Program: Civil Engineering

COURSE OUTCOMES

Vision

To be the leading department providing quality education to develop competent Civil Engineers, Entrepreneurs, and innovators to serve the nation.

Mission

M1-To provide technical education.

M2- To prepare competitive students for employment/self-employment

M3–To focus on developing the professional skills as well as the values

Program Educational Objectives

1. To ensure that graduates will have a mastery of fundamental knowledge, problem solving skills,engineeringexperimentalabilities,anddesign capabilitiesnecessaryfor entering civil engineering career and/or graduate school.
2. To incorporate verbal and written communication skills necessary for successful professional practice.
3. Demonstrate knowledge of management principles and engineering techniques for effective project management.
4. To prepare graduates to deal with ethical and professional issues, taking into account the broader societal implications of civil engineering.

Program Outcomes

PO1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science,computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 to develop to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development (WK1 to WK4)
PO3	**Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon,culture, society and environment as required (WK5).
PO4	**Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions (WK8).
PO5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).
PO6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1,WK5 and WK7).
PO7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).
PO8	**Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams
PO9	**Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
PO10	**Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) Independent and life-long learning, ii) Adaptability to new and emerging technologiesand iii) Critical thinking in the broadest context of technological change. (WK8).

Program Specific Outcome

PSO 1	Graduates will apply technical knowledge, engineering skills, and competencies necessary for entering civil engineering career.
PSO 2	Graduates will demonstrate knowledge and techniques in engineering fields for effective management and professional development.
PSO 3	Graduates will apply technical and professional skills to be nationally competitive for employment/self-employment thereby benefit the society.

S. Y. B. TECH Civil
Course Outcomes (2024Pattern)

Semester – I

Course Code	Course:Building Planning and Technology (105301)
CO1	Identify types of building and basic requirements of building construction and masonry.
CO2	Make use of Architectural Principles and Building byelaws for building construction.
CO3	Identify and select various building components according to their requirement.
CO4	Plan effectively various types of residential buildings and green building according to their utility, functions with reference to National Building Code.
CO5	Plan effectively various types of Public Building.

Course Code	Course:Mechanics of Structure (105302)
CO1	Describe stress-strain and determine various types of stress, strain in determinate, homogeneous and composite structures.
CO2	Calculate shear force and bending moment in determinate beams for various loading conditions and illustrate shear force and bending moment diagram
CO3	Determine, bending stresses, shear stresses and Principal stresses.
CO4	Analyze axially loaded and eccentrically loaded column
CO5	Determine the slopes and deflection of determinate beams and trusses

Course Code	Course: Fluid Mechanics (105303)
CO1	Identify fluid properties, fluid statics, and its application.
CO2	Perform dimensional analysis and boundary layer theory for solving practical problems of fluid flow.
CO3	Determine fluid kinematics, dynamics and flow around submerged bodies.
CO4	Determine various flow and losses through pipes.
CO5	Design of most economical open channel flow section.

Course Code	Course: Engineering Mathematics-III (170304A)
CO1	Solve higher order linear differential equations using appropriate techniques
CO2	Apply Laplace transform and Z-Transform to solve differential equations, difference equations.
CO3	Apply vector calculus concepts to analyze problems and solve system of linear equations by using numerical methods.
CO4	Analyze discrete and continuous random variables using Binomial, Poisson and Normal distributions.
CO5	Analyze data through hypothesis tests like Chi-square and *t*-tests.

Course Code	Course: Artificial Intelligence (170404A)
CO1	Explain the basic principles and scope of Artificial Intelligence and its relevance to different engineering disciplines.
CO2	Apply search algorithms for solving simple engineering problems
CO3	Understand and differentiate between types of machine learning and data representations.
CO4	Identify and analyze AI applications in domains such as predictive maintenance, smart cities, automation, and control systems.
CO5	Recognize ethical, social, and professional issues in deploying AI solutions in engineering contexts.

Course Code	Course: IPR and Ethics (171305A)
CO1	Understand the basics of intellectual property rights.
CO2	Learn the patent filing process.
CO3	Understand the copyright/trademark/industrial design and filing process.
CO4	Understand the importance of ethics in their personal and professional life.
CO5	Learn the workplace responsibilities and rights as an engineer in the industry.

Course Code	Course: Renewable Energy (171305B)
CO1	Describe the basics of renewable energy.
CO2	Explain the constructional details and working of hydro-electric power plant.
CO3	Describe the fundamentals and technology to harness solar energy.
CO4	Explain the wind energy conversion system.
CO5	Discuss the bio-energy conversion pathways.

Course Code	Course: Health, Care & Management System(171305C)
CO1	Understand the structure and function of key human body systems relevant to healthcare and diagnosis.
CO2	Identify common health issues and explain their causes, symptoms.
CO3	Describe the working principles and applications of basic biomedical instruments used in diagnosis and monitoring.
CO4	Analyze the role of advanced medical devices and imaging systems in clinical decision making and treatment.
CO5	Explain the components of hospital management system and significance of digital health technologies like Electronic Health Records (EHR), telemedicine and emergency tracking.

Course Code	Course: Smart City and Infrastructure (171305D)
CO1	Describe the concept, features, and components of smart cities with relevant examples.
CO2	Demonstrate the structure and regulatory mechanisms of smart city development in context of Indian and international benchmarks.
CO3	Apply GIS and remote sensing techniques for spatial analysis and infrastructure planning in smart cities.
CO4	Relate smart transportation technologies and their role in improving urban mobility and sustainability.
CO5	Suggest smart solutions for urban water, air and waste management using IOT technologies.

Course Code	Course:Entrepreneurship Development (172306)
CO1	Explain the concept of entrepreneurship and its importance in economic and social development.
CO2	Identify, evaluate, and validate innovative business ideas using market research techniques.
CO3	Analyze startup funding options, revenue models, and financial feasibility of new businesses.
CO4	Demonstrate the ability to pitch business ideas effectively to potential stakeholders.
CO5	Develop a structured business plan incorporating all key aspects of entrepreneurship**.**

Course Code	Course:Business Economics (172406)
CO1	Understand the role of economics in business decision-making and analyze real-world economic scenarios.
CO2	Apply demand and supply principles to determine market equilibrium and pricing strategies.
CO3	Analyze cost structures, profitability and break-even points in business operations.
CO4	Evaluate the impact of business cycles, inflation, and government economic policies on industries.
CO5	Develop pricing strategies based on competitive analysis and consumer demand

Course Code	Course:Universal Human Values (173307)
CO1	Explore a holistic vision of life, including the self and surroundings.
CO2	Recognize the co-existence of self, realize harmony, and comprehend the true happiness.
CO3	Apply strategies that foster harmony in family and society through effective communication and relationship-building to cultivate social well-being.
CO4	Execute self-regulations to mutually fulfilling human behavior and enriching interaction with nature to realize harmony.
CO5	Emphasize the implications of a holistic approach in terms of ethical human conduct, and transit towards value based life**.**

Course Code	Course: Environmental Studies (173407)
CO1	Describe the importance of environmental studies and the sustainable use of natural resources.
CO2	Explain the structure and function of ecosystems and the significance of biodiversity.
CO3	Identify various types of environmental pollution and their control measures
CO4	Discuss key environmental issues, policies and their impact on society.
CO5	Observe and report environmental conditions and features through field activities**.**

Course Code	Course: Community Engagement /Field Projects (105308)
CO1	Explore relevance between theory and practice through community-based problem learning.
CO2	Identify real-life socio-technical problems and develop the solution.
CO3	Implement a wisdom of empathy and social responsibility to meet complex global challenges.
CO4	Develop innovative ideas in collaboration with society through community-based research methods.
CO5	Analyze the need of research projects and develop a plan for betterment of public service values through active citizenship**.**

S. Y. B.TECH Civil
Course Outcomes (2024 Pattern)
Semester – II

Course Code	Course:Geotechnical Engineering(105401)
CO1	Classify the soil, on the basis of index properties and formation process.
CO2	Describe the permeability and seepage characteristics of soil.
CO3	Demonstrate the effects of compaction on soil behavior and stress distribution.
CO4	Determine the shear strength of soil under various drainage conditions.
CO5	Explain the process of subsurface investigation and the various types of foundations.

Course Code	Course: Surveying and Geomatics (105402)
CO1	Demonstrate concept of compass surveying, plane table surveying and leveling on field measurements
CO2	Demonstrate concept of theodolite surveying on field measurements.
CO3	Apply concept of tacheometry and contouring.
CO4	Apply concept construction survey and curves.
CO5	Describe geodetic survey, hydrograph survey and aerial photogrammetry and apply modern techniques on field measurements

Course Code	Course: Structural Analysis (105403)
CO1	Explain the basic concept and able to analyze redundant structure.
CO2	Analyze beams and portal frames using Slope and deflection method.
CO3	Analyze beams and portal frames using moment distribution method.
CO4	Analyze the structure using stiffness matrix method.
CO5	Apply the concepts of plastic analysis in the analysis of steel structures.

Course Code	Course: Artificial Intelligence (170404A)
CO1	Explain the basic principles and scope of Artificial Intelligence and its relevance to different engineering disciplines.
CO2	Apply search algorithms for solving simple engineering problems
CO3	Understand and differentiate between types of machine learning and data representations.
CO4	Identify and analyze AI applications in domains such as predictive maintenance, smart cities, automation, and control systems.
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CO4	Analyze discrete and continuous random variables using Binomial, Poisson and Normal distributions.
CO5	Analyze data through hypothesis tests like Chi-square and *t*-tests.

Course Code	Course: Cyber Security and Laws (171405A)
CO1	Understand the basics of cyber security.
CO2	Study ethical hacking techniques and hacker methodologies.
CO3	Identify and classify various types of cyber crimes and related cyber laws.
CO4	Apply methods for cyber forensics.
CO5	Use of AI in cyber security.

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CO4	Execute self-regulations to mutually fulfilling human behavior and enriching interaction with nature to realize harmony.
CO5	Emphasize the implications of a holistic approach in terms of ethical human conduct, and transit towards value based life.

Course Code	Course:Foreign Languages (174408)
CO1	Learn the basic phonetics, alphabets and sounds of the selected foreign language.
CO2	Interpret and use everyday vocabulary to manage simple social interaction.
CO3	Form simple sentences using basic grammatical structures and sentence patterns.
CO4	Participate in simple conversations and everyday communication situations relevant to academic, social and professional contexts.
CO5	Demonstrate cultural awareness and appropriate language behavior to facilitate global and cross-cultural interactions.

Course Code	Course:Software and Techniques in Civil Engg (AutoCAD) (105409)
CO1	Demonstrate the operation of the software.
CO2	Create engineering drawings using AutoCAD software.
CO3	Analyze the results of the model using AutoCAD software.

T.Y B. Tech CIVIL
Course Outcome (2024 Pattern)
Semester - I

Course Code	Course: Design of Steel Structures (105501)
CO 1	Design tension members and connections as per IS 800:2007.
CO 2	Design compression members including built-up sections.
CO 3	Design Eccentric Loaded Columns and Column Bases.
CO 4	Design flexural members, plate girders
CO 5	Design of Industrial truss and Gantry Girder.

Course Code	Course: Concrete Technology (105502)
CO 1	Explain the physical and chemical properties of cement, aggregates, mineral admixtures, and chemical admixtures.
CO 2	Evaluate fresh and hardened concrete properties using standard testing methods (IS/ASTM).
CO 3	Design concrete mixes using IS:10262, ACI, and other codes, including special concretes.
CO 4	Assess durability, microstructure, and performance of concrete under environmental and mechanical loading
CO 5	Apply advanced concrete technology concepts in real-world applications, sustainable development, and modern construction.

Course Code	Course: Environmental Engineering (105503)
CO 1	Understand environmental pollution and waste handling concepts and their control methods.
CO 2	Explain water supply infrastructure, demand estimation, and quality standards
CO 3	Describe water treatment principles and the design of basic treatment units.
CO 4	Apply coagulation, flocculation, and filtration techniques in water treatment plant design.
CO 5	Analyze advanced treatment methods and water distribution systems for efficient water management.

Course Code	Course: Earthquake Engineering (105504A)
CO 1	Understand principles of structural dynamics and develop equations of motion.
CO 2	Analyze SDOF and MDOF systems subjected to dynamic loading.

CO 3	Evaluate structural responses under earthquake ground motions using response spectra.
CO 4	Design earthquake-resistant buildings using IS 1893 and IS 13920.
CO 5	Use software for dynamic analysis and develop sustainable earthquake-resistant designs. Integrate seismic resilience and SDGs in disaster risk reduction and structural planning.

Course Code	**Course: Hydrology and Irrigation Engineering (105504C)**
CO 1	Analyze precipitation and runoff, apply QGIS in hydrology and explain government roles in water resources
CO 2	Apply mass flow curve concepts to determine reservoir storage requirements and effect of sedimentation on reservoir capacity.
CO 3	Analyze irrigation practices and crop water demand for efficient irrigation management.
CO 4	Analyze the occurrence and movement of groundwater, aquifer characteristics, and groundwater recharge methods
CO 5	Evaluate dam types and the functions of spillways, energy dissipaters, and weirs in water management.

Course Code	**Course: Project Management (105504D)**
CO 1	Apply project planning and scheduling techniques in construction.
CO 2	Determine the materials as per their usage and production rate of construction equipment with safety measures.
CO 3	Demonstrates resource allocation techniques for planning.
CO 4	Explain economical terms and laws associated with project management.
CO 5	Apply the methods of project selection for the best economical project.

Course Code	**Course: Remote Sensing and GIS (105504E)**
CO 1	Explain the fundamentals and principles of remote sensing.
CO 2	Interpret and analyze satellite images for engineering applications
CO 3	Describe the working and applications of GNSS in civil engineering.
CO 4	Develop thematic maps and models using GIS data.
CO 5	Apply RS and GIS techniques in solving civil engineering problems.

Course Code	Course: Multi-Disciplinary Minor Urban Planning and Infrastructure (105603B)
CO 1	Explain the role and types of urban infrastructure, key planning data and standards, and the planning process with stakeholder roles.
CO 2	Apply concepts of water supply, sanitation, storm water, and solid waste management to plan and propose basic urban infrastructure improvements.
CO 3	Apply transport and land-use planning concepts to improve urban mobility, accessibility, and sustainability
CO 4	Develop rural planning strategies using government schemes to improve village infrastructure, housing, and livelihoods.
CO 5	Implement rural infrastructure and connectivity solutions using GIS and other planning tools.

T.Y B. Tech CIVIL
Course Outcome (2024 Pattern)
Semester - II

Course Code	Course: Design of Reinforced Concrete Structures (105601)
CO 1	Assess design philosophies of R. C. structure and estimate the moment carrying capacity of singly, doubly and flanged section
CO 2	Design & detailing of one-way, two-way slab and staircase with different boundary conditions.
CO 3	Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.
CO 4	Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending.
CO 5	Design & detailing of pad footing subjected to axial load, uni-axial bending

Course Code	Course: Transportation Engineering (105602)
CO 1	Discuss the highway development and planning.
CO 2	Design of road geometry with drainage systems.
CO 3	Design of road pavement and analysis various pavement materials.
CO 4	Discuss the traffic engineering and control methods.
CO 5	Understand the fundamentals of bridge engineering and railway engineering

Course Code	**Course:** Professional Elective Course-II **Advanced Design of Steel Structures (105603A)**
CO 1	Analyze and design steel tension, compression, and flexural members using IS 800:2007.
CO 2	Apply design strategies to prevent buckling and failure, integrating stability and slenderness concepts.
CO 3	Design bolted and welded connections using practical detailing considerations.
CO 4	Design industrial structures such as trusses, portal frames, gantry girders, and plate girders for functional and sustainable performance.
CO 5	Utilize software tools for analysis and detailing, integrating sustainable and BIM-based practices.

Course Code	**Course: Professional Elective Course-II** **Architecture and Town Planning (105603B)**
CO 1	To understand principles of architectural planning, futuristic need of users and discuss the concepts of Urban renewal and sustainable architecture.
CO 2	To apply town planning concepts, planning levels, policies, and the functions of planning agencies in analyzing and preparing urban and regional development proposals.
CO 3	To demonstrate planning strategy with reference to different acts, guidelines, norms.
CO 4	To examine civic surveys and property valuations to support development planning and urban decision-making.
CO 5	To assess planning strategies for townships, new towns, satellite towns, and rural areas using GIS, GPS, remote sensing, and government schemes

Course Code	**Course: Course: Advanced Concrete Technology** **(105603C)**
CO 1	Analyze and evaluate the properties of fresh and hardened concrete with various admixtures and supplementary materials.
CO 2	Design concrete mixes for normal and special concrete applications using various methods and IS codes.
CO 3	Assess the durability aspects and deterioration mechanisms affecting concrete structures.
CO 4	Apply modern testing methods and NDT techniques for concrete quality assurance.
CO 5	Recommend sustainable and cost-effective concrete solutions for different structural applications.

Course Code	**Course:** Professional Elective Course-II **(Construction Management) (105603D)**
CO 1	Explain the construction industry's structure and its role in infrastructure development along with the functions of construction management and PMCs in addressing project.
CO 2	Apply various planning and scheduling tools such as WBS, Line of Balance, Work Study charts.
CO 3	Apply quantitative risk analysis techniques and the Value Engineering job plan to assess risks and propose value-improving alternatives in construction projects
CO 4	Interpret labour laws, financial statements, and basic project financing concepts relevant to construction project management
CO 5	Apply principles of materials management, HRM practices, and basic AI tools to improve productivity and decision-making in construction projects

Course Code	**Course: Domestic and Industrial Wastewater Treatment (105604A)**
CO 1	Understand wastewater collection, quantification, characteristics, and stream self-purification processes.
CO 2	Explain preliminary and primary treatment units and their design principles.
CO 3	Describe aerobic secondary treatment processes including activated sludge and wetland systems.
CO 4	Identify anaerobic and advanced treatment systems and their applications.
CO 5	Apply suitable treatment, disposal, and reuse methods for industrial wastewater based on CPCB norms.

Course Code	**Course: Airport and Bridge Engineering (105604B)**
CO 1	Outline the principles of airport planning, classification, and airport layout components.
CO 2	Examine runway orientation, airport capacity, and airside infrastructure requirements.
CO 3	Implement airport pavement design concepts and modern smart airport technologies.
CO 4	Differentiate bridge types, structural components, and loading conditions in bridge engineering.
CO 5	Assess bridge construction techniques, inspection methods, and modern infrastructure monitoring technologies.

Course Code	Course: Finite Element Method (105604B)
CO 1	Understand the foundational concepts and mathematical background of FEM
CO 2	Apply FEM to 1D structural elements such as bars and trusses, and interpret results with boundary and loading conditions.
CO 3	Analyze beam and frame structures using appropriate shape functions and FEM formulation.
CO 4	Analyze 2D elements for structural problems and implement isoperimetric and numerical integration techniques.
CO 5	Analyze axisymmetric and basic plate problems, understand FEM software applications, with real-life structural case studies.

Course Code	Course: Operation Research (105604C)
CO 1	Correlate applications of Operations Research in Civil Engineering field and solution for the problems related to dynamic models
CO 2	Solve the problems related to stochastic programming
CO 3	Optimize transportation and assignment problems.
CO 4	Apply linear programming techniques
CO 5	Analyze nonlinear programming problems

Course Code	Course: Course: Engineering Geology with Rock Mechanics (105604D)
CO 1	Elaborate Mineralogy, Petrology, Historical Geology and stratigraphy
CO 2	Explain plate tectonics, morphological structural features.
CO 3	Explore subsurface Geology for Civil Engineering projects to suggest foundation treatments for various geological defects and tail channel erosion.
CO 4	Validate the suitability of rocks on the basis of mechanical properties, R.Q.D. and geophysical exploration.
CO 5	Illustrate the suitability of proposed alignments for tunnels and bridges on the basis of Geological investigations.

Course Code	Course: Course: Multi-Disciplinary Minor Governing Policies (170605)
CO 1	Understand infrastructure, governance, and policy implementation in urban and rural development.
CO 2	Analyze economic aspects of infrastructure, apply demand forecasting, cost–benefit analysis, financing mechanisms, and PPP models.
CO 3	Apply national infrastructure programs, policies, and regulations to plan and assess urban and rural development projects.
CO 4	Implement planning and management tools for urban and rural infrastructure projects.
CO 5	Apply concepts of sustainable and inclusive infrastructure by integrating climate resilience, risk reduction, resource efficiency, digital governance, and global case insights.

Course Code	Course: Course: Software Skills in RCC and Steel Structures (105606)
CO 1	Model steel and RCC structures using software
CO 2	Apply loads, load combinations, and standards as per IS 875.
CO 3	Analyse structural behaviour (forces, moments, deflections, reactions).
CO 4	Design steel structural members as per IS 800.
CO 5	Design RCC members as per IS 456.
CO 6	Prepare and interpret software based analysis & design reports.

Semester - I

Course Code	Course: Foundation Engineering (401001)
C401.1	Perform subsurface investigations for foundations using different methods.
C401.2	Estimate the bearing capacity of shallow foundations.
C401.3	Calculate immediate and primary consolidation settlement of shallow foundations.
C401.4	Decide the capacity of a pile and pile group.
C401.5	Understand the steps in geotechnical design of shallow foundations and well foundations.
C401.6	Analyse problems related to expansive soil and overcome them using design principles, construction techniques in black cotton soil.

Course Code	Course: Transportation Engineering (401002)
C402.1	Discuss the highway development and planning.
C402.2	Discuss the traffic engineering and control methods.
C402.3	Design of road geometry with drainage system.
C402.4	Analysis various pavement materials.
C402.5	Design of Road Pavement.
C402.6	Understand the fundamentals of Bridge Engineering and Railway Engineering

Course Code	Course: Elective III Integrated Water Resources Planning & Management (401003.c)
C403c.1	Understand concerned organizations, IWRP & M objectives, principles, challenges,application&analysisofIWRP&Mapproaches&principlesinacase study
C403c.2	Understand PIM, WDS, WALMI, agriculture in the concept of integrated water resources, apply and analyse water requirements for food production
C403c.3	Understand assessment of surface and groundwater quality, EIA, CPCB regulations, application & analysis of effluent quality standards as per CPCB
C403c.4	Understand water economics and funding, application & analysis of planning for a sustainable water future
C403c.5	UnderstandlegalregulatorysettingsofIWRP&M,application&analysisofinter- basin water transfers and IWRP & M
C403c.6	Understand flood control & power generation for IWRP & M, application QIGIS for analysis of a basin for IWRP & M

Course Code	Course: Elective III Operation Research (401003.f)

C403f.1	To get acquainted with the various optimization techniques and their use in civil engineering
C403f.2	Applystochasticprogrammingtoreducetheprocessingtime
C403f.3	To optimise transportation costs and proficiently allocate scarce resources to optimise and maximize the profit
C403f.4	Toformulateandanalyzelinearprogrammingproblems
C403f.5	Tooptimizedifferentnonlinearfunctions
C403f.6	Ability to utilise dynamic programming in decision-making for linear programming problems

Course Code	**Course: Elective IV Airport and Bridge Engineering (401004-d)**
C404d.1	Plan airport as per specifications of international organizations
C404d.2	Plot airport layout and design runway and taxiway
C404d.3	Design runways and taxiway pavements and drainage
C404d.4	Locate heliports w.r.t landing area, marking and lighting
C404d.5	Investigate the site for bridge construction and analyse the time with different loading conditions
C404d.6	Classify bridges and bearings

Course Code	**Course: Project Stage I (401005)**
C405.1	Identify the thrust area in civil engineering and finalise the problem statement.
C405.2	Review the literature to search for technical information from various resources on selected problem.
C405.3	Formulate the appropriate solution methodology.
C405.4	Apply the principles, tools, and techniques to solve the problem.
C405.5	Prepare a report and a presentation of the project.

Course Code	**Course: Transportation Engineering Lab (401006)**
C406.1	Evaluate properties of aggregates as a part of road pavement
C406.2	Evaluate properties of bitumen as a part of road pavement
C406.3	Discuss pavement construction and apply modern trends in highway materials.

Course Code	Course:ElectiveIII Integrated Water Resources Planning & Management Lab (401007-c)
C407c.1	Analyse the components and approaches of Integrated Water Resources Planning and Management (IWRP &M), national water policy, participatory irrigation management and water distribution societies.
C407c.2	Compare the effluent quality standards as per CPCB
C407c.3	Illustrate the economics in IWRP & M and decision making, Dublin Principles(1992), water laws (National, State & Local), global water partnership (GWP).
C407c.4	Summarise the application of soft computing tools for flood forecasting and QGIS for IWRM.

Course Code	Course: Elective III Operation Research Lab (401007-f)
C407f.1	To get acquainted with the various optimization techniques and their use in civil engineering
C407f.2	Applystochasticprogrammingtoreducetheprocessingtime
C407f.3	To optimise transportation costs and proficiently allocate scarce resources to optimise and maximize the profit
C407f.4	To formulate and analyze linear programming problems
C407f.5	Tooptimizedifferentnonlinearfunctions
C407f.6	Ability to utilise dynamic programming in decision-making for linear programming problems

Course Code	Course: Elective IV Airport and Bridge Engineering Lab (401008-d)
C408d.1	Design runways with the required length and make necessary corrections while creating sketches of essential runway markings.
C408d.2	Design both pipe culverts and sandbox culverts with a focus on structural and hydraulic considerations.
C408d.3	Demonstrate their ability to perform structural design for flexible or rigid pavements, considering design factors.
C408d.4	Present a report on a topic related to the latest trends in airport planning and design, bridge site selection, or other relevant aspects of airport and bridge engineering, showcasing their research and presentation skills.

Course Code	Course: Computer Programming in Civil Engineering Lab (401009)
C409.1	Understand the basics of python programming language
C409.2	Writepython codesto solveproblems incivil engineering

Course Code	Course:AuditCourseI(401010)
C410.1	Develop an understanding of workplace codes, professionalism in the workplace
C410.2	Learn the workplace ethics
C410.3	Develop an understanding of Business ethics, workplace privacy and ethics
C410.4	Learn team work at workplace

Course Code	Course:Honor'sCourse:-TrafficandTransportation Planning(401401)
C4H1.1.	Understand traffic characteristics and methodology.
C4H1.2	Study traffic flow analysis.
C4H1.3	Understand design standards of transport.
C4H1.4	Design rotary intersection, at-grade intersection, at grade intersection and grade separated intersection
C4H1.5	Understand the transport land use pattern
C4H1.6	Understandhowtoplansustainableurbantransportationwithtransportationsystem

BE Civil
Course Outcome (2019 Pattern)
Semester – II

Course Code	Course: Dams and Hydraulic Structures (401011)
C411.1	Understand types of dams and instrumentation working
C411.2	ExecutestabilityanalysisofGravityDam
C411.3	Understand types of spillways & Design of Ogee spillway
C411.4	Illustrate the failures and analyze stability of earthen dam
C411.5	Design Canals and understand the canal structures
C411.6	Analysis of the Diversion headwork and Cross Drainage work

Course Code	Course: Quantity Surveying, Contracts and Tenders(401012)
C412.1	Understand concept of estimates and prepare approximate estimate for various for Civil Engineering works.
C412.2	Describe tendering process, construction contracts, and aspects of Arbitration and prepare tender documents.
C412.3	Prepare detailed estimate of various items of work by different methods and calculate quantity of steel from Bar bending schedule.
C412.4	Apply engineering knowledge to prepare an estimate for roads, culverts, and water tank (Elevated storage tank
C412.5	Apply concepts of specification to draft brief specification, detailed specification and prepare detailed rate analysis report.
C412.6	Evaluated depreciation and valuation of property on the basis of present condition, specifications and market trend.

Course Code	Course: ElectiveV Hydropower Engineering (401013-e)
C413e.1	Understand the classification of power resources & trends in energy use patterns
C413e.2	Identify the components of hydropower plant.
C413e.3	Analyse the load assessment for turbines.
C413e.4	Prepare the layout of the powerhouse based on the various structures needed for it.
C413e.5	Design the turbines and surge tanks.
C413e.6	Understand the laws and regulatory aspects of hydroelectric power

Course Code	Course: Elective VI TQM and MIS (401014-a)
C414a.1	Recognise the quality and contribution of quality gurus for best practices.
C414a.2	Relate the functioning and application of TQM & Six Sigma in the domain of construction sector
C414a.3	UnderstandISO9001principlesinpreparationofqualitymanualtoconstruction business
C414a.4	Understandmanagementcontrol&certificationsystemsforconstructionindustry
C414a.5	Choose TQM process implementation and various quality awards for the construction sector
C414a.6	Propose MIS for allied fields in construction sector

Course Code	Course: Elective VI Green Structures and Smart Cities(401014-d)
C414d.1	Describe the importance of energy and minimization by altering the building materials.
C414d.2	Understand the importance of green construction and the green rating system
C414d.3	Introduction of the applications of energy conservation and efficiency practices in buildings.
C414d.4	Understand phases and approval involved in smart city project
C414d.5	Assess the national and global experience of smart cities.
C414d.6	Understand the importance of sustainable development and current protocol of sustainable development goals

Course Code	Course: Project Stage II (401015)
C415.1	Identify the thrust area in civil engineering and finalise the problem statement.
C415.2	Review the literature to search for technical information from various resources on selected problem.
C415.3	Formulate the appropriate solution methodology.
C415.4	Apply the principles, tools, and techniques to solve the problem.
C415.5	Prepare a report and a presentation of the project.

Course Code	Course: Dams and Hydraulics Structures Lab (401016)
C416.1	Understand different types of dams
C416.2	Executestabilityanalysisofgravitydamandearthendam
C416.3	Design of profile spillway and energy dissipation device below the spillway
C416.4	Analysis of weirs on permeable foundations

Course Code	Course: Dams and Hydraulics Structures Lab (401016)
C416.5	Designoflinedcanal
C416.6	Understand the different components, working of gravity dam, earthen dam.

Course Code	Course: Quantity Surveying, Contracts and Tenders Lab(401017)
C417.1	Understand the concept of estimates and prepare an approximate estimate for Civil Engineering works.
C417.2	Prepare a tender documents with conditions of contracts,
C417.3	Prepare a detailed estimate for load-bearing structures
C417.5	Apply concepts of the specification to draft brief specification, detailed specification and prepare detailed rate analysis report.
C417.6	Evaluated depreciation and valuation of property on the basis of present condition, specifications and market trend.
C417.1	Understand concept of estimates and prepare approximate estimate for various for Civil Engineering works.

Course Code	Course: Elective V Hydropower Engineering Lab (401018-e)
C418e.1	Assess the load and power output of an hydroelectric power plant
C418e.2	Design turbines and draft tube
C418e.3	Design water conveyance system components
C418e.4	Justify the economics and environmental impact of a hydroelectric power plant

Course Code	Course: Audit Course II (401019)
C419.1	Gather Knowledge about Human Rights and Human Rights Movement
C419.2	Develop an understanding of Human Rights and the Indian Constitution
C419.3	Discuss Human Rights of the Different Sections and Contemporary Issues
C419.4	Discuss International Scenario toward Human Rights with Reference to the Engineering Industry

Course Code	Course: Honor's Course:-Land Use and Land Cover (401403)
C4H2.1	Understand how to use the history of town planning for the design of a new area.
C4H2.2	Analyse the urban settlement and growth pattern of the area.
C4H2.3	Understand surveys required to be conducted for a planning.

Course Code	Course: Honor's Course:-Land Use and Land Cover (401403)
C4H2.4	Understand different land use classification.
C4H2.5	Identify the role of different planning agencies in urban land use development.
C4H2.6	Understand how to use different area planning tools for land use and land cover activity.