

MECHANICAL ENGINEERING (MENG)

MENG-COMP Senior Comprehensive Exam
(NULL credits) (Both Fall & Spring Semesters)
NULL

MENG-3180 Manufacturing Process Lab I
(1 credit) (Spring Semester)

Manufacturing Processes Lab (1) (S) This hands-on laboratory course provides experience with manufacturing techniques including welding, surface preparation and coating, additive manufacturing (including casting), machine tools (mills, lathes), CAD/CAM/CNC, and metrology.
Prerequisite(s): ENGR-1500 and ENGR-3500.

MENG-3220 Design of Machinery
(3 credits) (Fall Semester)

Design of Machinery (3) (F) This course studies the design, analysis, and selection of machine components. Topics include review of static and introduction of variable load failure theories. Mechanisms include four-bar linkages, gear trains, shafts, bearings, threaded components, and bolted joints.

Prerequisite(s): ENGR-2000, ENGR-2310, and ENGR-2320.

MENG-3240 Junior Design
(2 credits) (Spring Semester)

Junior Design (2) (S) This course is an application of design and analysis tools learned in the mechanical engineering program to an open-ended consumer product design problem. Working in teams, students will take projects from conception through design, fabrication, and testing. This class course emphasizes creative design, analysis techniques, construction methods, and design report writing. Prerequisite or corequisite: MENG-3220.

MENG-3820 Ergonomics
(3 credits) (Discretion of Department)

Ergonomics (3) (D) This course introduces the ergonomic principles of designing for the human-machine interface. Emphasis will be placed on designing products and machines that are user-friendly to the human body, reduce injuries, and accommodate physical limitations.

Prerequisite(s): ENGR-1500.

MENG-4240 System Dynamics & Control
(3 credits) (Spring Semester)

System Dynamics and Control (3) (S) This course builds on concepts learned in ENGR-2310 and includes mathematical modeling of dynamic systems, focusing on non-time domain methods including Laplace transforms and computational solutions of responses of dynamic systems in state space. Transient response analysis and frequency response analysis of mechanical, electrical and fluid systems will be studied. Control of dynamic systems will also be investigated including classical control theory, root locus, stability, bode plots and analysis, and Nyquist theory. MATLAB used for analysis and design problems.

Prerequisite(s): ENGR-2000, ENGR-2310, and MATH-3100.

MENG-4600 Engineering Design I
(3 credits) (Fall Semester)

Mechanical Engineering Design I (3) (F) This is the first of a two-course sequence in engineering design in which teams of students will learn the design process and execute it through a major design project with multiple realistic constraints. Student teams will complete the design phase of the project by establishing the system requirements and limitations, allocations of resources, perform any necessary analysis and model development, explore alternatives, and conduct any necessary research. The course requires several written reports and oral presentations, culminating with a critical design report and presentation.

Prerequisite(s): MENG-3240.

Corequisite(s): ENGR-3170.

MENG-4610 Mechanical Engineering Design II
(3 credits) (Spring Semester)

Mechanical Engineering Design II (3) (S) This is the second course of a two-course sequence in engineering design in which teams of students will fabricate their design from MENG-4600. The course incorporates design methodologies, engineering standards, multiple realistic constraints, market analysis, design objectives, alternative designs, communication, and teamwork into a major engineering design experience. In addition to completing the project, the course will cover key elements of professional development and program management including scheduling, resource management, procurement, risk management, and negotiations. The course will culminate with a final project design report and presentation.

Prerequisite(s): MENG-4600.

MENG-4700 Senior Seminar
(1 credit) (Fall Semester)

Senior Seminar (1) (F) This seminar includes reports and presentations on current topics in engineering. Students will learn recent advances in engineered products, materials, and components. Information will also be provided regarding the Fundamentals of Engineering (FE) exam and licensure. (OC)

Prerequisite(s): MENG-3240.

General Education Categories: Oral Communication

MENG-4730 Mechanical Measurements & Control Lab
(2 credits) (Fall Semester)

Mechanical Measurements and Control Lab (2) (F) In this course, students will conduct experiments, analyze their data, and produce oral presentations and written reports on the operation and performance of instruments and basic mechanical engineering equipment. The focus will be on experimental methods for measuring temporal and frequency response of dynamic systems. Control of dynamic systems and measurement theory will also be introduced.

Prerequisite(s): MENG-4240.

MENG-4810 Vibration & Structural Dynamics
(3 credits) (Discretion of Department)

Vibration and Structural Dynamics (3) (D) Course topics include free and forced vibrations of single and multi-degree of freedom systems under a variety of time dependent loads. Techniques covered include modal analysis (eigenvalues, eigenvectors), numerical integration, time history analysis, and frequency response. Vibration of continuous systems will also be introduced.

Prerequisite(s): MENG-4240.

MENG-4820 Intro to Finite Element Analysis

(3 credits) (Discretion of Department)

Introduction to Finite Element Analysis (3) (D) Course topics include finite element analysis techniques and theory. Students will use ANSYS, an industry-standard FEA package, as well as write their own FEA algorithms. Matrix methods are used throughout.

Prerequisite(s): ENGR-2320.

MENG-4830 Environmental Stewardship

(3 credits) (Discretion of Department)

Environmental Stewardship (3) (D) This course offers students an opportunity to participate in guided research dealing with contemporary environmental issues in mechanical engineering, through the lens of the Catholic tradition, and in collaboration with scientists, theologians, philosophers, and other engineers. Research of this kind involves reading and discussing the Magisterial documents, seminal scientific data and publications, and government regulations and policies, as well as understanding the engineering practices and technologies of today.

Prerequisite or Open to all science & engineering fields.

Corequisite(s): MENG-3240 or instructor permission.

MENG-4840 Introduction to Robotics

(3 credits) (Discretion of Department)

Introduction to Robotics (3) (D) This course includes the following topics: kinematic modeling, analysis, path planning and control of robotic systems. It involves the use of manipulators, sensors, and computer vision for automation and includes hands-on activities with robotic systems. Pre-requisites: ENGR-2000 and MATH-1350.

MENG-4850 Heating, Air Conditioning & Ventilation

(3 credits) (Discretion of Department)

Heating Air Conditioning and Ventilation (3) (D) This course provides an introduction to the design of HVAC systems. Topics include the determination of heating and cooling loads, including psychrometrics, internal and external loads as well as how to design and size distributions systems and their components.

Prerequisite(s): ENGR-3250 and ENGR-3600.

MENG-4860 Intermediate Thermodynamics

(3 credits) (Discretion of Department)

Intermediate Thermodynamics (3) (D) This course includes an introduction to exergy analysis. Power cycles (vapor, gas) and refrigeration cycles are covered extensively, including the production of electricity and operational principles of engines. The course also focuses on environmental impact, including emissions and refrigerant properties.

Prerequisite(s): ENGR-3250.

MENG-4910 Intermediate Fluid Dynamics

(3 credits) (Discretion of Department)

Intermediate Fluid Dynamics (3) (D) The course introduces the theory and application of one-dimensional compressible flow, including: isentropic flow in converging and converging/diverging nozzles, normal shock waves, oblique shock waves, and checked flow. Computational Fluid Dynamics (CFD) software is utilized to analyze flows, and the course explores the styles, limitations, and applications of pumps.

Prerequisite(s): ENGR-1500, ENGR-3250, and ENGR-3300.

MENG-4920 Nonlinear Dynamics & Chaos

(3 credits) (Discretion of Department)

Nonlinear Dynamics and Chaos (3) (D) This course is an introduction to nonlinear differential equations and chaos with emphasis on applications from various fields of engineering and science. Topics include stability analysis and bifurcations, phase plane analysis, limit cycles, Poincare maps, chaos, iterated maps, fractals, and strange attractors.

Prerequisite(s): MATH-3100 and ENGR-2000.