

Mechanical Engineering (ME)

ME 2210. Manufacturing Processes for Engineers. (3 Credits)

Pre- or Corequisite(s): ENGR 2140, ENGR 2160

Introduces manufacturing processes, including machining, injection molding, casting, 3D printing, and forming. Introduces Computer Numeric Control (CNC) machining and Computer Aided Manufacturing (CAM).

Lab access fee of \$45 for computers applies. Course lab fee of \$21 for materials applies. Software fee of \$50 applies.

ME 3010. System Dynamics I. (3 Credits)

Prerequisite(s): ENGR 2030, MATH 2250, Matriculation into the Mechanical Engineering Program, and University Advanced Standing

Covers analysis of linear systems in the time and frequency domains. Focuses on modeling and analysis of physical systems. Introduces Laplace transforms. Includes a design component.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 3050. Mechatronic Systems. (3 Credits)

Prerequisite(s): MATH 1210, PHYS 2210, ENGR 2030, University Advanced Standing, and Matriculation into the Mechanical Engineering Program

Provides exposure to modeling and design of combined electro-mechanical systems. Covers an introduction to modeling of electrical circuits as well as how to integrate electrical systems with mechanical systems such as DC motors and sensors. Software fee of \$50 applies.

ME 3130. Kinematics. (3 Credits)

Prerequisite(s): ENGR 2030, University Advanced Standing, and (Formal Acceptance into the Mechanical Engineering Program or Departmental Approval)

Covers the analysis of dynamic mechanisms including: relative motion of links in mechanisms; velocities and accelerations of machine parts; rolling contact; cams; and synthesis of mechanisms. Introduces computer-aided engineering techniques for mechanism analysis. Includes a design component.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 3140. Machine Design. (3 Credits)

Prerequisite(s): ENGR 2140, ENGR 2160, University Advanced Standing, and (Formal Acceptance into the Mechanical Engineering Program or Departmental Approval)

Presents methods for static and dynamic stress and failure analysis for mechanical systems. Teaches how to create machine design models and free-body diagrams, calculate stress, estimate deflection, select an appropriate failure theory, and design to prevent failure. Gives experience using commercial FEA software to create models of simple structures and machine components. Includes a design component.

Lab access fee of \$45 for computers applies.

Canvas Course Mats \$85/McGraw applies. Software fee of \$50 applies.

ME 3160. Intermediate Materials. (3 Credits)

Prerequisite(s): ENGR 2140, ENGR 2160, University Advanced Standing, and (Formal Acceptance into the Mechanical Engineering Program or Departmental Approval)

Teaches in further depth the mechanical behavior of engineering materials including metals, woods, plastics, ceramics and composites. Looks at characteristics, failure mechanisms, and designing with various engineering materials.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 3170. Introduction to Plastics and Composites. (3 Credits)

Prerequisite(s): ENGR 2140, ENGR 2160, CHEM 1210, MATH 2250, University Advanced Standing, and (Formal Acceptance into the Mechanical Engineering Program or Departmental Approval)

Introduces the structure, processing, properties and uses of plastic and composite materials. Surveys manufacturing methods. Teaches the use of plastic and composite materials in various products.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 3300. Applied Thermodynamics. (3 Credits)

Prerequisite(s): ENGR 2300, University Advanced Standing, and (Formal Acceptance into the Mechanical Engineering Program or Departmental Approval)

Introduces thermodynamic analysis and design of vapor, gas, refrigeration and heat pump systems, along with exergy analysis. Covers thermodynamic relations, ideal gas mixture and psychrometric applications, reacting mixtures, and combustion. Includes a design component.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 3310. Fluid Mechanics. (3 Credits)

Prerequisite(s): ENGR 2030, ENGR 2450, University Advanced Standing, and Matriculation into the Mechanical Engineering Program

Covers the fundamentals of fluid mechanics including fluid properties, fluid statics, fluid kinematics, the Bernoulli equation, and the integral and differential analyses of fluid flow. Introduces dimensional analysis, similitude, and modeling. Covers viscous internal and external flows. Includes a design component.

Lab access fee of \$45 for computers applies.

ME 3320. Heat Transfer. (3 Credits)

Prerequisite(s): (ENGR 2300, ME 3310, or Departmental Approval) and University Advanced Standing

Focuses on the three modes of heat transfer: conduction, convection, and radiation. Introduces steady and unsteady heat conduction, convection heat transfer principles, forced and free internal and external convection flows. Covers radiation heat transfer, combined modes of heat transfer, and analysis and design of heat exchangers. Includes a design component.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 3335. Thermal/Fluid Experimentation WE. (2 Credits)

Prerequisite(s): (ENGR 2300 or Departmental Approval) and University Advanced Standing

Corequisite(s): ME 3320

Covers temperature, pressure, and flow measurement, along with calibration of thermal/fluid sensors in a lab setting. Focuses on experiments to investigate various phenomena in fluid flow, thermodynamics, and heat transfer. Investigates the performance of pumps, fans, and heat exchangers. Includes substantial amount of writing and satisfies WE requirements.

Course Lab access fee of \$45 applies. Software fee of \$50 applies.

ME 3410. Applied Finite Element Analysis. (3 Credits)

Prerequisite(s): EGDT 1071, ENGR 2140, University Advanced Standing and Matriculation into the Mechanical Engineering Program

Pre- or Corequisite(s): ME 3320

Covers the basic theory of finite element analysis (FEA) and its application using commercial software to solve typical problems of structural and heat transfer. Includes the application of finite element analysis with emphasis on modeling techniques and design. Software fee of \$50 applies.

ME 381R. Mechanical Engineering Internship. (1-3 Credits)

Prerequisite(s): University advanced standing. Matriculation into the Mechanical Engineering program and instructor approval.

Provides opportunities to apply classroom theory while students work as employees in a job that relates to their careers. Includes regular communication between students and the course coordinator. Credit is determined by the number of hours a student works during the semester and completion of individually set goals. May be repeated for a maximum of 3 credits toward graduation. May be graded as credit/no credit. Software fee of \$50 applies.

ME 4010. System Dynamics II. (3 Credits)

Prerequisite(s): ME 3010 and University Advanced Standing

Covers design and analysis of control systems. Introduces an introduction to digital control and feedback compensation concepts for system performance improvement. Includes a design component.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 4015. Control and Vibration Experimentation. (1 Credit)

Prerequisite(s): University Advanced Standing

Pre- or Corequisite(s): ME 4010

Introduces system modelling and characterization in the time and frequency domains, feedback and compensation, Proportional Integral Derivative (PID) control, control of velocity and position in a lab setting. Covers motion measurement, force measurement, free vibration, frequency response, impact response, noise, and signal processing. Includes a writing component.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 4180. Compliant Mechanisms. (3 Credits)

Prerequisite(s): ME 3140 and University Advanced Standing

Covers the design and analysis of compliant mechanisms and compliant structures. Includes large-deflection analysis/force displacement relationships, prediction of failure of compliant members, and synthesis of compliant mechanisms. Includes a design component.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 4310. Computational Fluid Dynamics. (3 Credits)

Prerequisite(s): ENGR 2450, ME 3310, and University Advanced Standing

Serves as an introduction to the scientific principles and applications of computational fluid dynamics (CFD). Discusses numerical methods and considerations associated with CFD, including finite difference methods, finite volume methods, model stability, grid generation, boundary conditions, model validation, convergence testing, error analysis, and turbulence models. Cements concepts through the use of selected methods in code, through use of commercial CFD software, and through plotting and analysis of resulting data. Employs analysis projects using commercial CFD software to give further experience in responsible application of CFD to various systems of interest, and to build student skills in analysis and communication of CFD data. Software fee of \$50 applies.

ME 4380. Design of Thermal/Fluid Systems. (3 Credits)

Prerequisite(s): ENGR 2300, ME 3320, and University Advanced Standing

Applies the principles of thermodynamics, fluid mechanics, and heat transfer to the design of conventional and emerging thermal/fluid systems. Includes lectures and design projects.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 4390. Heating Ventilating and Air Conditioning Design. (3 Credits)

Prerequisite(s): ENGR 2300, ME 3320, and University Advanced Standing

Covers air conditioning components and systems, moist air properties and conditioning processes. Covers indoor environmental quality indicators, space heating and cooling load calculations, and building energy consumption estimation. Focuses on water- and air-system design, refrigerants and refrigeration systems. Includes lectures and design projects.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 4410. Computer Aided Engineering. (3 Credits)

Prerequisite(s): ME 3140, ME 3320 and University Advanced Standing

Covers the application of computer-aided engineering tools in design; 3-D geometry and solid modeling; finite element analysis, kinematic analysis, and other software in engineering analysis. Includes a design component.

Lab access fee of \$45 for computers applies.

ME 4420. Finite Element Methods. (3 Credits)

Prerequisite(s): ENGR 2140, ME 3320 and University Advanced Standing

Covers discrete approximation of engineering problems, energy and weighted residual methods, and coordinate systems and mapping. Focuses on one-, two-, and three-dimensional formulation of problems in solid and fluid mechanics and heat transfer, time-dependent problems, and optimization techniques.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 4430. Computer Aided Design and Manufacturing - Theory and Application. (3 Credits)

Prerequisite(s): University Advanced Standing and ME 3210

Introduces the theoretical concepts and practical application of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM), and Computer Numerical Control (CNC). Emphasizes the central role of the solid model in the seamless integration between CAD and CAM, the automated generation of toolpaths, and final automated production.

Covers manufacturing concepts that considers some aspects of design for manufacturability, mechanical assembly, tolerancing, and process planning. Provides hands-on experience in implementing CAD/CAM to design parts for manufacture, simulating toolpaths, planning processes, and generating part programs to manufacture parts such tools (dies, fixtures, and molds), prototypes, and system components using CNC through lab work and projects. Software fee of \$50 applies. Course lab fee of \$17 applies.

ME 4440. Materials Selection in Design. (3 Credits)

Prerequisite(s): ENGR 2160, ENGR 2140, University advanced standing, and Matriculation into the mechanical engineering program

Develops a systematic procedure for selecting materials and processes leading to the subset which best matches the requirements of a design.

Emphasizes the design with materials rather than materials "science" to help with the structuring of criteria for selection. Integrates materials selection with other aspects of design. Establishes the relationship with the stages of design and optimization. Includes a term project dealing with real life applications. Software fee of \$50 applies.

ME 4510. Mechanical Engineering Seminar. (1 Credit)

Prerequisite(s): University Advanced Standing

Introduces various mechanical engineering careers and related industries. Emphasizes importance of life-long learning and active participation in professional societies and communities through lectures given by practicing engineers using their own experiences. Introduces various engineering codes of ethics. Intended as a culminating seminar for graduating seniors to prepare for their engineering careers.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 4550. Global Engineering. (3 Credits)

Prerequisite(s): University Advanced Standing and Formal Acceptance into the Mechanical Engineering Program or Department Approval

Focuses on importance of issues associated with global product development including product development needs in unfamiliar cultures, managing distributed design teams and manufacturing at remote and/or distributed sites. Introduces first-hand how global companies approach these issues.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 4610. Road Vehicle Dynamics. (3 Credits)

Prerequisite(s): ENGR 2030, University Advanced Standing

Covers dynamics of road vehicles, providing students an understanding of how physical laws, human factors, and design choices affect ride, handling, braking, acceleration, and vehicle safety of road-going vehicles. Software fee of \$50 applies.

ME 4810. Mechanical Engineering Capstone I. (3 Credits)

Prerequisite(s): University Advanced Standing, Matriculation into the Mechanical Engineering Program

Pre- or Corequisite(s): ME 2210, ME 3410

Serves as a comprehensive two-semester design experience from conception to modeling or prototype. Uses, where possible, multidisciplinary team application of the engineering design process along with project management, manufacturing methods and economic analysis. Culminates in a design review based on formal presentations of fully documented, detailed proposed designs. Capstone I and II must be taken in consecutive semesters.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 4820. Mechanical Engineering Capstone II. (3 Credits)

Prerequisite(s): ME 4810 and University Advanced Standing

Serves as a second semester of the two-semester design experience from conception to modeling or prototype. Uses, where possible, multidisciplinary team application of the engineering design process along with project management, manufacturing methods and economic analysis. Culminates in a demonstration of a final product (model or working prototype) with verification and documentation of how final product meets customer needs. Capstone I and II must be taken in consecutive semesters.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies.

ME 489R. Undergraduate Research Project. (1-3 Credits)

Prerequisite(s): University Advanced Standing, Matriculation into the Mechanical Engineering Program and instructor approval.

Applies, integrates and expands upon concepts, methodologies, and skills developed in previous Mechanical Engineering course work through pursuit of a research project related to Mechanical Engineering. Requires regular project updates throughout the semester and a final written project report. May be repeated for a maximum of 3 credits toward graduation. Software fee of \$50 applies.

ME 490R. Advanced Current Topics in Mechanical Engineering. (1-3 Credits)

Prerequisite(s): Matriculation into the Mechanical Engineering Program and University Advanced Standing

Provides exposure to emerging topics and technologies of current interest in mechanical engineering. Varies each semester depending upon the state of technology. May be repeated for a maximum of 6 credits toward graduation.

Lab access fee of \$45 for computers applies. Software fee of \$50 applies. Course lab fee of \$10 for materials applies.