design consideration.
	CO2	Differentiate & interpret between highway and railway bridges in masonry, reinforced concrete, pre-stressed concrete and steel bridges.
	CO3	Analyze and design of reinforced concrete slab bridge, girder bridge and composite bridges, differentiate & interpret between usage of types of bearings and expansion joint for different types of bridges.
	CO4	Differentiate & interpret between types of bridge piers, abutments & foundation, and design of solid pier, abutment and well & pile foundation.
	CO5	Examine construction techniques and maintenance of bridges, and design of steel bridges subjected to railway loading & design of truss bridges, design of rocker and roller bearing.
CE: ADVANCE CONSTRUCTION PLANNING AND MANAGEMENT	CO1	Discuss and explain the planning and management principles in construction projects.
	CO2	Demonstrate the techniques of resource management for optimizing the time & cost of project.
	CO3	Develop the contract documentation and explain different acts related to contracts and arbitration.
	CO4	Generate the estimation for different construction projects and evaluate budget for various construction projects.
	CO5	Develop the organization's working procedures and group decision making ability.
CE41311 PRESTRESSED CONCRETE DESIGN	CO1	Paraphrase the principles and concepts of prestressing.
	CO2	Discuss pre-tensioning and post-tensioning members accounting for losses.
	CO3	Solve the problems of design of prestressed members subjected to flexure.
	CO4	Calculate the Shear, Torsion, Deflection and crack width of prestressed members.
	CO5	Apply the concept of prestressed concrete in analysis and design of various elements.
CE. : SYSTEM APPLICATION TO WATER RESOURCES	CO1	Understand various components of water resources planning and systems.
	CO2	Interpret system techniques such as reservoir sizing, planning and operation, river water quality management, water supply systems, irrigation management.
	CO3	Apply deterministic optimization techniques such as Linear Programming, Dynamic Programming, and Optimization using Calculus.
	CO4	Apply Stochastic Optimization techniques such Stochastic Dynamic Programming, Chance Constrained.
	CO5	Evaluate reservoir optimization problems, reservoir storage yield, and flood control problem using dynamic Programming techniques

CE 41311: TRAFFIC ENGINEERING	CO1	To outline the administration and functions of road user and vehicle characteristics
	CO2	To describe speed, delays, vehicle volume counts, O&D surveys, parking surveys and statistical methods for traffic engineering.
	CO3	To demonstrate various traffic signs, road markings, traffic signals, street furniture, street lightings for regulation and management of traffic
	CO4	To identify the reasons for road accidents and implement suitable measures for safe and efficient traffic flow.
	CO5	To apply the basic concepts of level of service and traffic forecasting
	CO6	To demonstrate various elements of geometric design.
CEADVANCED FLUID MECHANICS	CO1	Enhanced understanding of fluid mechanics, including the equations of motion in differential form, and turbulence.
	CO2	Understand the concepts of specific force and its application in open channel phenomenon
	CO3	Apply the governing equation of open channel hydraulics to solve real life problems.
	CO4	Understand the terminology of hydraulic machines viz. the pumps and Turbines and their key features in the applied fluid mechanics.
	CO5	Understand the working mechanism and governing equation of displacement and reciprocating pumps.
CE41684: ADVANCED TRANSPORTATION ENGG	CO1	Outline the economic evaluation of highway projects.
	CO2	Assess the transportation demand and develop the transportation models.
	CO3	Analyze the various modes of transportation systems.
	CO4	Analyze the various modes of urban public transportation systems.
	CO5	Understand the different construction equipment used in pavement construction.
CE 41608: DESIGN OF R.C.C. & PRESTRESSED BRIDGE	CO1	Identify standard specifications of road bridges, define various specifications of IRC for planning, analysis & design of bridges in general design consideration.
	CO2	Define various Types of Bridges, Design of Solid slab and girder Slab Bridges & design of girders and slabs as per Courbon's Theory and Pigeaud Theory.
	CO3	Analyze and design of balanced cantilever bridges, design of cantilever section, suspended span and articulations.
	CO4	Analyze and design of bridge piers, abutments & bearings, define introduction of continuous and arch bridges.
	CO5	Analyse and design of prestressed concrete bridges, And define pre & post tensioning, cable zone equation, initial & final stress condition, shear.

CE: AIR QUALITY MANAGEMENT	CO1	To analyze various perspectives of air pollution, sources, classification.
	CO2	To understand the effects, air quality monitoring and indices, control technologies.
	CO3	To develop the concept of carbon credit and its applications, and to measure the effects of Photochemical Smog.
	CO4	To understand the meteorological terms related to the environment/atmosphere.
	CO5	To identify and understand the control devices for air pollution control and monitoring.
CE-41604 : ADVANCED HYDROLOGIC ANALYSIS	CO1	Summarize the hydrological modelling process especially in the context of design flood estimation.
	CO2	Apply the flood flow modelling equations in longer river channels.
	CO3	Evaluate the rainfall runoff modelling to predict the flows in various conditions of climatic factors and land cover land use.
	CO4	Understand the basic concepts of watershed modelling philosophy.
	CO5	Analyse the ground water processes and its flow phenomena.
CE: STRUCTURAL DYNAMICS	CO1	Calculate Natural Frequencies and draw mode shape for harmonic vibration.
	CO2	Calculate response of SDOF for General and random Vibration
	CO3	Identify, formulate and solve dynamic response of SDOF
	CO4	Identify, formulate and solve dynamic response of MDOF
	CO5	Analyse continuous systems subjected to different types of dynamic loads
CE – 41712 : ADVANCED CONSTRUCTION PRACTICES	CO1	Describe and explain the functions of the structures and form work.
	CO2	Discuss and demonstrate the mechanism of various construction equipment required to facilitate the construction process.
	CO3	Illustrate Construction features of Cofferdam, Caisson and Tunnel.
	CO4	Classify and recommend construction safety measures on field.
	CO5	Compose and modify Risk Management and Network Optimisation.
CE 41711: MUNICIPAL SOLID WASTE MANAGEMENT	CO1	To determine the sources, composition, characteristics and learning of all terms related to general solid waste management including explanation of hierarchical structure in solid waste management and requirement for integrated solution.
	CO2	To examine technical aspects of solid waste segregation, collection and transportation along with route optimization for a solid waste collection and transport system.
	CO3	To analyze and design compost and incineration facilities.
	CO4	To plan and design municipal sanitary landfills along with management of leachate and landfill gas.
	CO5	To identify appropriate technologies for recycle, recovery and reuse of municipal solid waste. Case studies and Solid waste legislation.

CE: FINITE ELEMENT METHOD	CO1	Discretize a structure into number of elements define and,
	CO2	Derive the interpolation polynomial for 1-D, 2-D and 3-D finite elements.
	CO3	Derive the element stiffness.
	CO4	Assemble and solve the equations of equilibrium, eigen value and propagation problems.
	CO5	Analyze structures using finite element analysis method.