Courses

MEE 0843. Technology Transformations. 3 Credit Hours.
Expand your knowledge by looking at how various technologies such as electricity, automobiles, airplanes, telephones, bridges, highways, electronics, computers, and information technology have transformed the world around us. What would we do without them? Where do they come from? How do they work? Technology is developed by people who have the ideas, design the machines and processes, and suffer the costs and benefits of technological changes in our society. Learn about science and technology through history of discovery, invention and innovation through lectures and labs. We will also study several promising fields which may lead us to the future of technology. NOTE: This course fulfills a Science & Technology (GS) requirement for students under GenEd and Science & Technology Second Level (SB) for students under Core.

Course Attributes: GS

Repeatability: This course may not be repeated for additional credits.

MEE 0844. The Bionic Human. 3 Credit Hours.
Can we replace our "worn-out" body parts with space-age materials? Will the day come when an injured athlete buys a tendon for the next big game? Why are your parents spending so much time at the doctor? We are on the verge of building "the bionic human" by repairing many of our body parts indefinitely. Become familiar with bio-engineered technologies for age-, disease-, sports-, and accident-related injuries. Learn why weight bearing exercise strengthens bones, the difference between MRI, CAT scan, and X-Ray, and what the folks at the Food and Drug Administration do. By the time you finish this course, you'll know how a pig heart could save your life, how stem cell research could affect your future, the purpose of animal testing, and why walking through airport security could be a problem if you have had your hip replaced. NOTE: This course fulfills a Science & Technology (GS) requirement for students under GenEd and Science & Technology Second Level (SB) for students under Core. Students cannot receive credit for this course if they have successfully completed MEE 0944.

Course Attributes: GS

Repeatability: This course may not be repeated for additional credits.

MEE 0944. Honors Bionic Human. 3 Credit Hours.
From MRIs to engineered organs, modern healthcare has become synonymous with applications of bioengineering and technology. This course focuses on the new bioengineering paradigm, exploring the ways in which disciplines intersect to produce advances in healthcare. A key goal is to enable students to make more informed decisions about healthcare based on their understanding not only of technological advancements but of the ethical and societal issues arising as a consequence. This discovery-based seminar includes interactive lectures, hands-on and virtual labs, discussion, research and presentations. NOTE: This course fulfills a Science & Technology (GS) requirement for students under GenEd and Science & Technology Second Level (SB) for students under Core. Students cannot receive credit for this course if they have successfully completed MEE 0944.

Cohort Restrictions: Must be enrolled in one of the following Cohorts: SCHONORS, UHONORS, UHONORSTR.

Course Attributes: GS, HO

Repeatability: This course may not be repeated for additional credits.

MEE 1001. Introduction to Mechanical Engineering. 2 Credit Hours.
Provides an understanding of the study and practice associated with mechanical engineering and technology disciplines. Understand the importance of good communications and teamwork skills in a successful engineering and technology career. Understand the basics of problem solving and design. Discipline-specific labs.

Repeatability: This course may not be repeated for additional credits.

MEE 1019. Automotive Design I. 1 Credit Hour.
Design of automotive chassis, suspension, and drive train for participation in Society of Automotive Engineers competitions. Grade based on participation (50%) and/or design report (50%).

Repeatability: This course may not be repeated for additional credits.

MEE 1029. Automotive Design II. 1 Credit Hour.
Continuation of MEE 1019 (0180). Grade based on participation (50%) and/or design report (50%).

Repeatability: This course may not be repeated for additional credits.
MEE 1039. Automotive Design III. 1 Credit Hour.
Continuation of MEE 1029 (0181). Grade based on participation (50%) and/or design report (50%).

**Repeatability:** This course may not be repeated for additional credits.

MEE 2011. Linear Systems. 3 Credit Hours.
This course introduces applications of mathematical concepts of vector calculus to mechanical engineering through both the analytical description and the programming environment of Matlab. Topics covered include engineering applications of vectors and matrices, linear matrix equations, eigenvalue problems, interpolations, differentiation and integration, and optimization. A particular emphasis will be paid to applications of those concepts to various concrete problems of mechanical engineering.

**Field of Study Restrictions:** Must be enrolled in one of the following Fields of study: Bioengineering, Civil Engineering, Mechanical Engineering.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**
(MATH 1042|Minimum Grade of C-|May not be taken concurrently
OR MATH 1942|Minimum Grade of C-|May not be taken concurrently)
AND (MATH 2043|Minimum Grade of C-|May be taken concurrently
OR MATH 2943|Minimum Grade of C-|May be taken concurrently)

MEE 2305. Measurements & Dynamics Laboratory. 1 Credit Hour.
Basic measurements and measurement principles. Experiments and simulations of static and dynamic systems. Statistical analysis of results, written reports and journals.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**
ENGR 2332|Minimum Grade of C-|May be taken concurrently
OR ENGT 3323|Minimum Grade of C-|May be taken concurrently.

MEE 3301. Machine Theory and Design. 3 Credit Hours.
Course includes design process, statistical method, stress and deflection, materials, failure criteria from static and dynamic loadings. Analysis of mechanical components including screws, welded parts, gears, belts and shafts. Team design projects with written reports and presentations.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**
(ENGR 1117|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 2332|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 2933|Minimum Grade of C-|May not be taken concurrently
OR ENGR 2933|Minimum Grade of C-|May not be taken concurrently)

MEE 3302. Kinematics of Mechanisms. 3 Credit Hours.
This course builds on the concepts of kinematics first presented in sophomore level Dynamics and explores its application to mechanical design. Starting with an introduction to links, joints and kinematic chains, students will learn the analysis and design of spatial mechanisms with an emphasis on position, velocity and acceleration of linkages. In addition to graphical and numerical analysis, computer aided mechanism design will be performed using SolidWorks Motion.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**
ENGR 2332|Minimum Grade of C-|May not be taken concurrently.
MEE 3305. Materials Laboratory. 1 Credit Hour.
Laboratory experiments related to the nature and properties of materials, including: stress, strain, fractures, microstructure, metallography, and nondestructive testing.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ENGR 2333|Minimum Grade of C-|May not be taken concurrently)
OR ENGR 2933|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3496|Minimum Grade of C-|May be taken concurrently
OR ENGR 3201|Minimum Grade of C-|May be taken concurrently
OR ENGT 3396|Minimum Grade of C-|May not be taken concurrently
OR ENGT 3201|Minimum Grade of C-|May not be taken concurrently)
AND (MEE 2305|Minimum Grade of C-|May not be taken concurrently)

MEE 3421. Dynamic Systems. 3 Credit Hours.
A study of the dynamic response of physical systems, concentrating on mechanical systems in translation, rotation, and combined motion. Mathematical models are developed using interacting elements, inter-connecting laws, and physical laws. Both the state variable and input-output analysis are considered. Solutions for the model response include using the following techniques: analytical, Laplace Transform, transfer function, matrix methods, and numerical analysis. Design project.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ENGR 2332|Minimum Grade of C-|May not be taken concurrently)
AND (MEE 2011|Minimum Grade of C-|May not be taken concurrently
OR MATH 2101|Minimum Grade of C-|May not be taken concurrently)
AND (MATH 3041|Minimum Grade of C-|May not be taken concurrently)

MEE 3506. Fluids and Energy Laboratory. 1 Credit Hour.
This laboratory aims to familiarize the students with different data acquisition techniques and devices to measure and control the vibratory behavior of various systems. Experiments will include pressure and velocity measurements as well as modern transducers and pressure/flow regulators.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ENGR 3553|Minimum Grade of C-|May be taken concurrently
OR ENGT 2521|Minimum Grade of D-|May be taken concurrently
AND (ENGR 3571|Minimum Grade of D-|May be taken concurrently
OR ENGT 3532|Minimum Grade of D-|May be taken concurrently)

MEE 4040. Special Topics. 1 to 4 Credit Hour.
A course designed to present new and emerging areas of engineering. The course may also be used to present areas not normally taught in the College. Course requirements vary with the topic and instructor. Offered as needed or as appropriate.

Class Restrictions: Must be enrolled in one of the following Classes: Junior 60 to 89 Credits, Senior 90 to 119 Credits, Senior/Fifth Year 120+ Credits.

Repeatability: This course may be repeated for additional credit.

MEE 4173. Data Acquisition and Analysis for Engineers. 3 Credit Hours.
Course content includes the use of microcomputers for automated data acquisition, process control, and data analysis. The principles and applications of sensors, transducers, recording instruments, signal conditioning, and control instrumentation, and sampling theory. Data analysis using Fourier transform and least squares method. Computer software development for interfacing and graphics. Hands-on lab and design project required.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(MATH 2101|Minimum Grade of C-|May not be taken concurrently
OR MEE 2011|Minimum Grade of C-|May not be taken concurrently)
AND (MEE 2305|Minimum Grade of C-|May not be taken concurrently)
AND (ECE 2112|Minimum Grade of C-|May not be taken concurrently)
MEE 4191. Independent Research in Mechanical Engineering. 2 to 5 Credit Hours.
Arranged each semester, please consult with the instructor.

Repeatability: This course may be repeated for additional credit.

MEE 4311. Mechanics of Composite Materials. 3 Credit Hours.
Introduction to the behavior of composite materials and their use in engineering structures: behavior and properties of the constituent fibers and matrices, micromechanical predictions of composite properties, anisotropic elasticity, behavior of composite laminae, classical lamination theory; fracture mechanisms, failure theories; behavior of composite plates and beams.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ENGR 2333|Minimum Grade of C-|May not be taken concurrently
OR ENGR 2933|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3496|Minimum Grade of D-|May not be taken concurrently
OR ENGR 3201|Minimum Grade of D-|May not be taken concurrently)
AND (MATH 2101|Minimum Grade of C-|May not be taken concurrently
OR MEE 2011|Minimum Grade of C-|May not be taken concurrently)
AND (MATH 3041|Minimum Grade of C-|May not be taken concurrently)

MEE 4312. Deformation & Fracture of Engineering Materials. 3 Credit Hours.
This course will cover fundamental concepts of deformation and fracture that lead to structural failures. Failure mechanisms associated with material structure and properties will be discussed. Effects of material defects such as dislocations, voids, and pores will be introduced. Key concepts in linear fracture mechanics will be emphasized including stress intensity factor, critical flaw size, etc. Elastic-plastic fracture mechanics and fatigue crack growth will be briefly discussed.

Class Restrictions: Must be enrolled in one of the following Classes: Senior 90 to 119 Credits, Senior/Fifth Year 120+ Credits.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(MEE 3301|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3496|Minimum Grade of D-|May not be taken concurrently
OR ENGR 3201|Minimum Grade of D-|May not be taken concurrently)

MEE 4313. Metallurgy. 3 Credit Hours.
Course topics include physical and mechanical metallurgy, phase transformations, phase diagrams. Emphasis on heat treating, forming, welding, and other fabrication processes. Term design project.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
ENGR 3496|Minimum Grade of D-|May not be taken concurrently
OR ENGR 3201|Minimum Grade of D-|May not be taken concurrently.

MEE 4382. Independent Study in Mechanical Engineering. 1 to 6 Credit Hour.
Arranged each semester, please consult with the instructor.

Repeatability: This course may be repeated for additional credit.

MEE 4405. Vibrations and Controls Laboratory. 1 Credit Hour.
This laboratory aims to familiarize the students with different data acquisition techniques and devices to measure and control the vibratory behavior of various systems. Experiments will include, but not be limited to, vibration behavior and control of single degree of freedom and continuous systems.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(MEE 3421|Minimum Grade of D-|May not be taken concurrently
AND MEE 4422|Minimum Grade of D-|May be taken concurrently)
MEE 4411. Introduction to Mobile Robotics. 3 Credit Hours.
How can one create mobile robots that operate autonomously in cluttered indoor and outdoor environments? How do robots determine their state and properties from noisy sensor data to accomplish navigation and manipulation tasks? The Introduction to Mobile Robotics course will address motion planning and control software modules for robotic systems. Students taking this course are expected to be familiar with differential equations, linear algebra, and multi-variable calculus. Experience with programming in Matlab or Octave is recommended (and Matlab will be used in this course).

Repeatability: This course may not be repeated for additional credits.
Pre-requisites:
(MEE 2011|Minimum Grade of C-|May not be taken concurrently)
AND (MEE 3421|Minimum Grade of C-|May not be taken concurrently)

MEE 4422. Mechanical Vibrations. 3 Credit Hours.
The study of single degree, two degrees, and multi-degrees of freedom systems, harmonic and non-harmonic excitation, damped and undamped response, free, forced, transient, and random vibrations, resonance beating, force transmission, isolation, base, and self excitation. Term design project. Computer numerical methods.

Repeatability: This course may not be repeated for additional credits.
Pre-requisites:
MEE 3421|Minimum Grade of D-|May not be taken concurrently.

MEE 4506. Energy Conversion Laboratory. 1 Credit Hour.
This laboratory will emphasize advanced measurement techniques in energy systems. Computer based data acquisition and statistics are integral parts of the course. Experiments will include: gas and liquid measurements, heat and mass transfer, and engine measurements.

Repeatability: This course may not be repeated for additional credits.
Pre-requisites:
(ENGR 3553|Minimum Grade of C-|May not be taken concurrently
OR ENGR 3953|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3571|Minimum Grade of C-|May not be taken concurrently)
AND (MEE 3506|Minimum Grade of C-|May not be taken concurrently)
AND (MEE 4571|Minimum Grade of D-|May be taken concurrently)
AND (MEE 4572|Minimum Grade of D-|May be taken concurrently)

MEE 4512. Compressible Fluid Dynamics. 3 Credit Hours.
This course will introduce students to the subject of high speed gas dynamics. Compressible flows exhibit fundamentally different behavior from that observed in low speed, constant density fluids. Such flows are found in aerodynamics, combustors, turbines, jets, gas pipelines, and wind tunnel test facilities. Students will study phenomena associated with supersonic flows, including normal and oblique shocks, expansion fans, and compressible flows with friction and/or heat transfer. An introduction to high temperature and rarefied gas dynamics will also be included.

Repeatability: This course may not be repeated for additional credits.
Pre-requisites:
(ENGR 3553|Minimum Grade of C-|May not be taken concurrently
OR ENGR 3953|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3571|Minimum Grade of C-|May not be taken concurrently)

MEE 4513. Aerodynamics. 3 Credit Hours.
The forces and moments exerted by moving fluids on solid bodies are of concern in numerous applications. While the performance of flight vehicles is of particular interest, aerodynamics is also a subject of importance in passenger and race car design, wind turbines, structures, sea vessels, etc. Students will study various topics in low speed aerodynamics, including thin airfoil theory and airfoil nomenclature, finite wing theory, high lift and drag reduction devices, separated and vortical flows, and rotating blades. An introduction to transonic flows and computational aerodynamics will also be included.

Field of Study Restrictions: Must be enrolled in one of the following Fields of study: Civil Engineering, Mechanical Engineering.

Repeatability: This course may not be repeated for additional credits.
Pre-requisites:
ENGR 3553|Minimum Grade of C-|May not be taken concurrently
OR ENGR 3953|Minimum Grade of C-|May not be taken concurrently.
MEE 4571. Advanced Thermodynamics and Combustion. 3 Credit Hours.
Review of basic concepts, first and second laws, entropy (statistical and classical), power and refrigeration cycles, thermodynamic relationships, mixtures, chemical reactions and equilibrium, introduction to combustion process. Term design project.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
ENGR 3571 Minimum Grade of C- May not be taken concurrently.

MEE 4572. Heat and Mass Transfer. 3 Credit Hours.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(MATH 3041|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3571|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3553|Minimum Grade of C-|May not be taken concurrently)
OR ENGR 3953|Minimum Grade of C-|May not be taken concurrently)

MEE 4573. Internal Combustion Engines. 1 Credit Hour.
Types of engines, design considerations, combustion, friction, emission.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
MEE 4571 Minimum Grade of D- May be taken concurrently.

MEE 4574. Heating, Ventilating, and Air Conditioning. 3 Credit Hours.
Course content includes human comfort criteria, heating and cooling loads, HVAC system types, room air distribution, terminal unit selection, fans and ducts, pumps and piping, computer-aided design; term design project.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ENGR 3571|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3553|Minimum Grade of C-|May not be taken concurrently)
OR ENGR 3953|Minimum Grade of C-|May not be taken concurrently)

MEE 4575. Renewable and Alternative Energy. 3 Credit Hours.
Current state of renewable and alternative energy; different scenarios of producing energy: mechanical heat engines, ocean thermal energy converters, thermoelectricity, solar radiation, biomass, photovoltaic converters, wind energy, and ocean engines; design of hydrogen-powered systems: polymer electrolyte membrane fuel cells.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
ENGR 3571 Minimum Grade of C- May not be taken concurrently.

MEE 4576. Photovoltaic System Design for Engineers. 3 Credit Hours.
The course will introduce students to the photovoltaic system design. It will begin by providing a basic understanding of the properties of sunlight, review the relevant semiconductor concepts and provide an in-depth understanding of the principles governing conventional solar cell operation. Focus will then be placed on the intricacies of solar cell design exploring such aspects as module fabrication, standalone and grid-connected system requirements, and photovoltaic material specific issues. The remainder of the course will be devoted to requirements, design and economics of specific purpose photovoltaic applications.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
ENGR 3571 Minimum Grade of C- May not be taken concurrently.
MEE 4577. Power Generation and Storage Technologies. 3 Credit Hours.
This course will give an overview of electric power generation technologies including coal, gas, and nuclear power plants, as well as some emerging technologies such as photovoltaic. This course will also discuss technologies used in power transmission and distribution such as overhead power line conductors. Power storage technologies will also be introduced, including compressed air, flywheel, hydrogen, and batteries.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**
(ENGR 3571|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3201|Minimum Grade of C-|May be taken concurrently)
AND (ENGR 3553|Minimum Grade of C-|May not be taken concurrently)
OR ENGR 3953|Minimum Grade of C-|May not be taken concurrently)

MEE 4643. Manufacturing Engineering. 3 Credit Hours.
A course designed to present new and emerging areas of Manufacturing Engineering. This course covers manufacturing processes under the classification of processing operations and the assembly operations, and the parameters involved in these processes. The course is combination of lectures and intensive lab activities such as machining, welding, 3-D printing.

**Field of Study Restrictions:** Must be enrolled in one of the following Fields of study: Mechanical Engineering.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**
MEE 3301|Minimum Grade of D-|May not be taken concurrently.

MEE 4731. Cardiovascular Fluid Dynamics. 3 Credit Hours.
Mechanics of blood circulation, fluid mechanics of the heart, blood flow in arteries, unsteady flow in veins, current concepts in circulatory assist devices, biofluidics, and other selected topics.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**
ENGR 3553|Minimum Grade of C-|May not be taken concurrently
OR ENGR 3953|Minimum Grade of C-|May not be taken concurrently.

MEE 4734. Forensic Engineering. 3 Credit Hours.
The purpose of this course is to expose students to rigorous engineering techniques and methodologies utilized in forensic engineering, accident reconstruction, failure analysis and the analysis of injury biomechanics. Additionally, the role of engineering accident reconstruction and biomechanical injury analysis in the engineering design process to ensure product safety will also be discussed, as will the role of standards in engineering design.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**
(ENGR 2333|Minimum Grade of C-|May not be taken concurrently
OR ENGR 2933|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3553|Minimum Grade of C-|May not be taken concurrently)
AND (ENGR 3953|Minimum Grade of C-|May not be taken concurrently)

MEE 5110. Special Topics. 3 Credit Hours.
**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

MEE 5117. Finite Element Analysis. 3 Credit Hours.
Concepts and techniques of finite element and finite difference methods; mesh generation techniques; computer graphics presentation methods. Application to solids, liquids, and gases in the areas of stress, strain, deflection elasticity, heat transfer, fluid flow, and combustion.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.
MEE 5201. Thermodynamics of Materials. 3 Credit Hours.
An introductory master's level course that explores materials from a thermodynamic perspective: Includes the laws of thermodynamics, free energy, chemical potential, stability, etc. A detailed analysis of phase diagrams is presented in the second half of the course.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5203. Advanced Materials Science. 3 Credit Hours.
Chemical bonding, crystallography, defects and their effects on material properties, nucleation, growth, and microstructure development.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5204. Solid State Physics for Material Science. 3 Credit Hours.
Crystal structures, bonding, crystal binding energies, reciprocal lattice, elastic properties, phonons, thermal properties, electronic properties, energy bands, band structures, semiconductors, doping, carrier concentration, fermi surfaces, metals, excitation, optical properties, electron scattering, carrier transport, impurities, defects, surfaces, interfaces.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5205. Microscopy and Microanalysis of Materials. 3 Credit Hours.
This course will cover various Microscopy and Microanalysis techniques which are widely used in research labs and in industries to characterize micro and nano structure and chemical composition of solid matter. Among them are visual light, scanning probe and electron beam microscopy and associated spectroscopy. The primary focus will be on fundamental aspects and experimental methods of Scanning Electron Microscopy (SEM) and associated spectroscopy. The SEM facility will be used for individual student projects. Particular attention will be given to the selection criteria used for choosing the appropriate technique for materials characterization.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5312. Mechanics of Composite Materials. 3 Credit Hours.
Introduction to the behavior of composite materials and their use in engineering structures: behavior and properties of the constituent fibers and matrices, micromechanical predictions of composite properties, anisotropic elasticity, behavior of composite laminae, classical lamination theory; fracture mechanisms, failure theories; behavior of composite plates and beams.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5411. Introduction to Mobile Robotics. 3 Credit Hours.
How can one create mobile robots that operate autonomously in cluttered indoor and outdoor environments? How do robots determine their state and properties from noisy sensor data to accomplish navigation and manipulation tasks? The Introduction to Mobile Robotics course will address motion planning, control, sensing and estimation for mobile robots. The goal of the class is to train students to develop real-time planning and control software modules for robotic systems. Students taking this course are expected to be familiar with differential equations, linear algebra, and multi-variable calculus. Experience with programming in Matlab or Octave is recommended (and Matlab will be used in the course).

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5511. Thermodynamic Properties. 3 Credit Hours.
Review of quantum mechanics and introduction to statistical mechanics. Statistical thermodynamics and various models of matter. Accuracy and trends of the predicted properties of various materials.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.
MEE 5512. Compressible Fluid Dynamics. 3 Credit Hours.
This course introduces students to the subject of high speed gas dynamics. Compressible flows exhibit fundamentally different behavior from those in low speed, constant density fluids. Such flows are found in aerodynamics, combustors, turbines, jets, gas pipelines, and wind tunnel facilities. Students study phenomena associated with supersonic flows, including normal and oblique shocks, expansion fans, and compressible flows with friction and/or heat transfer. An introduction to high temperature and rarified gas dynamics is also included.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5575. Renewable and Alternative Energy. 3 Credit Hours.
The objective of the course is to establish the theoretical basis for the description of regular and chaotic dynamic systems. Students learn to understand the basic ideas of dynamic systems and the nature of chaotic behavior so they can apply these ideas to particular systems. They also learn how to choose the appropriate modeling techniques and hypothesis to establish a mathematical model of a qualitatively described phenomenon. Discussed applications include examples from fluid mechanics, physics, and biology.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5576. Photovoltaic Syst Design. 3 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5577. Power Generation and Storage Technologies. 3 Credit Hours.
This course will give an overview of electric power generation technologies including coal, gas, and nuclear power plants, as well as some emerging technologies such as photovoltaic. This course will also discuss technologies used in power transmission and distribution such as overhead power line conductors. Power storage technologies will also be introduced including compressed air, flywheel, hydrogen, and batteries.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5731. Cardiovascular Fluid Dynamics. 3 Credit Hours.
Mechanics of blood circulation, fluid mechanics of the heart, blood flow in arteries, unsteady flow in veins, current concepts in circulatory assist devices, biofluidics, and other selected topics.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5732. Tissue Biomechanics. 3 Credit Hours.
Tissue Biomechanics course is an introductory course about the mechanical properties of living tissues. The emphasis of the course is on the meaning of constitutive models for bio-solids and bio-fluids. Topics include a review of elastic, viscous, and viscoelastic constitutive models; bioviscoelastic solids; mechanical properties of blood vessels; mechanics of skeletal and heart muscles.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5733. Viscoelasticity. 3 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 5734. Forensic Engineering. 3 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

MEE 8110. Special Topics. 3 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.
MEE 8315. Fracture Mechanics. 3 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.
Repeatability: This course may not be repeated for additional credits.

MEE 9182. Independent Study I. 3 Credit Hours.
Special study in a particular aspect of engineering under the direct supervision of a graduate faculty member. May be taken once by MS/MSE students and once by Ph.D. students.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.
Repeatability: This course may be repeated for additional credit.

MEE 9282. Independent Study II. 3 Credit Hours.
Special study in a particular aspect of engineering under the direct supervision of a graduate faculty member. May be taken once by Ph.D. students.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.
Repeatability: This course may be repeated for additional credit.

MEE 9991. Directed Research. 1 to 6 Credit Hour.
Under the guidance of a faculty member, the student will conduct independent research on a selected topic in engineering.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.
Repeatability: This course may be repeated for additional credit.

MEE 9994. Preliminary Examination Preparation. 1 to 6 Credit Hour.
This course is intended for Ph.D. students who have completed their coursework but who have not yet passed both the Ph.D. Preliminary Examination.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.
Repeatability: This course may be repeated for additional credit.

MEE 9995. Project. 1 to 3 Credit Hour.
A project assigned with the approval of the Mechanical Engineering Graduate Committee and conducted under the supervision of a graduate faculty advisor. An oral presentation in an open seminar and a written report are required to complete the independent project. Projects related to industrial applications are encouraged. For non-thesis students only.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.
Repeatability: This course may be repeated for additional credit.

MEE 9996. Thesis. 1 to 3 Credit Hour.
Master's thesis. May be taken twice.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.
Repeatability: This course may be repeated for additional credit.

MEE 9998. Pre-Dissertation Research. 1 to 6 Credit Hour.
This course is intended for Ph.D. students who have passed both the Preliminary and Qualifying Examinations but who have not been elevated to candidacy.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.
Repeatability: This course may be repeated for additional credit.

MEE 9999. Dissertation Research. 1 to 6 Credit Hour.
This course is intended only for those students who have achieved Ph.D. Candidacy status. A minimum of 6 semester hours is required for graduation.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.
Student Attribute Restrictions: Must be enrolled in one of the following Student Attributes: Dissertation Writing Student.
Repeatability: This course may be repeated for additional credit.