**COURSE OUTCOMES**

**Department of Civil Engineering**

**M. Tech. Structural Engineering**

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| **S No** | **Class & Semester** | **Course & Course Code** | **COs** | **Course Outcomes** |
| 01 | M. Tech. & I-Sem | Advanced Structural Analysis & MSE6101T | CO 1 | Explain the fundamental concepts of structural analysis. (Understanding) |
| CO2 | Apply energy methods for solving structural problems. (Applying) |
| CO3 | Analyze various types of structures using matrix methods. (Analyzing) |
| CO4 | Evaluate indeterminate structures under different loading conditions. (Analyzing) |
| CO5 | Implement numerical techniques in structural analysis. (Applying) |
| 02 | Advanced Solid Mechanics & MSE6102T | CO 1 | Describe stress and strain behavior in solid materials. (Understanding) |
| CO2 | Apply principles of elasticity and plasticity to mechanical components. (Applying) |
| CO3 | Analyze failure theories and their application in design. (Analyzing) |
| CO4 | Evaluate stress-strain relations in complex loading conditions. (Analyzing) |
| CO5 | Use mathematical models to predict material behavior. (Applying) |
| 03 | Theory of Structural Stability (MSE6105T) | CO 1 | Define stability criteria for different structures. (Understanding) |
| CO2 | Apply stability principles to analyze column buckling. (Applying) |
| CO3 | Examine the stability of beams, frames, and plates. (Analyzing) |
| CO4 | Evaluate nonlinear stability behavior of structures. (Analyzing) |
| CO5 | Use numerical approaches for stability assessment. (Applying) |
| 04 | Structural Health Monitoring & MSE6107T | CO 1 | Explain the importance of structural health monitoring (Understanding) |
| CO2 | Apply various NDT techniques for damage detection. (Applying) |
| CO3 | Analyze the performance of smart sensors in monitoring. (Analyzing) |
| CO4 | Evaluate different methods of damage assessment. (Analyzing) |
| CO5 | Implement SHM techniques for real-time applications. (Applying) |
| 05 | Research Methodology and IPR (MLC6101T) | CO 1 | Explain the fundamentals of research methodology. (Understanding) |
| CO2 | Apply research design techniques in problem-solving. (Applying) |
| CO3 | Analyze various intellectual property rights (IPR) policies. (Analyzing) |
| CO4 | Evaluate the impact of patents and copyrights in research. (Analyzing) |
| CO5 | Use ethical guidelines in research and publication. (Applying) |
| 06 | Disaster Management (AUD6101T) | CO 1 | Describe types and causes of disasters. (Understanding) |
| CO2 | Apply disaster risk reduction strategies. (Applying) |
| CO3 | Analyze the impact of disasters on infrastructure and society. (Analyzing) |
| CO4 | Evaluate disaster preparedness and response plans. (Analyzing) |
| CO5 | Implement mitigation strategies for disaster management. (Applying) |
| 07 | M. Tech. & II-Sem | FEM in Structural Engineering (MSE6201T) | CO 1 | Understand the fundamental concepts and principles of Finite Element Method (FEM) and its application in structural engineering. |
| CO2 | Develop mathematical formulations and element stiffness matrices for structural problems using FEM techniques. |
| CO3 | Analyze plane stress and plane strain problems with different types of elements. |
| CO4 | Implement FEM techniques for real-world structural engineering problems using computational tools. |
| CO5 | Evaluate and interpret FEM results for effective decision-making in structural design. |
| 08 | Structural Dynamics (MSE6202T) | CO 1 | Explain the fundamental principles of structural dynamics and vibration analysis. |
| CO2 | Derive equations of motion for single and multi-degree-of-freedom systems. |
| CO3 | Analyze structural response under dynamic loads using modal and numerical methods. |
| CO4 | Apply damping, resonance, and earthquake response concepts in structural analysis. |
| CO5 | Use computational methods for solving real-world structural dynamics problems. |
| 09 | Advanced Steel Design (MSE6203T) | CO 1 | Understand the design philosophy and codal provisions for steel structures. |
| CO2 | Analyze and design beam-columns and torsional buckling effects in steel structures. |
| CO3 | Implement design concepts for fatigue-resistant steel structures. |
| CO4 | Apply stability design principles to complex steel structures. |
| CO5 | Evaluate steel structures as per IS, AISC, and Eurocode standards. |
| 10 | Design of Advanced Concrete Structures (MSE6207T) | CO 1 | Understand advanced concepts in reinforced concrete design. |
| CO2 | Analyze and design deep beams, corbels, and shear walls using strut-and-tie models. |
| CO3 | Implement torsion design and compression field theory for concrete structures. |
| CO4 | Compare IS, ACI, and Eurocode approaches for concrete structural design. |
| CO5 | Use software tools for analyzing and designing advanced concrete structures. |
| 11 | English for Research Paper Writing (AUD6201T) | CO 1 | Understand the structure and components of a research paper. |
| CO2 | Develop technical writing skills and academic communication. |
| CO3 | Apply proper citation styles and ethical research writing practices. |
| CO4 | Enhance clarity, coherence, and logical flow in technical documents. |
| CO5 | Prepare and edit research papers for academic and professional publication. |
| 12 | M. Tech. & III-Sem | Finite Element Analysis (MSE-301) | CO 1 | Understand the fundamental concepts of the Finite Element Method (FEM) and its applications in civil engineering. |
| CO2 | Develop mathematical formulations for 1D and 2D finite elements. |
| CO3 | Apply FEM to analyze plane stress, plane strain, and axisymmetric problems. |
| CO4 | Utilize numerical techniques for solving structural and geotechnical engineering problems. |
| CO5 | Interpret FEM results and validate solutions using commercial FEM software. |
| 13 | Advanced Foundation Design (MSE-302) | CO 1 | Understand the principles and design methodologies of shallow and deep foundations. |
| CO2 | Analyze the bearing capacity and settlement characteristics of different soil types. |
| CO3 | Apply geotechnical engineering concepts for designing foundations under complex loading conditions. |
| CO4 | Evaluate the stability of retaining walls, pile foundations, and well foundations. |
| CO5 | Implement IS, AASHTO, and Eurocode guidelines in foundation design. |