

## **MASTER OF TECHNOLOGY - STRUCTURAL ENGINEERING**

### **Program Outcomes (POs):-**

1. **Scholarship of Knowledge:** Through rigorous coursework, research endeavors, and specialized study, students delve into the intricacies of their subject area, gaining a nuanced understanding that extends beyond foundational principles. Acquire in-depth knowledge of specific discipline or professional area, including wider and global perspective, with an ability to discriminate, evaluate, analyze and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge.
2. **Critical Thinking and Analytical Skill:** Students emerge with the ability to systematically evaluate information, discern patterns, and synthesize complex concepts. This skill set empowers them to approach challenges with a discerning eye, fostering innovative problem-solving. Through rigorous coursework and practical applications, students hone their analytical prowess, enabling them to dissect problems, make informed decisions, and contribute meaningfully to their respective fields. This program outcome not only equips graduates for success in diverse professional environments but also underscores their capacity to navigate complexity, adapt to change, and contribute thoughtfully to the advancement of knowledge and practice in their chosen domains.
3. **Problem Analysis and Solving:** Students acquire the ability to methodically assess complex challenges, identifying root causes and potential solutions. Through practical applications and case studies, they refine their problem-solving techniques, fostering adaptability and resilience. This outcome not only equips graduates with the capacity to navigate diverse issues within their respective fields but also underscores their commitment to implementing effective, innovative solutions. As adept problem solvers, they contribute valuable insights and drive positive change, positioning themselves as resourceful and impactful professionals in a variety of industries and contexts.
4. **Research and Innovation:** the emphasis on innovation encourages the development of creative problem-solving and the translation of research findings into practical applications. This dual focus prepares graduates to be dynamic contributors in academia, industry, or other sectors, where they can actively participate in advancing their respective fields through the generation of new ideas, technologies, and methodologies. Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyse and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains.
5. **Collaborative and Multidisciplinary work:** Possess knowledge and understanding of group dynamics, recognise opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a capacity for self-management and teamwork, decision-making based on open-mindedness, objectivity and rational analysis in order to achieve common goals and further the learning of themselves as well as others. The student must be skilled to abridge the industry academia gap while studying. To develop proper corporate working environment in education.
6. **Ethical Practices and Social Responsibility:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. Acquire professional and

intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

7. **Teamwork:** To transform a group into an effective, cohesive and collaborative unit. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. Enable learners to understand the stages of team development- Forming stage, Storming stage, Norming stage, Performing stage, and Adjourning stage. To set team norms set a standard for behavior, attitude, and performance that all the learning group team members are expected to follow.
8. **Project Management and Finance:** Demonstrate knowledge and understanding of engineering and management principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economical and financial factors.
9. **Lifelong Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. To incubate the culture of lifelong learning that is, self-initiated education focused on personal development. As natural learners to inculcate natural drive to explore natural curiosity, learn and grow and encourage us improve quality of life and sense of self-worth by paying attention to the contemporary ideas and goals. Encourage learners to self-learn giving rise to Renewed self-motivation, Recognition of personal interests and goals, Improvement in other personal and professional skills, Improved self-confidence, Stronger soft skills, Better cognitive health, Confidence, Networking opportunities.
10. **Entrepreneurship & Startuppreneurship:** Practice process of planning, starting and operating a business venture. Making learners to get educated from the knowledge & skills perspectives, awareness and culture for entrepreneurship. This includes - training & education, business mentoring & coaching, financing (debt or equity), networking initiatives, framework conditions and policies. Inculcate startuppreneurship to create and launch innovative products or services, Building a sustainable business model for long-term success.

## Semester-I

Course Code/ Name	Course Outcomes
-------------------	-----------------

<p>MTSE-101 Advance Mathematics and Numerical Analysis</p>	<ul style="list-style-type: none"> <li>• Student will be able to understand finite differences and its application to solve partial differential equations.</li> <li>• Student will be able to understand Integral transforms like Mellin, Hankel and Fourier transform and its applications by using boundary values.</li> <li>• Learners will be able to convert linear differential equation and boundary value problems to integral equations using green function and solution of integral equation, fredholm equation and volterra equation using method of successive approximation.</li> <li>• Student will be able to understand calculation of variables by using Eulers equation for function of one and two independent variables and its applications.</li> <li>• Students develop the ability to demonstrate how to use Ritz, Galerkins, Descretizations, Finite element methods for one dimensional problems.</li> </ul>
<p>MTSE-102 Theory of Elasticity and Introduction to Plasticity</p>	<ul style="list-style-type: none"> <li>• Students will be able to analyse two dimensional problems of stress &amp; strain in rectangular co-ordinates.</li> <li>• Learner will study about two dimensional problem in polar co-ordinates.</li> <li>• Learner will study about three dimensional problems of stress and strain.</li> <li>• Students will study about Torsion on prismatic bars, rectangular bar, rolled section, hollow shaft and thin tubes.</li> <li>• Learner will study about plasticity on different loading condition like loading, unloading and reverse loading.</li> </ul>
<p>MTSE-103 Advance Structural Analysis</p>	<ul style="list-style-type: none"> <li>• Students will study about matrix flexibility method and transformation of single member.</li> <li>• Learner will be able to understand the application of flexibility method.</li> <li>• Students will study about matrix stiffness method, effect of support displacement and temperature.</li> <li>• Learner will be able to understand the application of stiffness method.</li> <li>• Students will be able to understand analysis of space trusses and grids.</li> </ul>
<p>MTSE-104 Design of Concrete Structures</p>	<ul style="list-style-type: none"> <li>• The learner will be able to explain the concepts of Effects of Earthquake and Wind.</li> <li>• Learner will be able to analyse and design of water tanks and bridges as per codal provision.</li> <li>• Student will study about analysis and design of sections under flexure using limit state approach and introduction to statistically indeterminate pre-stressed concrete structures.</li> </ul>
	<ul style="list-style-type: none"> <li>• Learner will study about Janseen's and Airy's theory and design of different shapes of silo and bunker with sloping bottom.</li> <li>• Learner will be able to analyse and design floor grid and flat slab as per codal provision.</li> </ul>

<p>MTSE-105 Computer Aided Design</p>	<ul style="list-style-type: none"> <li>• Student will study about basics of C++ Programming, loops, decisions, structures, functions, objects, classes and array.</li> <li>• Students will study about object oriented programming in detail.</li> <li>• Demonstrate the geometry transformation of 2D models and its application in CAD systems.</li> <li>• Demonstrate the geometry transformation of 3D models and its application in CAD systems.</li> <li>• Learner will study about the introduction of computer graphics, 3D Modelling softwares and its analysis.</li> </ul>
<p>MTSE-106 Lab-I Concrete</p>	<ul style="list-style-type: none"> <li>• Students will be able to perform various test on cement.</li> <li>• Students will be able to determine compressive strength of concrete with different cement grades.</li> <li>• Students will be able to determine workability by compacting factor apparatus and Vee Bee consistometer.</li> <li>• Students will be able to perform non destructive testing of concrete by Rebound hammer test and Ultrasonic method.</li> <li>• Students will be able to perform test for the effect of admixtures on the concrete compressive strength and testing of micro concrete.</li> </ul>
<p>MTSE-107 Lab-II CAD</p>	<ul style="list-style-type: none"> <li>• Students will be able to write a program to print “HELLO WORD” on the screen.</li> <li>• Learner will be able to write a program of Arithmetic expression.</li> <li>• Learner will be able to write a program to interchange value of two variables without using third variable.</li> <li>• Students will study about general and modified command of Autocad.</li> <li>• Students will be able to do planning of residential and commercial building plan on autocad.</li> </ul>

## Semester-II

<p><b>Course Code/ Name</b></p>	<p><b>Course Outcomes</b></p>
<p>MTSE-201 Structural</p>	<ul style="list-style-type: none"> <li>• The Graduates will be able to summarize the solution technique for dynamics of SDOF(single degree of freedom) systems.</li> </ul>

Dynamics	<ul style="list-style-type: none"> <li>• Learner will be able to design and develop analytical skills to calculate natural frequencies, mode shape and will study about Laplace and Fourier transform.</li> <li>• The Graduates will get the knowledge of Damped and Un-damped vibration in detail.</li> <li>• The Graduates will be able to summarize the solution technique for dynamics of MDOF(multi degree of freedom) systems.</li> <li>• Student will study about various structural component like bar, shaft, beam, string are considered as continuous system which have finite number of degree of freedom.</li> </ul>
MTSE-202 FEM in Structural Engineering	<ul style="list-style-type: none"> <li>• The graduates will study about introduction to finite element method.</li> <li>• The Graduates will be able to understand solution methodologies for solving complex stress analysis problems.</li> <li>• The Graduates will be able to understand the general steps of finite element methods and be able to derive equation in finite element methods for 1D, 2D and 3D problems.</li> <li>• The Graduates will be able to apply Lagrange and Hermite interpolation functions, Isoparametric Elements, Numerical Integration.</li> <li>• The Graduates will study about formulation of equilibrium equation, analysis of truss, frames, plane stress and plane strain problems of plates and shells.</li> </ul>
MTSE-203 Advance Concrete Technology	<ul style="list-style-type: none"> <li>• Students will study about cement and its properties, compaction and curing of concrete and properties of fresh concrete.</li> <li>• Learner will study about properties of hardened concrete, strength characteristics, shrinkage, creep, durability and fattier of concrete.</li> <li>• Learner will study about special concrete and its properties.</li> <li>• Learner will study about the effect of temperature on concrete, Air entrained concrete and High performance concrete.</li> <li>• Students will study about mix design in detail and non destructive testing of concrete.</li> </ul>
MTSE-204 Experimental Stress Analysis	<ul style="list-style-type: none"> <li>• Students will be able to explain the measurement of strain under static and dynamic loads.</li> <li>• Learner will be able to describe the Mechanical, optical, pneumatic and electrical strain gauges for strain measurement.</li> <li>• Student will study about crack growth, fracture mechanism, displacement fields in the vicinity of crack tips and principle in crack theory.</li> <li>• Learner will study about stress intensity factor and its basic numerical methods and about some material characteristics used for the evaluation of crack propogation resistance.</li> <li>• Learner will be able to solve some plane and three dimensional problems, constructional crack arrest and shell with crack trajectory..</li> </ul>
MTSE-205	<ul style="list-style-type: none"> <li>• The Graduates will be able to understand the behavior of plates of different</li> </ul>

Theory of Plates and Shells	<p>shape and thickness under various loading and boundary conditions .</p> <ul style="list-style-type: none"> <li>• The Graduates will be able to develop numerical solution using basic principles of mathematics for analysis of rectangular plates.</li> <li>• The Graduate will be able to analyze plate element used as a structural component using special &amp; approximate methods.</li> <li>• The Graduates will be able to understand the behavior of shells of different shape and thickness under various loading and boundary conditions.</li> <li>• Learner will study about the classification of shells.</li> </ul>
MTSE-206 Lab-III (Instrumentation)	<ul style="list-style-type: none"> <li>• Students will measure stress and strain using strain gauge mounted on a cantilever beam.</li> <li>• Students will study linear variable differential transformer and use it in a simple experimental setup to measure the meter in a tank.</li> <li>• Students will study various temperature measuring instrument and to estimate their response time.</li> <li>• Students will measure load using a load cell on tube and the speed of a motor shaft with the help non-contact type pick up.</li> <li>• Students will study about Polariscope stress calculation using fringes.</li> </ul>
MTSE-207 Lab-IV (Structural Software)	<ul style="list-style-type: none"> <li>• Students will study about the STAAD Pro and SAP software analysis.</li> <li>• Student can easily analyse &amp; design civil engineering structures such as buildings, bridges, dams, sewage systems, canals, plane and space trusses.</li> <li>• STAAD Pro can generate loads such as wind, or earthquake as per buildings codes of selected countries.</li> <li>• SAP software enables contractors or construction firms to manage the full lifecycle while handling some of the complex challenges.</li> <li>• SAP Software can certainly take your construction enterprise to a new level.</li> </ul>

## Semester-III

Course Code/ Name	Course Outcomes
MTSE 301 (1) Advance FEM and programming	<ul style="list-style-type: none"> <li>• The learner will be able to recognize Structural modeling by FEM for structures such as shear walls, core walls, bridges and cooling towers.</li> <li>• The ability to comprehend the Iso-parametric formulation for plate and shell elements; various types of elements; Hybrid elements.</li> <li>• Learners will be able to examine FEM in dynamics problems.</li> <li>• The ability to characterize buckling problems.</li> <li>• The ability to demonstrate Computational aspects; interpretation of results; comparison with other methods.</li> </ul>
MTSE 301 (2)	<ul style="list-style-type: none"> <li>• Recognize the fundamentals of soil exploration.</li> </ul>

Advance Foundation Engineering	<ul style="list-style-type: none"> <li>• Give an overview of shallow foundation.</li> <li>• Examine the deep foundation structures in light of modern demands.</li> <li>• Explain the facets of the fundamentals of coffer dam and underground structure.</li> <li>• The ability to characterize machine foundation.</li> </ul>
MTSE 301 (3) Design of Advance Steel Structures	<ul style="list-style-type: none"> <li>• Student will be able to describe the concepts and principles of beam – column and moment resistant connections.</li> <li>• Student will be able to analyze torsional effect.</li> <li>• Student will be able to analyze the design of gantry girder and portal frame.</li> <li>• Student will be able to calculate the design of bridges.</li> <li>• Student will be able to understand the design of high-rise structures.</li> </ul>
MTSE 301 (4) Design of Earth Quake Resistant Structures	<ul style="list-style-type: none"> <li>• Student will be able to describe the concepts and principles of seismic effect.</li> <li>• Student will be able to analyze the torsion and rigidity.</li> <li>• Student will be able to analyze the design of earthquake.</li> <li>• Student will be able to calculate the design of special structures.</li> <li>• Student will be able to understand the behavior of engineering seismology.</li> </ul>
MTSE-302 (1) Stability Theory in Structural Engineering	<ul style="list-style-type: none"> <li>• The Graduates will be able to understand the concepts of stability and column buckling.</li> <li>• The Graduates will study about torsional buckling in beam and column.</li> <li>• The Graduates will get the knowledge about buckling behavior of plates.</li> <li>• The Graduates will get the knowledge about buckling behavior of shells.</li> <li>• The Graduates will study about application of energy method and matrix method in stability problems.</li> </ul>
MTSE-302 (2) Design of Tall Structures	<ul style="list-style-type: none"> <li>• The Graduates will study about introduction of Tall Structures.</li> <li>• The Graduates will be able to understand the analysis of wind and earthquake forces on tall structures.</li> <li>• The Graduates will study about shear walls, frame structure, coupled shear walls, tabular structures, ductility and reinforcement details at joints .</li> <li>• The Graduates will be able to understand the design criteria of chimneys, tower and other tall structures.</li> <li>• The Graduates will study about modelling of tall structures and case studies.</li> </ul>
MTSE-302 (3) Design of Offshore Structure	<ul style="list-style-type: none"> <li>• Students will study about loads and structural forms of different types of offshore structure and elements of single DOF system subjected to free and forced vibration .</li> <li>• Learner will study about analysis of forces on offshore structure.</li> <li>• Learner will study about mode superposition, fourier series and spectral method for response of single DOF systems.</li> <li>• Learner will study about the behavior of concrete gravity platform as a rigid body on soil as a continuum and short and long term statistics of wind..</li> </ul>

	<ul style="list-style-type: none"> <li>• Students will apply the concepts of wave theories and wind loads.</li> </ul>
MTSE-302 (4) Reliability Based Civil Engg. Design	<ul style="list-style-type: none"> <li>• Students will be able to understand the concept of probability and apply it.</li> <li>• Learner will study about different properties of concrete.</li> <li>• Student will be able to compute reliability indices for simple structural engineering problems.</li> <li>• Student will be able to understand design of beams, trusses &amp; frames based on reliability.</li> <li>• Student will study about reliability based structural systems.</li> </ul>
MTSE-303P Seminar	<ul style="list-style-type: none"> <li>• Show that you understand the chosen seminar topic at a high technical level.</li> <li>• Identify the problem, formulate a solution, and implement it.</li> <li>• Design engineering uses a systems approach to solve complicated problems.</li> <li>• Engage in dialogue with engineers and the general public.</li> <li>• Exhibit the expertise, abilities, and dispositions of a qualified.</li> </ul>
MTSE-304P Dissertation Part- I (Literature Review/Problem Formulation/ Synopsis)	<ul style="list-style-type: none"> <li>• To compile every topic from the structural engineering thesis.</li> <li>• Acknowledging the subjects where work is advancing more quickly.</li> <li>• Assemble all the information you have gathered about the subject you have chosen.</li> <li>• After reading the workable approach, begin writing on the synopsis.</li> <li>• Once the synopsis has been created, ensure that the guide confirm it and start creating a PowerPoint for the Viva.</li> </ul>

## Semester-IV

<b>Course Code/ Name</b>	<b>Course Outcomes</b>
MTSE-401P Dissertation Part- II	<ul style="list-style-type: none"> <li>• Compile all the data you have learned regarding the approach you have selected for Dissertation-I.</li> <li>• Determine the issue with the approach selected for the given topic.</li> <li>• Create a solution and put it into action.</li> <li>• After the thesis has been developed, make sure the guide endorses it, and then begin working on the Viva PowerPoint.</li> </ul>