

MECHANICAL ENGINEERING (MECH)

MECH 3110 Machine Design (3)

This course delves into the fundamentals of machine design, emphasizing the creative and analytical processes involved in developing mechanical systems. Students will explore key concepts such as material properties, stress analysis, static and fatigue theories, and design of mechanical components like gears, bearings, and shafts. The curriculum integrates theoretical knowledge with practical applications through design projects and case studies, enabling students to develop innovative solutions to real-world engineering problems. The course also highlights the benefits of machine design in improving the quality of life and harnessing mechanical energy for example wind energy, hydropower, wave and tidal energy, etc. By learning to design efficient and sustainable machines, students can contribute to advancements in healthcare, transportation, and energy systems, ultimately fostering a more sustainable and equitable future. Ideal for those pursuing careers in mechanical engineering, this course equips students with the essential skills to design reliable and efficient machines.

Prerequisite(s): ENGP 2430.

A minimum grade of D- is required in ENGP 2430.

MECH 3410 Manufacturing Processes (3)

This course introduces the principles, science, and applications of manufacturing processes used to shape, join, and finish engineering materials. Topics include metal casting, forming, machining, additive manufacturing, joining, and surface engineering. For graduate students, the course extends into process modeling, design for manufacturability, optimization techniques, and emerging manufacturing technologies.

Prerequisite(s): ENGP 2430.

A minimum grade of D- is required in ENGP 2430.

MECH 6010 Mechanical Finite Element Analysis (3)

This course introduces the fundamentals of finite element analysis for engineering applications and explores potential applications of FEA in the mechanical engineering space.

MECH 6110 Machine Design (3)

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MECH 6220 Advanced Fluid Mechanics (3)

Fluid statics, kinematics of the flow field, control volume analysis, equations of motion for viscous flow, dynamical similarity, flows dominated by inertia and viscous forces, irrotational flow theory, boundary layers, and surface tension. This course covers foundational and advanced topics in fluid mechanics of interest to graduate-level mechanical engineers and researchers, with emphasis on mastering the application of fundamental principles and techniques to solve real-world flow problems. One or more advanced topics (hydrodynamic stability, rotating flows, turbulent flows) may be included based on student interest.

MECH 6240 Compressible Flows (3)

Thermodynamics of gases, integral conservation equations, flows with friction and heat addition, normal and oblique shocks, expansion fans, flow through nozzles and diffusers, and basics of air-breathing engines. This course provides a graduate-level introduction to compressible flows and gas dynamics for mechanical and aerospace engineers.

MECH 6250 Analysis and Design of Thermal Energy Systems (3)

This course examines fluid systems designed for energy transfer. Students will perform analysis and design of piping networks, heat exchangers, pumping systems, and other components. Other topics will include codes and standards, documentation, material and component selection, and economic considerations.

MECH 6410 Manufacturing Processes (3)

This course introduces the principles, science, and applications of manufacturing processes used to shape, join, and finish engineering materials. Topics include metal casting, forming, machining, additive manufacturing, joining, and surface engineering. For graduate students, the course extends into process modeling, design for manufacturability, optimization techniques, and emerging manufacturing technologies.