



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
Kakinada-533003, Andhra Pradesh, India
M.Tech in Machine Design

Vision

To nurture the excellence in modeling and designing of modern mechanical engineering systems by imparting timeless core values to the learners and to mould the Department into a centre of academic excellence catering to the industrial needs through advanced research.

Mission

To offer high quality graduate and post graduate programs in Mechanical Engineering in order to make the learners globally competitive technologists who are professionally capable and socially responsible. The department enables the learners inculcate and imbibe theoretical and practical knowledge for exploration and deep insight for advanced technological innovations and inventions.

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1 To impart the fundamentals of the basic sciences and engineering to develop modelling and analytical skills required for professional practice of Mechanical Engineering and other allied fields.

PEO 2 To provide the core knowledge in the fields of manufacturing, design and thermal engineering to model, design, analyze and innovate the effective and efficient Mechanical Engineering systems.

PEO 3 To equip the learners demonstrate successful careers in industry with sound technical skills in design, production, execution and optimization of Mechanical systems.

PEO 4 To produce ethical and socially responsible graduates with commitment to lifelong learning and exhibit competency in their work culture.

PROGRAM OUTCOMES: At the end of the program the student will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.



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PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society 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.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance : Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

P012: Life-long 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.

COURSE OUTCOMES

M.Tech - I Sem		T	P	C
R19ME3206B	ADVANCED MECHANICS OF SOLIDS	3	0	3



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- Able to identify the failure modes of different structural members and apply.
- Various energy methods for statically determinant and in determinant structures.
- Gets acquainted with solving problems of curved beams and beams with un-symmetrical loading
- Able to apply the Soap-film analogy concept for torsional problems with non-circular cross section
- Exposed to solve the contact stress problems like rail wheels contact with rail track, hip joint
- Explain the stresses under two bodies in contact

Course Code	PRODUCT DESIGN
R19MD103	

- Apply creative thinking skills for idea generation
- Translate conceptual ideas into clear sketches
- Present ideas using IT application software and physical model
- Able to identify causes of failure through fault free analysis and perform failure analysis
To carryout perform product testing under thermal, vibration, electrical and combined environments.

Course Code	GEOMETRIC MODELLING
R19MD103	

COURSEOUTCOMES

- The students will get a thorough view on modern techniques in geometric modeling, emphasizing practical methods and the mathematical theory.

Course Code	FRACTURE MECHANICS
R19MD103A	

- After completion of this course students will acquire the knowledge for applying fracture mechanics theory
- To calculate stress areas and the "energy release rate" around crack tips and crack growth due to fatigue. • To do clop the theory of fracture by different postulator- Griffith's theory and fracture toughness etc.
- Understand the concepts of elastic-plastic functional machines (EPFM) theorems

Course Code	NON-DESTRUCTIVE EVALUATION
R19MD 1041A	

- Define different non-destructive testing (NDT) methods and to be able to demonstrate various NDT techniques to evaluate materials during processing and finished products and structures.



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- Explain the principles of conventional NDT methods (visual inspection, magnetic methods, thermal methods, radiography, Eddy current testing, ultrasonic inspection).
- Analyze the different NDT methods to select the appropriate techniques for inspections

Course Code	THEORY OF PLASTICITY
R19MD 2031A	

- Describe the elastic and plastic behavior from stress-strain curves for materials:
- Recognize typical plastic yield criteria established in constitutive modelling
- Understand the physical interpretation of material constants in mathematical formulation of constitutive relationship
- solve analytically the simple boundary value problems with elasto-plastic properties
- Develop constitutive models based on experimental results on material behaviour

Course Code	SIGNAL ANALYSIS AND CONDITION MONITORING
R19MD 2032B	

- Ability to analyse various types of signal and its analysis like ITT. filtering. windowing etc.
- Enhance the students abilities to apply different types of signals in the form of stationary. non stationary and transient for mechanical components.
- Able to apply condition monitoring techniques to industrial machinery for health monitoring.
- Able to compare the response of mechanical system behaviour with ISO standards

Course Code	COMPUTATIONAL FLUID DYNAMICS
R19MD 2033C	

- An ability to identify. formulate. and solve engineering problems by approximating complex physical systems in fluid flow by simplified canonical models.
- Knowledge of fluid mechanics and its mathematical description.
- An ability to apply knowledge of math and science to engineering by describing continuous fluid-floes phenomena in a discrete numerical sense.
- An ability to use the techniques. skills. & engineering tools necessary for engineering practice by applying numerical methods to a "real-world" fluid-flow problem. integrating various numerical techniques in formulating a numerical solution method for that problem

Course Code	COMPOSITE MATERIALS
R19MD 2034D	

- CO1. Understand composite material and their reinforcements
CO2. Select constituent materials glass. carbon. aramid. ceramic fibers and resins
CO3. Understand engineering mechanics. analysis and design. macro and micro mechanics of composites
CO4. Develop and processing of metal- matrix. ceramic -matrix and carbon- carbon



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composites

CO5. Understand and analyze the properties and performance of composites

Course Code	DESIGN WITH ADVANCED MATERIALS
R19MD 2042B	

- Characterise materials structure and properties
- Acquaint the knowledge of understanding the microstructure and properties of advanced materials.
- Design and operation of processes to engineer the required properties in a given material
Model the processes to engineer the required properties in a given material.

Course Code	MECHATRONICS
R19MD 2043C	

- Identify and explain various elements of a mechatronics system
- Model and simulate simple physical systems
- Suggest appropriate sensors and actuators for an engineering application
- Write simple microcontroller programs
- Build simple homemade projects using electronic devices integrating with mechanical systems

Course Code	TRIBOLOGY
R19MD 2044D	

- Students will demonstrate basic understanding of friction, lubrication and wear processes
- Student, will become familiar with mathematical tools used to analyze tribological processes.
- To enhance students' awareness of tribological issues in the design of machine components, such as rolling element bearings, journal bearings, thrust bearings, seals and braking systems.
- Students will become familiar with common anti-friction and anti-wear components and the lubricants used therein.
- Students will be able to describe the detailed operation of selected anti-friction or anti-wear component.
- Students, will be exposed to design a tribological system for optimal performance
Students will be able to develop technical project report and technical presentations

Course Code	INDUSTRIAL ROBOTICS
R19MD 3011A	

1. Identify various robot configuration and components.
2. Select appropriate actuators and sensors for a robot based on specific application
3. Carry out kinematic and dynamic analysis for simple serial kinematic chains.
4. Write a program for pick and place operations and design a cell for a small manufacturing unit

Course Code	ADVANCED OPTIMIZATION TECHNIQUES
R19MD 3012B	



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- Students at the end of the course learn advanced optimization techniques to show real-life problems
- Students can able to formulate and solve various practical optimization problems in manufacturing and service organizations

Course Code	MECHANICS OF COMPOSITE MATERIALS
R19MD 3014D	

- Some understanding of types, manufacturing processes, and applications of composite materials
- Ability to analyze problems on macromechanical behavior of lamina
- Ability to analyze problems on micromechanical behavior of lamina
- Ability to analyze problems on macromechanical behavior of laminate
- Ability to analyze problems on bending and vibration of laminated plates and beams

Course Code	OPERATIONS RESEARCH
R19MD 3022B	

1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it.