

Undergraduate Mechanical Engineering Courses

MEEN 2115. Engineering Computer Aided Manufacturing. 1 Credit Hour (Lecture: 1 Hour, Lab: 2 Hours).

This is a fundamental course that demonstrates the integration of Computer-Aided-Design (CAD) and Computer-Aided-Manufacturing (CAM), and examines how to program and operate Computer Numerical Control (CNC) mills and lathes. It is a study of modern prototyping and machining methods, with emphasis on teaching the use of CAM software. This program converts 2D and 3D CAD drawing geometry directly into tool path information that is used to drive numerically-controlled turning and milling machines. Prerequisite: MEEN 2210 (prereq); MATH 2413 (coreq).

MEEN 2210. Engineering Computer Aided Design. 2 Credit Hours (Lecture: 2 Hours, Lab: 2 Hours).

Fundamentals of engineering design and solid modeling using computer aided drafting tools; application of solid modeling, analysis and simulation software and 3-D printing to problem solving and design. Prerequisite: ENGR 1211 (coreq); MATH 2412 (coreq) Lab fee: \$2.

MEEN 2212. Programming for Engineers. 2 Credit Hours (Lecture: 1 Hour, Lab: 2 Hours).

Programming principles and techniques for matrix and array operations, equation solving, and numeric simulations applied to engineering problems and visualization of engineering information; platforms include spreadsheets, symbolic algebra packages, engineering analysis software, and laboratory control software. Prerequisite: MATH 2413 Lab fee: \$2.

MEEN 2310. Engineering CAD/CAM. 3 Credit Hours (Lecture: 2 Hours, Lab: 3 Hours).

Application of solid modeling, analysis and simulation software and 3-D printing to problem solving and design. Fundamentals of engineering design and solid modeling using computer-aided drafting tools. Standard terminologies, conventions, processes, operations, design and operational characteristics of key hardware components, programming techniques, applications, merits and demerits of Computer Numerical Controlled (CNC) machines. Prerequisite: ENGR 1212; MATH 2413 or concurrent registration Lab fee: \$2.

MEEN 3305. Fluid Mechanics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).

This course is an introduction to fluid mechanics, and emphasizes fundamental concepts and problem-solving techniques. Topics to be covered include fluid properties, fluid statics, fluid kinematics, control volume analysis, dimensional analysis, internal flows (pipe flows), and external flows (lift and drag). Brief introductions to computational fluid dynamics (CFD), compressible flow, and fluid power systems such as turbomachinery (pumps and turbines) will also be provided. Prerequisite: PHYS 2425, MATH 2414, ENGR 2322.

MEEN 3310. Materials and Manufacturing Processes in Design. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).

This course covers the relationship between product design and manufacturing, assembly, testing and service. Includes materials selection, traditional and nontraditional manufacturing process, inspection, reliability, quality engineering and the economic impact of modern process engineering. Also emphasizes mechanical properties of materials, material microstructures and use of design methodology. Prerequisite: MEEN 2210, CVEN 3423.

MEEN 3314. Signals and Systems. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).

Modeling and analysis of electrical and mechanical systems using Laplace transformation methods; transient and steady-state analysis; Fourier series; Fourier transform; elementary feedback. Prerequisite: ELEN 2425, MATH 3306 or concurrent registration.

MEEN 3325. Advanced Thermodynamics. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).

Design of power and refrigeration systems, mixing or separation, multiphase, air conditioning and energy conversion processes; engine design and operating parameters dealing with thermo-chemistry of fuel air mixtures; properties of working fluids; power cycle analysis with thermodynamic properties and working fluids. Prerequisites: ENGR 2322, CHEM 1409, and MATH 3306 (coreq).

MEEN 3335. Mechanical Vibration. 3 Credit Hours (Lecture: 3 Hours, Lab: 2 Hours).

Modeling, analysis and design for mechanical vibrations. Fundamentals of free vibration, harmonically excited vibration and vibration under general forcing conditions for one degree and multidegree of freedom systems; vibration design strategies including isolation and absorbers; analysis of mechanical systems for stability, resonance, damping, and modal coupling. Prerequisite: ENGR 2324, CVEN 3423, MATH 3306 Lab fee: \$2.

MEEN 3345. Heat Transfer. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).

Heat transfer by conduction, convection, and radiation; steady-state and unsteady heat conduction; free and forced convection heat transfer; radiative heat transfer; heat exchanger analysis. Prerequisite: ENGR 2322, MEEN 3305, MATH 3306.

MEEN 3350. Measurement System Design. 3 Credit Hours (Lecture: 2 Hours, Lab: 3 Hours).

Design of measurement systems including hardware and software specifications, design, prototyping and testing. Includes fundamentals of data acquisition, design of experiments, instrumentation and sensor calibration commonly used in industry and research (e.g., sensors, signal conversion and conditioning, and wireless data communications). Prerequisite: ELEN 3314, MEEN 2210, PHYS 2426 Lab fee: \$2.

MEEN 3400. Fluid Mechanics. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).

Perform analyses involving hydrostatics, fluid dynamics, pipe flow, open-channel flow, pumps, and dimensional analysis. Design and conduct fluid mechanics experiments. Perform computer simulations of fluid processes. Prerequisites: PHYS 2425 and MATH 2414 Lab fee: \$2.

MEEN 3440. Heat Transfer. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).

Steady and transient conduction in one- and two-dimensions; forced and natural convection; radiation; phase change; basic heat exchangers design; elements of thermal system design. Includes an introduction to computational analysis of heat transfer and temperature distributions and laboratory experiences. Prerequisite: ENGR 2322 Lab fee: \$2.

MEEN 4086. Special Problems. 1-4 Credit Hours (Lecture: 1-4 Hours, Lab: 1-4 Hours).

Directed study of selected topics in Mechanical Engineering. May be repeated with approval of department head.

MEEN 4205. Mechanical Engineering Experimental Lab. 2 Credit Hours (Lecture: 1 Hour, Lab: 3 Hours).

Experimentation and measurements in fluid mechanics and heat transfer; efficiency analysis; design of experiment; data processing and analysis; report writing. Prerequisite: MEEN 3305, MEEN 3345 Lab fee: \$2.

MEEN 4300. Renewable Energy Systems and Applications. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours). [WI (<http://catalog.tarleton.edu/academicaffairs/>)]

Study of renewable energy sources, future demands, energy management and conservation techniques with focus on sources such as solar energy, biomass (conversions), wind power, geothermal energy, ocean energy, fuel cells and hydro power; assessing the viability of renewable energy systems; and analysis of renewable energy systems, applications, backup energy needs and economic factors. Prerequisite: MEEN 3325, MEEN 3305, MEEN 3345.

MEEN 4310. Mechanical Engineering Design I. 3 Credit Hours (Lecture: 3 Hours, Lab: 0 Hours).

Application of principles of mechanics and physical properties of materials, stress fundamentals and failure theories to the design, selection and analysis of linear elastic solid materials in machine elements with consideration of economics, safety and design for manufacturing. Prerequisite: MEEN 2210, MEEN 2115, CVEN 3423, ENGR 2324.

MEEN 4320. Mechanical Engineering Design II. 3 Credit Hours (Lecture: 3 Hours, Lab: 2 Hours).

Modeling, analysis and design of machine elements such as springs, bearings, gears, shafts, and mechanisms based on extensive application of physics, mathematics, core engineering principles and industrial practice; design for optimal manufacturability, quality and reliability in the mechanical engineering practice of design. Prerequisite: MEEN 4310, MEEN 3305 Lab fee: \$2.

MEEN 4420. Thermal-Fluid System Design. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).

Application of thermodynamics, heat transfer and fluid mechanics concepts to the analysis and design of thermal-fluid systems. Emphasis on component and system modeling, energy balances, performance measurements and experimental design. Prerequisite: ENGR 2322, MEEN 3305, MEEN 3345 Lab fee: \$2.

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MEEN 4425. Mechatronics. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).

The study and design of electromechanical devices including comprehensive principles from mechanics, electronics, instrumentation and software; includes sensors, control systems and actuators along with how to choose a proper controller for mechanical engineering design problems. Prerequisite: ELEN 2425, MEEN 4310; ELEN/MEEN 4443 Lab fee: \$2.

MEEN 4443. Linear Control Systems. 4 Credit Hours (Lecture: 3 Hours, Lab: 3 Hours).

Application of state variable and frequency domain techniques to modeling and analysis of single input, single output linear control systems; physical implementation of control systems by integrating sensors, actuators and other control system components; use of software design tools. Prerequisite: ELEN 2425, ELEN 3320 or COSC 3344, MATH 3306. Lab fee: \$2.