Mechanical Engineering

In the College of Engineering

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Faculty
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Karen D. May-Newman, Ph.D., Professor of Mechanical Engineering (Bioengineering Graduate Adviser)
Kee S. Moon, Ph.D., Professor of Mechanical Engineering
Khaled B. Morsi, Ph.D., Professor of Mechanical Engineering
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Samuel K. Kassegne, Ph.D., Associate Professor of Mechanical Engineering
Fletcher J. Miller, Ph.D., Assistant Professor of Mechanical Engineering

Adjunct Faculty
Bryan Cornwall, Ph.D., Mechanical Engineering

Courses Acceptable on Master's Degree

Programs in Mechanical Engineering (M E)

Refer to Courses and Curricula and Regulations of the Division of Graduate Affairs sections of this bulletin for explanation of the course numbering system, unit or credit hour, prerequisites, and related information.

UPPER DIVISION COURSES

NOTE: Proof of Completion of prerequisites required for all Mechanical Engineering 300-, 400-, and 500-level courses. Copy of transcript. In addition, Mechanical Engineering 351, 490A, and 530 require evidence of concurrent registration in appropriate courses.

M E 502. Continuum Mechanics (3)
Prerequisites: Mechanical Engineering 304 (or Civil Engineering 301) and Engineering Mechanics 340.
Mechanics of continua, stress, strain, deformation and flow, constitutive relations. Applications to common solids and fluids

M E 514. Advanced Machine Design (3)
Prerequisites: Mechanical Engineering 314 and 340.
Application of advanced mechanics of materials to design and analysis of mechanical elements. Probabilistic design and finite element methods and applications. Design projects involving extensive use of finite element programs.

M E 520. Introduction to Mechanical Vibrations (3)
Prerequisites: Mechanical Engineering 304 (or Civil Engineering 301) and Mechanical Engineering 330.
Analysis of mechanical vibration: single- and multi-degree of freedom systems; free and forced vibrations; vibration isolation; vibration absorbers. Theory of vibration measuring instruments.

M E 530. Automatic Control Systems (3)
Prerequisite: Mechanical Engineering 330.
Dynamic characteristics of control components and systems. Stability and response of closed loop systems. Design of control systems.

M E 540. Nonmetallic Materials (3)
Prerequisites: Mechanical Engineering 314 and 340.
Fundamentals of ceramics, polymers, and composite materials.

M E 543. Powder-Based Manufacturing (3)
Prerequisite: Mechanical Engineering 340.
Manufacturing of micro and nano-structured engineering components and composites starting with metal and/or ceramic powders. Powder production methods, characterization, powder shaping and compaction, sintering, hot consolidation, design considerations, and finishing operations.

M E 552. Heating, Ventilating, and Air-Conditioning (3)
Prerequisites: Mechanical Engineering 351 and 452.

M E 555. Energy and Thermal Systems Analysis and Design (3)
Prerequisites: Mechanical Engineering 351 and 452.
Analysis, design, and optimization of thermal systems using microcomputers. Modeling of thermal systems and components. Thermal system component characteristics and their effect on overall system performance. Relationship among thermal sciences in design process. Introduction to thermoeconomic optimization.

M E 556. Solar Energy Conversion (3)
Prerequisites: Engineering Mechanics 340, Mechanical Engineering 351 and 452.
Application of thermodynamics, fluid mechanics and heat transfer to the thermal design of solar energy conversion systems. Computer simulations utilized.

M E 580. Biomechanics (3)
Prerequisites: Mechanical Engineering 304 (or Civil Engineering 301) and Engineering Mechanics 340.

One lecture and four hours of laboratory.
Microfabrication techniques, microsensors and microactuators, and scaling laws. A design project of a micro-device including schematic creation, test of performance, layout generation, and layout versus schematic comparison.

M E 596. Advanced Mechanical Engineering Topics (1-3)
Prerequisite: Consent of instructor. Proof of completion of prerequisite required. Copy of transcript.
Modern developments in mechanical engineering. May be repeated with new content. See Class Schedule for specific content. Maximum credit of nine units for any combination of Mechanical Engineering 496, 498 and 596 applicable to a bachelor’s degree. Credit for 596 and 696 applicable to a master’s degree with approval of the graduate adviser.
GRADUATE COURSES

M E 610. Finite Element Methods in Mechanical Engineering (3)
Prerequisites: Engineering 280 with a grade of C or better and Mechanical Engineering 514.
Development of finite elements and an introduction to solution methods. Problems from various fields of study in mechanical engineering such as stress analysis, vibrations and heat transfer. Introduction to finite element programs such as NASTRAN.

M E 645. Mechanical Behavior of Engineering Materials (3)
Prerequisites: Mechanical Engineering 314, 340, and 350.

M E 646. Mechanics of Sintering (3)
Prerequisite: Mechanical Engineering 340.
Practical aspects and conceptual models and mechanisms associated with sintering of ceramic and metal powders.

M E 651. Advanced Thermodynamics (3)
Prerequisites: Engineering 280 with a grade of C or better and Mechanical Engineering 351.
Advanced concepts of macroscopic thermodynamics are developed including entropy generation, irreversibility, effectiveness, exergy, and chemical exergy of fuels. Concepts applied to power and refrigeration cycles using computer software.

M E 653. Combustion (3)
Prerequisite: Mechanical Engineering 351.
Thermodynamics of combustion, chemical equilibrium, chemical kinetics, combustion of gaseous, liquid and solid fuels, and their application.

M E 656. Conduction Heat and Transfer (3)
Prerequisites: Mechanical Engineering 452 and Engineering 510.
Conduction heat transfer analysis of multi-dimensional and transient processes using both classical analysis and numerical methods.

M E 657. Convection Heat Transfer (3)
Prerequisites: Mechanical Engineering 452 and Engineering 510.
Convection heat transfer processes under laminar and turbulent conditions. Mass transfer. Scaling arguments, analytical and numerical modeling.

M E 658. Radiation Heat Transfer (3)
Prerequisites: Mechanical Engineering 452 and Engineering 510.

M E 661. Gas Dynamics (3)
Prerequisites: Mechanical Engineering 351 and Engineering 510.
Thermodynamics of high velocity compressible fluid flow. Adiabatic and diabatic flow; shock phenomena; imperfect gases; multidimensional flow. Applications to the propulsive duct and turbomachinery.

M E 681. Biomaterials (3)
Prerequisites: Mechanical Engineering 240 and 580.

M E 683. Design of Medical Devices (3)
Prerequisites: Mechanical Engineering 314 and 580.
Device design, including biomaterials, human factors engineering, reliability, and manufacturing. Topics relevant to industry reviewed include regulatory, documentation, quality, and legal.

(Same course as Electrical Engineering 685)
Prerequisite: Mechanical Engineering 585.
Design and manufacturing technology for micro- and nano-scale devices. Topics include solid state transducers, microscale physics, biomedical microelectronics, microfluidics, biosensors, and hybrid integration of microfabrication technology. Emphasis on biomedical applications.

M E 696. Advanced Topics in Mechanical Engineering (2 or 3)
Intensive study in specific areas of mechanical engineering. May be repeated with new content. See Class Schedule for specific content. Credit for 596 and 696 applicable to a master’s degree with approval of the graduate adviser.

M E 797. Research (1-3) Cr/NC/RP
Prerequisites: Consent of graduate adviser and advancement to candidacy.
Research in engineering. Maximum credit six units applicable to a master’s degree.

M E 798. Special Study (1-3) Cr/NC/RP
Prerequisite: Consent of graduate adviser; to be arranged with department chair and instructor.
Individual study or internship. Maximum credit three units applicable to a master’s degree.

M E 799A. Thesis or Project (3) Cr/NC/RP
Prerequisites: An officially appointed thesis committee and advancement to candidacy.
Preparation of a project or thesis for the master’s degree.

M E 799B. Thesis or Project Extension (0) Cr/NC
Prerequisite: Prior registration in Thesis or Project 799A with an assigned grade symbol of RP.
Registration required in any semester or term following assignment of RP in Course 799A in which the student expects to use the facilities and resources of the university; also student must be registered in the course when the completed thesis or project is granted final approval.

M E 799C. Comprehensive Examination Extension (0) Cr/NC
Prerequisite: Completion or concurrent enrollment in degree program courses.
Registration required of students whose only requirement is completion of the comprehensive examination for the master’s degree. Registration in 799C limited to two semesters.