

- **Department Name :-Mechanical Engineering Department**
- **PG Program Name :- M. Tech. Mech. Design Engineering**

- **Vision :-**

To transform the department into center of excellence by synergizing teaching, learning and research to produce globally competent, innovative and entrepreneurial Mechanical Engineers.

- **Mission :-**

1. To develop state of the art facilities to stimulate faculty, staff and students to create, analyze, apply and disseminate knowledge.
2. To build the competency to transform students into globally competent mechanical engineers by imparting quality education.
3. To collaborate with research organizations, reputed educational institutions, industries and alumni for excellence in teaching, research and consultancy practices

Sr. No.	Program Outcomes
1.	An ability to apply knowledge of mathematics and engineering
2.	An ability to design analyses and interpret data by using experimental & design tools
3.	An ability to design and develop a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, maintainability, and sustainability
4.	An ability to function in multi-disciplinary teams.
5.	An ability to identify, formulate and solve mechanical engineering problems
6.	Responsiveness towards professionalism and ethics .
7.	An ability to communicate effectively
8.	Domain knowledge is necessary to understand the impact of engineering solution in a global and societal context
9.	Recognition of the need for, and an ability to engage in lifelong learning.
10.	Knowledge of contemporary issues affecting technical fields.
11.	an ability to use the techniques, skills, and modern engineering tools such as computer-aided design, analysis & simulation tools necessary for engineering practices
12.	An ability to lead and motivate a team for the accomplishment of the task
13.	An ability to demonstrate the knowledge of engineering and management principles and apply these to manage the projects and its financial aspects

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	I	MDS1013	Advanced Stress Analysis	<ol style="list-style-type: none"> 1. Analyze stresses and strains at a point. 2. Model and analyze mechanical structures using energy methods. 3. Apply shear center of beams, torsion and axisymmetric problems 4. Analyze and determine pressurized cylinders and rotating disks problems under loading. 5. Solve the problems in contact stresses.
2	I	MDS1023	Finite Element Methods	<ol style="list-style-type: none"> 1. Apply the concept of finite element method for solving machine design problems. 2. Formulate and solve manually problems in 1-D structural systems involving bars, trusses, beams and frames. 3. Develop 2-D FE formulations involving triangular, quadrilateral elements and higher order elements. 4. Apply the FEM for stress analysis, model analysis, heat transfer analysis and flow analysis.
3	I	SHP 513	Advanced Mathematical Methods in Engineering	<ol style="list-style-type: none"> 1. Evaluate Fourier Series and Fourier Transforms for given function and apply it to solve the partial differential equations in Engineering problems. 2. Apply the specific method of solution of partial differential equations for solving the given problems. 3. Formulate and solve a boundary value problem (Partial differential equation, boundary. 4. Use the relevant method for solving the simultaneous linear equations and compute the Eigen values. 5. Estimate numerically the solution of given algebraic equation. 6. Analyze the variance and explain the different research designs.
4	I	MDS1033	Mechanics of Composite Materials	<ol style="list-style-type: none"> 1. Student will be able to understand the basic concepts and difference between composite materials with conventional materials. 2. Students will be able to understand role of constituent

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				materials in defining the average properties and response of composite materials on macroscopic level. 3. Students will be able to apply knowledge for finding failure envelopes and stress-strain plots of laminates. 4. Students will be able to develop a clear understanding to utilize subject knowledge using computer programs to solve problems at structural level.
5	I	MDS1043	Design for Manufacturing & Assembly	1. Recognize the importance of selection of proper manufacturing process and its influence on new product development process and understand the interrelationship between product design and production methods for improving product performance during stage of design itself. 2. Identify the factors contributing reduction in assembly time and understand to incorporate assembly & disassembly guidelines in product design. 3. Utilize reliability concepts, failure analysis tools and techniques and accelerated life test methods for improving product life cycle. 4. Understand the factors controlling cost and time required for the product maintenance and utilize this information for design for maintenance
6	I		Engineering Mechanics	1. Determine direction and magnitude of principal stresses by using various techniques of Experimental Stress Analysis. 2. Solve two and three dimensional problems of stress-strain analysis in mechanical engineering. 3. Formulate solutions to general image processing problems.
7	I	MDS1063	Reliability Engineering	1. Apply concepts of Reliability, Availability and Maintainability. 2. Develop hazard-rate models to know the behavior of components. 3. Apply reliability

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				measures to the components. 4. Build system reliability models for different configurations. 5. Assess reliability of components and systems using field and test data
8	I	MDS1063	Advanced Engineering Materials	1. Analyze the importance of various engineering materials (metals, polymers, ceramics, composites, Semi-conductor). 2. Recite polymers, ceramics and composites, their manufacturing techniques, properties and applications. 3. Propose appropriate ceramics, glass, plastics and polymers for different applications. 4. Understand and apply Electrical, Thermal, Optical and Magnetic Properties of metals, ceramics, polymers and composites for various applications. 5. Adapt economic considerations in usage and recycling of materials in human use. 6. Apply nano materials and nanocomposites for various applications.
9	I	MDS1083	Tribology and Condition Monitoring	1. Infer the laws of friction, mechanisms of friction, friction space, stiction, stick slip, and surface temperature. 2. Design hydrostatic step bearing. 3. Evaluate different types of lubrication modes. 4. Apply appropriate condition monitoring technique for diagnosis of mechanical systems
10	I	MDS1093	Robotics	1. Comprehend basic terminologies and concepts associated with Robotics and Automation. 2. Demonstrate comprehension of various Robotic sub-systems. 3. Compute kinematics and dynamics to explain exact working pattern of robots 4. Design and select robots for Industrial and Non - Industrial applications.
11	I	MDS1103	Smart Materials	1. Understand the behavior and applicability of various smart

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				materials. 2. Demonstrate knowledge of the physical principles underlying the behavior of smart materials. 3. Describe the basic principles and mechanisms of the stimuli-response for the most important smart materials. 4. Design simple models for smart structures & materials
12	I	MDS1113	Design Engineering Lab-I	1. Solve 1D, 2D and 3D structural analysis problems using the ANSYS software. 2. Appraise steady state and transient thermal concept in design of members. 3. Solve Coupled Field Analysis problems. 4. Correlate software and experimental results obtained in mini projects.
13	I	MDS1123	Advanced Stress Analysis Lab	1. Determine and analyze the stresses and strains in machine component. 2. Analyze the stresses and strains on combined bending and torsion. 3. Experiment on demonstration of photoelastic techniques. 4. Calibration of the photoelastic constant, determination of the stress field in a beam under bending. 5. Determine stress and strain fields using DIC.
14	I	SHP551	Technical Communication	1. Acquire skills required for good oral and written communication. 2. Demonstrate improved writing and reading skills. 3. Ensure the good quality of oral and written communication.
1	II	MDS2013	Vibration Engineering	1. Derive and interpret equation of motions of multi-degrees of freedom system. 2. Solve problems of multi-degrees of freedom system by numerical methods. 3. Derive and interpret equation of motions of continuous systems. 4. Analyze the systems with Non-linear vibrations. 5. Derive and interpret response of the system subjected to Transient vibrations.

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2	II	MDS2023	Synthesis and Analysis of Mechanisms	1. Deduce the four bar coupler point curves. 2. Locate centre of curvature of link in mechanism by various methods. 3. Synthesize various mechanisms by using geometric method, algebraic methods and complex number method. 4. Analyze complex mechanism by using graphical methods.
3	II	MDS2033	Engineering Acoustics	1. Determine acoustic parameters in terms of decibel levels for pressure, power, intensity and impedance. 2. Calculate sound levels by applying 1-D wave equation for air-borne and structure borne sound. 3. Estimate absorption coefficient for different acoustic materials. 4. Measure sound levels for mechanical systems and reduce it up to audible range by using suitable method.
4	II	MDS2043	Fracture Mechanics	1. Explain the mechanism of fracture in ductile and brittle materials 2. Explain the micro mechanisms of brittle and ductile fracture 3. Analyze the fatigue and fracture behavior of materials. 4. Apply the knowledge for failure analysis and case studies 5. Estimate crack tip opening displacement (CTOD) and J-integral.
5	II	MDS2053	Product Design and Development	1. Explore and analyze product development processes used in product design and development. 2. Identify and apply various product development techniques. 3. Analyze, evaluate and apply design consideration like concurrent engineering, aesthetic and ergonomical for industrial product design. 4. Apply different methods, tools and technique to create new product design for consumer product.
6	II	MDS2063	Rapid Manufacturing Techniques	1. Identify suitable time compression techniques for rapid product development. 2. Model complex engineering products

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				and develop process plans for rapid production. 3. Analyze and select a rapid manufacturing technology for a given component. 4. Identify the errors during generation of STL files and minimize them. 5. Optimize FDM process parameters to improve the quality of the parts.
7	II	MDS2073	Rotor Dynamics	1. Model the Rotor bearing systems and formulate the governing equations. 2. Describe the role of damping, stiffness and inertia effects. 3. Compute the critical speeds and stability limits. 4. Analyze the rotors using transfer matrix method. 5. Compute the transient response of rotors.
8	II	MDS2083	Design for Optimization	1. Identify and apply mathematical models in optimization method. 2. Recognize the suitable method of optimization in non linear programming with and without constraints. 3. Apply optimization method for static applications like shafts and springs. 4. Design dynamic applications like linkage mechanism by using optimization method 5. Use genetic algorithm, ANN and Fuzzy logic to optimize various design parameters
9	II	MDS2093	Computer Aided Design	1. Have a conceptual understanding of the principles of CAD systems, the implementation of these principles, and its connections to CAM and CAE systems. 2. Understand 2D, 3D transformations and projection transformations. 3. Get knowledge of various approaches of geometric modeling. 4. Understand mathematical representation of 2D and 3D entities. 5. Understand basic fundamentals of FEM

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10	II	MDS2103	Multi-Body Dynamics	1. Derive equations of motion for interconnected bodies in multi-body systems with three dimensional motion. 2. Implement and analyze methods of formulating equations of motion for interconnected bodies. 3. Write programs to solve constrained differential equations for analyzing multi-body systems. 4. Simulate and analyze all types of static and dynamic behaviors of the multi-body systems. 5. Lead team projects in academic research or the industry that require modeling and simulation of multi-body systems. 6. Demonstrate an improved technical writing and presentation skills.
11	II	MDS2113	Research Methodology & IPR	1. Formulate a research problem. 2. Analyze research related information. 3. Prepare and present research proposal/paper by following research ethics. 4. Make effective use of computers and computing tools to search information, analyze information and prepare report. 5. Describe nature and processes involved in development of intellectual property rights
12	II	MDS2123	Design Engineering Lab-II	1. Appraise Linear buckling concept in Design of members which are succumbed to buckling. 2. Evaluate dynamic behavior of components 3. Apply geometric and material nonlinearity while designing the components 4. Formulate matlab coding for static, dynamic, nonlinear and field analysis problems.
13	II	MDS2133	Dynamics Laboratory	1. Estimate natural frequency, damping factor, modal density of given component experimentally. 2. Extract experimental mode shapes of plates. 3. Predict fault of machine by vibration and sound measurement.

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14	II	MDS2143	Mini Project	1. Identify structural engineering problems reviewing available literature. 2. Study different techniques used to analyze complex structural systems. 3. Work on the solutions given and present solution by using his/her technique applying engineering principles.
15	II	MDS2153	Industry Internship	1. Identify the real applications and practices of courses studied, at industry level 2. Recognize various modeling, analysis and validation techniques adopted at industries 3. Demonstrate the issues at design, manufacturing and assembly levels 4. Summarize and present technical data in report format.
1	III	MDS3013	MOOC Course	1. Identify the real applications and practices of courses studied, at industry level 2. Recognize various modeling, analysis and validation techniques adopted at industries. 3. Demonstrate the issues at design, manufacturing and assembly levels. 4. Summarize and present technical data in report format.
2	III	MDS3023	Dissertation Stage-I	1. Explain the contributions of various researchers in the field of design engg after carrying out literature survey from reputed journals 2. Recognize the gap in the research and define a problem statement 3. Explain significance and applicability of problem statement 4. Summarize and present technical data in report format
3	III	MDS3033/M DS3043	Dissertation Stage-II	1. Outline the work plan for problem statement 2. Identify the proper modeling and analysis tool 3. Reproduce the preliminary results of problem statement 4. Summarize and present technical data in report format
1	IV	MDS4013	Dissertation Stage-III	1. Explain the issues related to method adopted in solving the problem 2. Select proper

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				technique in solving the problem 3. Compare the results with available literature
2	IV	MDS4023/M DS4033	Dissertation Stage-IV	1. Design new methodology to address the problem 2. Justify the results obtained from new methodology 3. Write technical report and defend work.