

MECHANICAL ENGINEERING (MENG)

MENG 199. DIRECTED STUDY. 1-5 Credits.

Directed Study

MENG 201. MATLAB. 4 Credits.

Pre-requisites: MATH 141, MATH 142 or MATH 161 with a grade \geq C.

This course introduces the student to the application of basic MATLAB building blocks to engineering problems. Students will get a thorough introduction to data visualization, data analysis, symbolic calculations, numeric computations and other basic skills related to MATLAB.

MENG 207. ELECTRICITY. 3 Credits.

Pre-requisites: MATH 162, PHYS 133 or PHYS 153; and PHYS 163, which may be taken concurrently, all grades \geq C.

This course is intended to provide students with a basic understanding of electricity and its applications. In this course, basic concepts of current, voltage and resistance will be presented as well as basic circuit-analysis methods including inductor and capacitor.

MENG 217. 3D PARAMETRIC COMPUTER AIDED DESIGN. 4 Credits.

Pre-requisites: METC 110 or \geq C or High School AUTOCAD or permission of Instructor.

This course uses the computer to draft parametric models in three dimensions. File management methods, rapid prototyping and 2D drawing development techniques are discussed. (Four hours per week.)

MENG 240. STATICS. 4 Credits.

Pre-requisites: PHYS 151, PHYS 161, and MATH 161, all with grades \geq C. Fundamentals of applied mechanics, equivalent force systems, equations of equilibrium, structures, three dimensional force systems and friction.

MENG 241. STRENGTH OF MATERIALS. 4 Credits.

Pre-requisites: MENG 240, MATH 162, PHYS 152, and PHYS 162, all with grades \geq C.

A study of the internal stresses, internal deformations and deflections of materials. Topics may include: shear and moment diagrams for beams, combined loading on beams, temperature stresses and torsional loading. (four hours lecture per week)

MENG 242. DYNAMICS. 4 Credits.

Pre-requisites: MENG 240 with grade \geq C.

Kinematics and kinetics of particles and rigid bodies using vector analysis; force mass acceleration, work and energy, impulse and momentum, translating and rotating coordinate system.

MENG 300. LABORATORY ANALYSIS AND REPORTS. 5 Credits.

Pre-requisites: PHYS 133 or PHYS 153; PHYS 163, MATH 162, ENGL 201, all with \geq C; or permission of instructor.

This course examines the different aspects of laboratory analysis and report writing. This includes description of engineering problems, analysis of data including error analysis and data interpretation, instrumentation and measurements. In addition, the application of spreadsheets for solving and analyzing engineering problems, creating technical graphs, trending and curve fitting and project management will be addressed.

MENG 307. INDUSTRIAL CONTROLS AND INSTRUMENTATION. 5 Credits.

Pre-requisites: MENG 207 or EENG 209 with a grade \geq C.

This course includes principles of instrumentation, sensors, motors and actuators, electrical power systems, relays, and basic control theory. Emphasis will be on discrete control systems and methods.

MENG 353. INDUSTRIAL MATERIALS. 5 Credits.

Pre-requisites: CHEM 121 or CHEM 171/HONS 171 with CHEM 171L; and ENGL 201; and MATH 142 or MATH 161/HONS 161 or MATH 162 or MATH 163; all \geq C.

Students in this course achieve a thorough understanding of engineering materials, their properties, responses and applications. Laboratory work includes destructive and non destructive testing and image analysis of microscopic structure of industrial materials.

MENG 380. THERMODYNAMICS. 5 Credits.

Pre-requisites: PHYS 152 and PHYS 162; MATH 162; MENG 300, all with grades \geq C. Declared Mechanical Engineering Major.

This course explores properties of materials, work, heat, conversion of energy, conservation of mass and energy transformation processes. Emphasis is on application of the first and second laws to engineering systems.

MENG 382. FLUID MECHANICS. 5 Credits.

Notes: laboratory work is included.

Pre-requisites: MENG 242; grades \geq C in all of the following, PHYS 152; PHYS 162, MATH 162; MENG 300; and a declared Mechanical Engineering major.

This course introduces the student to theory, concepts and applications of fluid mechanics. Topics include static and dynamic forces; conservation of mass, energy and momentum; flow in pipes and ducts; and fan and pump performance.

MENG 385. ROBOTICS AND AUTOMATION. 5 Credits.

Notes: three hours lecture, four hours laboratory per week.

Pre-requisites: MENG 201 or CSCD 255; MENG 307; all grades \geq C and a declared in Mechanical Engineering or Mechanical Engineering Technology major or permission of instructor.

This course covers various electrical and mechanical systems used in robotics and other automated industrial systems. It includes automated equipment programming and industrial planning as applied to automated systems.

MENG 386. ENGINEERING NUMERICAL ANALYSIS. 5 Credits.

Pre-requisites: PHYS 153; PHYS 163; MATH 163; and either MENG 201 or CSCD 255; and a declared Mechanical Engineering major.

This course covers a multitude of numerical approximation methods used to solve specific structural engineering problems and highlights the algorithms used in many common scientific software packages.

MENG 398. SEMINAR. 1-5 Credits.

Seminar

MENG 399. DIRECTED STUDY. 1-5 Credits.

Pre-requisites: junior standing; declared Mechanical Engineering major and permission of the instructor, department chair and college dean. Independent Study.

MENG 405. DESIGN OF MACHINE ELEMENTS. 5 Credits.

Pre-requisites: MATH 162 and MENG 241 and MENG 353, with grades \geq C, and a declared Mechanical Engineering major.

This course covers the design of machine components and mechanisms and utilizes the concepts of engineering mechanics and strength of materials.

MENG 407. HEATING, VENTILATING AND AIR CONDITIONING. 5 Credits.

Pre-requisites: PHYS 132 or PHYS 152; PHYS 162, MENG 380 or METC 388 (may be taken concurrently), all with grades \geq C, and a declared Mechanical Engineering or Mechanical Engineering Technology major. The study of the principles of Heating, Ventilating and Air Conditioning (HVAC) including the investigation of the basic calculations to determine heating and cooling loads and the study of the basic equipment design for HVAC.

MENG 412. FUNDAMENTALS OF ENGINEERING. 2 Credits.

Pre-requisites: senior standing; MENG 241 or METC 341; MENG 242 or METC 342; MENG 380 or METC 388; and declared into one of the following: Mechanical Engineering, Mechanical Engineering Technology; or permission of instructor.

This course reviews the fundamentals of engineering. It provides an overview of principles of the practice of engineering and assists students in preparation for the first steps in professional licensure.

MENG 444. HEAT TRANSFER. 5 Credits.

Pre-requisites: MATH 241, MATH 347, MENG 300, MENG 382, MENG 386; all with grades \geq C, and a declared Mechanical Engineering major.

This course provides a detailed calculus-based analysis of the heat transfer through solids, fluids and vacuums. Concepts include conduction, convection, and radiation heat transfer in one and two dimensions for steady and unsteady states.

MENG 452. ENGINEERING ECONOMICS. 2 Credits.

Pre-requisites: MATH 142 or MATH 161, with grades \geq C, and a declared Mechanical Engineering or Mechanical Engineering Technology major; junior standing; or permission of instructor.

This course focuses on the systematic evaluation of the economic benefits and costs of projects involving engineering design and analysis. Engineering economics quantifies the benefits and costs associated with engineering projects to determine whether they make (or save) enough money to warrant their capital investment.

MENG 453. MATERIALS AND DESIGN. 5 Credits.

Notes: four hour lecture, two hours lab per week.

Pre-requisites: MENG 241 with a grade \geq C or METC 341 with a grade \geq B; MENG 353 with a grade \geq C; and a declared Mechanical Engineering or Mechanical Engineering Technology major.

This course expands upon the concepts covered in the Industrial Materials class. Focus is on how materials and the design of products and the processes to make them are interrelated. Students explore processing and properties of materials such as glass, ceramics, polymers and metals other than steel.

MENG 455. COMPOSITE MATERIALS. 5 Credits.

Pre-requisites: MENG 201 and MENG 353, both with grades \geq C; and a declared Mechanical Engineering or Mechanical Engineering major. This course covers basics of composite materials including manufacturing, design and applications. Students learn anisotropic and heterogeneous material systems; types of composite constituents; physical and mechanical properties; micro, macro and ply mechanics; composite design related to strength and different failure modes; and applications of composite beams, plates and stiffened panels.

MENG 482. ADVANCED FLUID DYNAMICS. 5 Credits.

Pre-requisites: grades \geq C in all of the following, MATH 347, MENG 217, MENG 382; and a declared Mechanical Engineering major.

Students apply fluid principles to various technical situations and utilize advanced methods to derive a solution. Topics covered may include Computational Fluid Dynamics (CFD), turbo machinery, compressible fluid flow, turbulence, thermo-fluid system design, and fan and pump performance.

MENG 485. ADVANCED ROBOTICS AND AUTOMATION. 5 Credits.

Pre-requisites: MENG 385 with a grade \geq C; and a declared Mechanical Engineering or Mechanical Engineering Technology major.

A study of the various electrical and mechanical systems used in advanced robotics and other automated systems. Topics include automated equipment, programming and industrial planning as applied to automated systems, robotic vision, cooperative robotics and service robots.

MENG 486. PROGRAMMABLE LOGIC CONTROLLERS IN AUTOMATION. 5 Credits.

Notes: five hours lecture per week.

Pre-requisites: MENG 207 or EENG 160; MENG 201 or CSCD 110 or CSCD 255, all with a grade \geq C.

A study of Programmable Logic Controllers used in industrial automation and advanced robotics. Course explores automated equipment, ladder logic programming and industrial planning as applied to automated systems.

MENG 487. MECHATRONICS. 5 Credits.

Pre-requisites: MENG 385 with a grade \geq C; and a declared major in Mechanical Engineering or Mechanical Engineering Technology or permission from instructor.

This course includes a study of process control in automation, including basic control concepts, open and closed loop systems, sensors, actuators, control methods. Practical applications with the use of common input sensors and output actuators are emphasized.

MENG 490A. SENIOR CAPSTONE: DESIGN LABORATORY I. 2 Credits.

Pre-requisites: MENG 217, MENG 241 or METC 341, MNTC 301, and ENGL 201, all with a grade \geq C; and senior standing, and a declared Mechanical Engineering or Mechanical Engineering Technology major.

Satisfies: a university graduation requirement—senior capstone.

This course simulates the industrial environment, where students work in teams to solve a real world problem from design to implementation. Team dynamics and project constraints are strictly monitored and each student's unique skills are utilized in different stages of the design process.

MENG 490B. SENIOR CAPSTONE: DESIGN LABORATORY II. 3 Credits.

Pre-requisites: MENG 490A with a grade \geq C.

Satisfies: a university graduation requirement—senior capstone.

See description for MENG 490A.

MENG 491. SENIOR THESIS. 1-6 Credits.

Pre-requisites: permission of instructor.

Independent and/or group study and implementation of a design and development project. (variable time)

MENG 492. FINITE ELEMENT ANALYSIS. 5 Credits.

Pre-requisites: MENG 201, MENG 217, MENG 241, all with grades \geq C; and a declared Mechanical Engineering major or permission of the instructor.

This course introduces the computational methods to solve engineering problems using the finite element approach. Modeling techniques for different engineering structures such as truss, beams, frames, two and three dimensional solids, and thin-walled structures are introduced in this course. Students solve a wide variety of engineering problems dealing with statics, dynamics, fluid mechanics, heat transfer and design and material selections using the state of art FEA software.

MENG 493. SENIOR SEMINAR. 1 Credit.

Notes: graded Pass/Fail.

Pre-requisites: senior standing or permission of instructor; and a declared Mechanical Engineering or Mechanical Engineering Technology major.

This course provides the students firsthand exposure to the latest technological advances directly from the manufacturer or researcher. This helps students in their lifelong learning and provides an opportunity to inquire about particular topics or fields of interest.

MENG 495. INTERNSHIP. 1-6 Credits.

Notes: Graded Pass/Fail. A minimum of 180 hours of work is required for students to complete the internship experience. Students working part-time over multiple quarters will have the credit hours divided across quarters to match the hours worked in each quarter.

Pre-requisites: junior or senior status and permission of the instructor, department chair and dean; and declared Mechanical Engineering major. This course gives students applied field experience working in industry. Students will apply engineering principles to solve problems under the supervision of a practicing engineer.

MENG 496. EXPERIMENTAL. 1-10 Credits.**MENG 499. DIRECTED STUDY. 1-10 Credits.**

Pre-requisites: permission of the instructor, department chair and college dean; senior standing; and a declared Mechanical Engineering major. Designed for students wanting to pursue a subject beyond the scope of regular courses.