

# Mukesh Patel School of Technology Management and Engineering

# **B.Tech (Civil Engineering)**

- Program Educational Objectives (PEOs)
- Program Outcomes (POs)
- Course Outcomes (COs)

# **Program Educational Objectives (PEOs):**

- 1. Professional Skills
- 2. Career Growth
- 3. <u>Higher Studies</u>

# Program Outcomes (POs):

**PO-1:** Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

**PO-2:** Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

**PO-3:** 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)

**PO-4:** 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).

**PO-5:** 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)

**PO-6:** 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).

**PO-7:** Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

**PO-8:** Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

**PO-9:** 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.

**PO-10:** 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.

PO-11: 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 technologies and iii) critical thinking in the broadest context of technological change.
(WK8)

# Courses and Course Outcomes (COs):

### **Environmental Science**

- **CO-1:** Explain the concept of natural resources, ecosystem, and biodiversity,
- **CO-2:** Relate the various aspects of environmental pollutions with its cause and effect
- **CO-3:** Explain the greenhouse effect and climate change.
- **CO-4:** Discuss the role of individual in environmental conservation

#### Disaster Management

- **CO-1:** Identify Disasters
- **CO-2:** Suggest approaches to disaster management
- **CO-3:** Apply disaster mitigation and management techniques to respond to disaster.

#### Waste Management

- **CO-1:** Explain segregation and storage of waste
- **CO-2:** Recommend suitable treatment techniques for waste
- **CO-3:** Illustrate efficient waste management techniques

#### Principle of Economics and Management

- **CO-1:** Illustrate basic concepts of economics (demand, supply, elasticity, scarcity) and explain behaviour on individual, households and firm and Handle economic data and write economic report,
- **CO-2:** Analyse and evaluate the impact of Economic Policies and its implication on the Business Environment,
- **CO-3:** Determine the students towards basic management principles and act as foundation for higher levels of learning and to be able to handle basic functions of management (planning, organizing, coordination, and control)

# **Critical Thinking**

- **CO-1:** Solve problems or take decisions by processing information in a clear, logical, reasoned and reflective manner
- **CO-2:** Recognise, build and appraise arguments
- **CO-3:** Analyse contexts effectively
- **CO-4:** Recognise bias and its impact on decision making

#### Design Thinking

- **CO-1:** Develop a human centred approach to problem solving
- **CO-2:** Apply design thinking principles to come up with innovative solutions to the problems, as new products, services, experiences or new Business models.

#### **Professional Ethics**

- **CO-1:** Understand the engineering code of ethics and be able to apply them as necessary
- **CO-2:** Understand moral complexities in many engineering activities and decisionmaking processes
- **CO-3:** Understand some of the contemporary issues in the engineering professions
- **CO-4:** Effectively communicate their knowledge and understanding of engineering ethics

#### **Environmental Impact Assessment and Auditing**

- **CO-1:** Discuss Environmental Impact Assessment and process
- **CO-2:** Draft EIA documentation
- **CO-3:** Develop Environmental Auditing methodology

#### Industrial Waste Management

- **CO-1:** Discuss industrial waste treatment strategy based on waste type
- **CO-2:** Evaluate type and quantity of industrial waste

• **CO-3:** Design of various units of Effluent Treatment Plant

# Design Thinking and Innovation

- **CO-1:** Demonstrate a low fidelity to medium fidelity prototype of the alternative solutions to the identified problem.
- **CO-2:** Test and validate the prototype.
- **CO-3:** Design a Minimal Viable Product (MVP) and formulate an appropriate marketing strategy.

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#### Workshop on Building Planning and Design

- **CO-1:** Outline an architectural design idea
- **CO-2:** Plan and Design the buildings with the sketches
- **CO-3:** Create drawings using software

#### Green and Intelligent Buildings

- **CO-1:** Categorize buildings as per various governing agencies for green certification
- **CO-2:** Suggest improvements for energy efficiency of a building
- **CO-3:** Identify materials and systems for green buildings

#### **Construction Contracts and Administration**

• **CO-1:** Explain different types of tenders and contracts in construction

- **CO-2:** Describe various mechanisms of alternative dispute resolution including arbitration
- **CO-3:** Summarize various laws related to construction

# **Construction Economics and Finance Management**

- **CO-1:** Interpret financial statements
- **CO-2:** Assess the investment alternatives
- **CO-3:** Summarize funds allocation and its management for construction projects

# Building Design and Drawing

- **CO-1:** Understand the principles of planning, architectural planning and building byelaws while designing and preparing building drawings
- **CO-2:** Design buildings including its various components for the given requirements of the building as per Development Control laws of local governing bodies
- **CO-3:** Plan and develop drawings for residential buildings
- **CO-4:** Draw various buildings components

# **Construction Project Management and Finance**

- **CO-1:** Understand the fundamental construction project concepts, including project stakeholders and their roles, as well as the project life cycle.
- **CO-2:** Understand Industrial and Labor Act
- **CO-3:** Apply knowledge of basic concepts of construction project such as risk management process, risk identification, etc.
- **CO-4:** Classify sources of funds and their disbursement required for the project
- **CO-5:** Plan and prepare the schedule for construction project activities using tools such as Bar Chart, CPM, PERT

#### **Building Utilities and Services**

- **CO-1:** Identify different building services & utilities required for smooth functioning of the building
- **CO-2:** Illustrate various technical processes involved for installation of building services
- **CO-3**: Discuss the rules and regulations of building services

#### **Computer Application in Civil Engineering**

- **CO-1:** Prepare a model for a part of infrastructure project in civil engineering
- **CO-2:** Analyse and design the civil engineering infrastructure project
- **CO-3:** Prepare the report to represent the output of the processed data

#### **Open Elective - Smart Cities**

- **CO-1:** Decode the Smart City concept & different models of Smart cities in the world
- **CO-2:** Application of technological innovations for smart city enablement
- **CO-3:** Identify and measure requirements of a smart city.

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# Enginerring Mechanics

- **CO-1:** Identify and solve force systems using fundamental principles of mechanics to understand their effects on engineering structures and components.
- **CO-2:** Apply equilibrium conditions to determine support reactions, internal forces, and assess the stability of various structures.
- **CO-3**: Identify centroids and moments of inertia of engineering components, utilizing the parallel and perpendicular axis theorems for structural analysis.
- **CO-4:** Analyze particle motion using velocity, acceleration, and different coordinate systems.

• **CO-5:** Apply Newton's laws, D'Alembert's principle under translational motion, rotational motion to solve particle motion problems.

### Foundation Engineering

- **CO-1:** Classify active and passive conditions of lateral earth pressure
- **CO-2:** Apply knowledge of Rankine's and Coulomb's theories for cohesive and noncohesive soils
- **CO-3:** Analyse the effect of different shape of footing on Bearing capacity
- **CO-4:** Classify different ground improvement techniques for cohesive and noncohesive soils
- **CO-5:** Design Shallow Foundations based on geotechnical parameters
- **CO-6:** Design a single pile under axial load

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#### **Engineering Workshop**

- **CO-1:** llustrate the properties of building materials and methods of construction
- **CO-2:** Describe various building services
- **CO-3:** Demonstrate the use of minor surveying instruments
- **CO-4:** Create products of complex geometries using 3D printer

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#### Prestressed Concrete

- **CO-1:** Understand the concept of pre-stressing its casting techniques and applications, behaviour of the pre-stressed structures vis-à-vis that of the RCC structure
- **CO-2:** Apply the concept to take the decision with respect to the choice of prestressed section over RCC
- **CO-3:** Analyse the various pre-stressed components of the structure and design the same using relevant IS Code

#### **Construction Technology**

- CO-1: Describe various construction activities and their sequence
- CO-2: Explain the process of concreting from manufacturing to finishing
- CO-3: Discuss various types of flooring and their applications

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#### Transportation Engineering

- **CO-1:** Classify the type of roads based on the loading conditions
- **CO-2:** Plan and design the highways
- **CO-3:** Illustrate various signaling processes system for highways, railway track components, and traffic characteristics
- **CO-4:** Illustrate the runway patterns and basic aircraft characteristics
- **CO-5:** Test and interpret the highway material properties for quality control

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#### **Open Elective- Fundamentals of Climate Change**

- **CO-1:** Explain the climate systems and global circulations
- **CO-2:** Investigate climate projections from the past
- **CO-3:** Discuss global climate change policy and its implementation, mitigation and adaptation

#### Hydraulics and Fluid Machinery

- **CO-1:** Analyze the flow network and three reservoir problems
- **CO-2:** Use dimensional analysis to derive relationships between physical quantities, and identify dimensionless quantities
- **CO-3:** Compute the flow through open channels
- **CO-4:** Experiment with the impact of jet on stationary and moving plates
- **CO-5:** Demonstrate the working of hydraulic machines like pumps and turbines

# Department Elective-Design of Hydraulic Structures

- **CO-1:** Estimate various forces on hydraulic structures
- **CO-2:** Design different dam structures, spillways and energy dissipaters
- **CO-3:** Analyse small bridges, surplus weirs, causeways and culverts

# Surveying

- **CO-1:** Identify various surveying instruments with their suitability
- **CO-2:** Make use of levelling instruments and methods for obtaining levels
- **CO-3:** Construct the curves using surveying instruments
- **CO-4:** Survey the land with surveying instruments by measuring distances and angles
- **CO-5:** Survey for measuring distances and angles using Theodolite

#### Theory of Structures

- **CO-1:** Apply knowledge of general theorems related to elastic structures
- **CO-2:** Examine the deflections of statically determinate structures
- **CO-3:** Construct influence lines diagrams for determinate beams
- **CO-4:** Analyze indeterminate structures by flexibility and stiffness method
- **CO-5:** Analyze column for various end conditions
- **CO-6:** Analyze beams using plastic theory

#### **Elements of Biology**

- **CO-1:** Identify the principles of biomimicry and explain their applications in engineering and sustainable design, demonstrating an understanding of biologically inspired solutions.
- **CO-2:** Classify the fundamental building blocks of life (carbohydrates, proteins, lipids, and nucleic acids) and describe their structural and functional roles in cellular processes and metabolism.
- **CO-3:** Explain the molecular basis of genetic information transfer, including DNA replication, transcription, and translation, and interpret Mendel's laws and their significance in genetics.
- **CO-4:** Describe the mechanisms of enzyme action, enzyme-substrate interactions, and enzyme inhibition, and discuss their industrial and biological applications.
- **CO-5:** Explain the principles of metabolism and energy transactions, and categorize microorganisms based on their characteristics, growth kinetics, and applications in biotechnology and drug discovery.

#### **Basic Electrical & Electronics Engineering**

- **CO-1:** Explain the fundamental concepts of DC circuits, including Kirchhoff's laws and network theorems
- **CO-2:** Interpret the principles of AC circuit analysis, including resonance and three-phase systems
- **CO-3:** Illustrate the working principles of transformers and different types of electrical machines
- **CO-4:** Explain the basic operation of analog electronic components, including rectifiers, transistors and operational amplifiers.
- **CO-5:** Make use of logic gates and Boolean expressions for digital circuits.