ENGINEERING (ENGR)

Courses

ENGR 101 Introduction to Engineering 1 Credit
Exploration of engineering as a field. Includes general characteristics of the profession, training required for various engineering degrees, industries in which engineers practice, and tools for academic and professional success in engineering, including the basics of report generation and the licensure process. Ethics and societal issues related to engineering will also be introduced.
Terms Typically Offered: Fall.

ENGR 125 Computer-Aided Design and Fabrication 3 Credits
Introduction to engineering design with a contemporary computer-aided design (CAD) software application. Includes relevant engineering graphics concepts such as orthographic projection, sections, creation of 3D models, and engineering drawing practices.
Terms Typically Offered: Fall, Spring.

ENGR 140 First-Year Engineering Project 3 Credits
Introduction to the application of mathematic and scientific skills in interdisciplinary engineering projects. Includes elements of teamwork, project management, engineering design and prototyping, and project documentation.
Prerequisites: MATH 119; or MATH 119A and MATH 119B.
Terms Typically Offered: Spring.

ENGR 196 Topics: 1-3 Credits
Course may be taken multiple times up to maximum of 15 credit hours.

ENGR 224 Materials Science 2 Credits
Structure, properties, and processing of metallic, polymeric, ceramic, and composite materials. Perfect and imperfect solids; phase equilibria; transformation kinetics; mechanical behavior; material degradation. Includes both materials science and materials engineering components.
Prerequisites: CHEM 151/CHEM 151L or CHEM 131/CHEM 131L; and PHYS 131/PHYS 131L.
Corequisites: ENGR 224L.
Terms Typically Offered: Fall, Spring.

ENGR 224L Materials Science Laboratory 1 Credit
Hands-on application of topics learned in lecture. Includes mechanical testing, determination of material properties, thermal processing, and technical reporting. Lab component for ENGR 224.
Prerequisites: CHEM 151/CHEM 151L or CHEM 131/CHEM 131L; and PHYS 131/PHYS 131L.
Corequisites: ENGR 224.
Terms Typically Offered: Fall, Spring.
Fees: Yes.

ENGR 225 Introduction to Manufacturing 3 Credits
Principles, processes, and problems associated with the conversion of engineered materials into useful goods. Fundamentals of geometric specification, casting, machining, plastic deformation, bulk deformation, joining processes, and processes for plastics, ceramics, and composites.
Prerequisites: MAMT 106 and ENGR 224.
Terms Typically Offered: Fall.
Fees: Yes.

ENGR 261 Statics and Structures 3 Credits
Statics of particles, equivalent force systems, rigid bodies, equilibrium of rigid bodies in two and three dimensions, analysis of truss and frame structures, distributed force systems including centroid calculations, and friction.
Prerequisites: MATH 136 or MATH 152, and PHYS 131/PHYS 131L.
Terms Typically Offered: Fall, Spring.

ENGR 263 Mechanics of Solids 3 Credits
Exploration of solid mechanics, including: normal stress/strain, shear stress, torsional stress/strain, bending stress, analysis of combined stress states in 2-D and 3-D, and stress concentrations.
Prerequisites: ENGR 261.
Terms Typically Offered: Fall, Spring.

ENGR 305 Engineering Economics and Ethics 2 Credits
Applications of economics and ethics for mechanical engineers. Topics include: cost concepts and design economics, money-time relationships, and comparison of alternatives. Engineering ethics includes personal vs. professional ethics, ethical problem-solving techniques, rights and responsibilities of engineers, and whistle-blowing.
Prerequisites: ENGR 261 (may be taken concurrently).
Terms Typically Offered: Fall.

ENGR 312 Engineering Thermodynamics 3 Credits
Introduction to engineering thermodynamics, the science of heat energy conversion. Develops an understanding of the interrelations of energy, heat, and work. Covers the first and second laws of thermodynamics applied to closed and open systems, the ideal gas law relations, thermodynamic properties of materials, and ideal thermodynamic cycles.
Prerequisites: ENGR 261.
Terms Typically Offered: Fall.

ENGR 317 Fundamentals of Circuits and Electronics 2 Credits
Introduction to resistive circuits, capacitors, inductors, transient analysis, sine waves, AC circuit analysis, resonance, and transformers.
Prerequisites: MATH 136 or MATH 152, and PHYS 131/PHYS 131L.
Corequisites: ENGR 317L.
Terms Typically Offered: Spring.

ENGR 317L Fundamentals of Circuits and Electronics Laboratory 1 Credit
Introduction to resistive circuits, capacitors, inductors, transient analysis, sine waves, AC circuit analysis, resonance, and transformers.
Prerequisites: MATH 136 or MATH 152, and PHYS 131/PHYS 131L.
Corequisites: ENGR 317.
Terms Typically Offered: Spring.
Fees: Yes.

ENGR 321 Fluid Mechanics 3 Credits
Introduction to fluid mechanics. Develops an understanding of fluid statics and fluid dynamics, pressure and flow measurements, laminar and turbulent flow analyses, flow in pipes and ducts, the forces due to fluid motion, and fluid machinery.
Prerequisites: ENGR 261.
Terms Typically Offered: Fall.

ENGR 325 Component Design 3 Credits
Application of fundamental mechanics in analysis and design of machine components and systems. Emphasis on stress and strain analyses using failure theory for ductile and brittle components including fatigue failure theories.
Prerequisites: ENGR 224 and ENGR 263.
Terms Typically Offered: Spring.

ENGR 329 Bicycle Design and Frame-Building 3 Credits
Engineering and artistic execution of designing and building a bicycle frame. Fundamentals of bicycle dynamics, handling, and sizing. Material properties and selection. Discussion of relevant standards covering bicycle frame and fork testing. Fabrication skills necessary to construct a custom bicycle frame will be developed.
Prerequisites: ENGR 125 and ENGR 263.
Terms Typically Offered: Spring.

ENGR 333 Lean Principles 3 Credits
Overview of the structure and tools of the Lean production system. Students will learn how Lean can be applied to various industries and even outside of the factory, in settings such as health care, finance, IT, and engineering.
Prerequisites: ENGR 225.
Terms Typically Offered: Spring.

ENGR 336 Heat and Power 3 Credits
Investigation of major modes of heat transfer, including steady and transient conduction, internal and external convection, and radiation. Emphasis is placed on application to industrial processes. Analyses include processes like heat treatment of materials and heat exchangers using simulation.
Prerequisites: ENGR 312 and ENGR 321.
Terms Typically Offered: Spring.
Fees: Yes.

ENGR 343 Dynamics 3 Credits
Kinematics of particles and rigid bodies. Kinetics of particles and rigid bodies in plane motion, including Newton's second law, work and energy, and impulse and momentum.
Prerequisites: ENGR 261.
Terms Typically Offered: Fall, Spring.

ENGR 345 Engineering Integration I 3 Credits
First course in a design sequence integrating concepts from the mechanical engineering technology curriculum. Emphasis on laboratory experience and the design, analysis, and testing of mechanical systems. Teamwork on "design-and-build" projects will require manufacture of mechanical systems and/or electronic circuits.
Prerequisites: ENGR 224, ENGR 263, MAMT 102, and CSCI 130.
Terms Typically Offered: Fall.
Fees: Yes.

ENGR 353 Exploring Entrepreneur Opportunities 3 Credits
Introduction to innovation and opportunity recognition, including development of business ideas, business model validation and business feasibility analysis.
Equivalent Course(s): ENTR 343

ENGR 385 Engineering Integration II 3 Credits
Second course in a design sequence integrating concepts from the mechanical engineering technology curriculum. Emphasis on laboratory experience and the design, analysis, and testing of mechanical systems. Teamwork on "design-and-build" projects will require manufacture of mechanical systems and/or electronic circuits.
Prerequisites: ENGR 345.
Terms Typically Offered: Spring.
Fees: Yes.

ENGR 387 Structured Research 1-3 Credits
Supervised research experience offering students the opportunity to conduct primary or secondary research under faculty guidance.
Prerequisites: Sophomore standing or higher.
Terms Typically Offered: Fall, Spring.
Course may be taken multiple times up to maximum of 6 credit hours.

ENGR 395 Independent Study 1-3 Credits
Course may be taken multiple times up to maximum of 6 credit hours.

ENGR 396 Topics 1-3 Credits
Course may be taken multiple times up to maximum of 15 credit hours.

ENGR 399 Internship 1-12 Credits
Course may be taken multiple times up to maximum of 15 credit hours.

ENGR 401 Professionalism Seminar 1 Credit
Preparation for a career in the engineering profession. Includes professionalism, ethics, competitive job application materials, jobs and internships, and current engineering issues.
Prerequisites: ENGR 345 (may be taken concurrently).
Terms Typically Offered: Fall.

ENGR 424 Machine Elements 3 Credits
Principles of mechanics and commonly used failure theories applied to the design and analysis of machine elements subjected to static and dynamic (fatigue) load conditions. Includes the use and interpretation of simulation tools throughout the course.
Prerequisites: ENGR 325.
Terms Typically Offered: Fall.

ENGR 425 Advanced Manufacturing 3 Credits
Use of cutting edge materials and emerging capabilities that utilize the coordination of information, automation, computation, software, sensing, and networking. Includes discussion of product data management, flexible manufacturing, manufacturability, and product life-cycle management.
Prerequisites: ENGR 225, ENGR 305, and STAT 305.
Terms Typically Offered: Spring.
Fees: Yes.

ENGR 427 Engineering Measurements 2 Credits
Methods of experimentation and data analysis. Specific skills used in planning an experiment, applying sound procedures, data analysis, and written and oral communication of results.
Prerequisites: ENGL 325, ENGR 263, ENGR 317, and STAT 305.
Terms Typically Offered: Fall.
Fees: Yes.

ENGR 435 Industrial Controls 3 Credits
Fundamentals of electronic control of industrial systems via programmable logic controllers for discrete event control and analog applications. Applications include: relay logic, input/output field devices, programmable logic controllers, human machine interfaces, and variable frequency drives. Topics covered include: design and programming of complete control circuits, selecting appropriate components, and troubleshooting improperly functioning systems.
Prerequisites: ENGR 317/ENGR 317L.
Terms Typically Offered: Spring.

ENGR 445 MET Design Project I 3 Credits
First of a two-course comprehensive group capstone design experience, focusing on the design proposal. This sequence applies material from prior coursework and introduces project management concepts such as defining the project scope, specifying design requirements, analyzing engineering design, prototyping proofs-of-concept, creating technical drawings, and preparing project reports and documentation.
Prerequisites: ENGR 140, ENGR 225, ENGR 312, ENGR 317, ENGR 317L, ENGR 321, ENGR 325, ENGR 385, MAMT 102, and ENGL 325.
Terms Typically Offered: Fall.

ENGR 455 Fluid Power Systems 3 Credits
Fundamentals and electronic control of hydraulic and pneumatic systems and their respective components. Includes designing fluid power systems, specifying necessary components, and systemic troubleshooting of circuits commonly experienced in industrial applications.
Prerequisites: ENGR 321.
Terms Typically Offered: Fall.
Fees: Yes.

ENGR 485 MET Design Project II 3 Credits
Second of a two-course comprehensive group capstone design experience, focusing on design optimization, fabrication, testing, and evaluation. Students apply their project management skills to complete the project and orally present the final design, write a final project report, and develop proper documentation for the final product.
Prerequisites: ENGR 445.
Terms Typically Offered: Spring.

ENGR 487 Structured Research 1-3 Credits
Supervised research experience offering students the opportunity to conduct primary or secondary research under faculty guidance.
Prerequisites: Junior standing or higher.
Terms Typically Offered: Fall, Spring.
Course may be taken multiple times up to maximum of 6 credit hours.

ENGR 495 Independent Study 1-4 Credits
Course may be taken multiple times up to maximum of 6 credit hours.

ENGR 496 Topics 1-3 Credits
Course may be taken multiple times up to maximum of 15 credit hours.