Courses

MEEG 5033. Advanced Mechanics of Materials I. 3 Hours.
Combined stress, theories of failure, thick-walled cylinders, bending of unsymmetrical sections, torsion in noncircular section, plate stresses, and strain energy analysis. Prerequisite: MEEG 2013 and MEEG 3013. (Typically offered: Irregular)

MEEG 5153. Fundamentals of Mechanical Design. 3 Hours.
(Formerly MEEG 4153.) This class is designed to provide engineering students with a head start in industry as design engineers or working in an engineering related function. The course contents cover machine design and analysis experiences as related to working in industry and performing consulting work. Major topics include the design process, design procedures, fasteners, general design and numerous consulting experiences. A concept design exercise and two special design projects will be assigned to the students as homework. Graduate degree credit will not be given for both MEEG 4153 and MEEG 5153. Prerequisite: MEEG 4103. (Typically offered: Fall)

MEEG 5163. Advanced Product Design. 3 Hours.
This course provides an in-depth and comparative study on the theories of engineering design and equips students to understand and utilize the tools and methodologies founded on those theories. (Typically offered: Fall)

MEEG 5173. Model-Based Systems Design and Analysis. 3 Hours.
This course provides students with an introduction into the two main approaches to understanding and designing complex engineered systems. First, the course covers the unique technical challenge of systems engineering and design of systems. Second, the course covers concepts, methods and tools related to ‘model-based systems design.’ This covers formal modeling of the information content of complex systems. The third portion of the course will focus on modeling the complex behavior of the systems. This is often described as dynamical systems modeling. Students will utilize the methods and tools presented in class to model a complex engineered system of their choice (with instructor approval). The classes will alternate between presenting modeling methods to the students and students demonstrating their system to the class utilizing those methods. Students may not receive credit for both MEEG 4173 and MEEG 5173. Prerequisite: MEEG 4103 or Instructor consent. (Typically offered: Spring Even Years)

MEEG 5203. Robot Modeling and Simulation. 3 Hours.
This is a graduate level course in Robotics dealing with the behavioral study of robots. Topics covered in this course will include but not limited to the following: mathematical modeling of robots, rigid motions and homogeneous transformation, forward/inverse kinematics of robots, velocity kinematics, path and trajectory planning, robot dynamics, joint control, PD/PID control, and multivariable control. Advanced topics may include passivity-based motion control, geometric nonlinear control, computer vision, vision-based control, and sensor fusion. Prerequisite: Graduate standing in MEEG or ELEG and consent of the instructor. (Typically offered: Spring)

MEEG 5253. Bio-Mems. 3 Hours.
Topics include the fundamental principles of microfluidics, Navier-Stokes Equation, bio/abio interfacing technology, bio/abio hybrid integration of microfabrication technology, and various biomedical and biological problems that can be addressed with microfabrication technology and the engineering challenges associated with it. Lecture 3 hours per week. Prerequisite: MEEG 3503 or CVEG 3213 or CHEG 2133. (Typically offered: Spring)
This course is cross-listed with BENG 5253.

MEEG 5263. Introduction to Micro Electro Mechanical Systems. 3 Hours.
A study of mechanics and devices on the micro scale. Course topics will include: introduction to micro scales, fundamentals of microfabrication, surface and bulk micromachining, device packaging, device reliability, examples of micro sensors and actuators. Recitation three hours per week. (Typically offered: Fall)

MEEG 5283. Microelectronics Reliability. 3 Hours.
In this course, students will learn about common failure modes experienced in electronic packaging and devices, with special attention on mechanical and thermally driven failure mechanisms. Additionally, students will gain familiarity with accelerated testing methods and the associated governing standards associated with electronics reliability qualifications used in identifying and certifying electronics for various applications. Prerequisite: ELEG 5273 or instructor consent. (Typically offered: Fall Even Years)

MEEG 5303. Physical Metallurgy. 3 Hours.
Physical and chemical properties of solids and the application of materials in commerce. Prerequisite: MEEG 2303. (Typically offered: Irregular)

MEEG 5333. Introduction to Tribology. 3 Hours.
A study of science and technology of interacting surfaces in relative motion. Topics include solid surface characterization, contact between solid surfaces, adhesion, friction, wear, lubrication, micro/nanotribology, friction and wear screening test methods, and tribological components and applications. Students may not earn credit for both MEEG 5333 and MEEG 4313. Prerequisite: Graduate standing. (Typically offered: Irregular)

MEEG 5353. Lithium-ion Batteries and Beyond: Materials, Characterization, and Performance. 3 Hours.
This course is intended to provide students an overview of various battery systems and help students establish the concepts of primary and secondary batteries. The course materials will focus on lithium-ion batteries (LIBs), covering their electrochemical mechanisms, components, materials synthesis, materials characterization, and performance evaluations. Prerequisite: CHEM 1103 and MEEG 2303. (Typically offered: Fall)

MEEG 5403. Advanced Thermodynamics. 3 Hours.
An in-depth review of classical thermodynamics, including availability analysis, combustion, and equilibrium, with an introduction to quantum mechanics and statistical thermodynamics. Prerequisite: Graduate standing in Engineering or consent of instructor. (Typically offered: Spring)

MEEG 5453. Advanced Heat Transfer. 3 Hours.
More in-depth study of topics covered in MEEG 4413, Heat Transfer, and coverage of some additional topics. Prerequisite: MEEG 4413 or equivalent. (Typically offered: Fall)

MEEG 5473. Radiation Heat Transfer. 3 Hours.
Spectral analysis, radiant exchange in gray and non-gray enclosures, gas radiation, and multi-mode heat transfer. Prerequisite: MEEG 5453 or equivalent. (Typically offered: Summer Even Years)

MEEG 5483. Thermal Systems Analysis and Design. 3 Hours.
(Formerly MEEG 4483.) Analysis design and optimization of thermal systems and components with examples from such areas as power generation, refrigeration, and propulsion. Availability loss characteristics of energy systems and availability conservation methods. Graduate degree credit will not be given for both MEEG 4483 and MEEG 5483. Prerequisite: MEEG 4413. (Typically offered: Fall and Summer)
MEEG 5503. Advanced Fluid Dynamics I. 3 Hours.
A basic survey of the characteristics of fluid flow under a variety of conditions with examples. Begins with a derivation of the Navier-Stokes equations and an evaluation of the dimensionless groups found from these equations. Topics to be covered include viscous laminar and turbulent boundary layers, jets and wakes, Stokes flow, inviscid flows with and without free surfaces and turbulence. Prerequisite: MEEG 3503 and MATH 2584. (Typically offered: Spring)

MEEG 5513. Introduction to Flight. 3 Hours.
(Formerly MEEG 4503.) The course will provide understanding in basic aerodynamics, airfoil design and characteristics, and flight control surfaces. Graduate degree credit will not be given for both MEEG 4503 and MEEG 5513. Prerequisite: MATH 2584, MEEG 3503. (Typically offered: Fall)

MEEG 5523. Astronautics. 3 Hours.
(Formerly MEEG 4523.) Study of spacecraft design and operations. Graduate degree credit will not be given for both MEEG 4523 and MEEG 5523. Prerequisite: MEEG 2103 and MEEG 2403 or consent of instructor. (Typically offered: Irregular)

MEEG 5533. Fundamentals of Aerodynamics. 3 Hours.
A study of external-flow fluid mechanics applied to Aerodynamics. Topics include integral and differential forms of the basic fluid equations (continuity, momentum, and energy), potential flow, and supersonic flow. Prerequisite: MEEG 3503. (Typically offered: Spring)

MEEG 5633. Additive Manufacturing. 3 Hours.
This course provides an overview of developing opportunities and critical challenges of additive manufacturing (AM, also known as 3-D printing). It covers existing and emerging additive manufacturing processes in the context of product design, materials selection and processing, and industrial and consumer applications. Students may not receive credit for both MEEG 4633 and MEEG 5633. Prerequisite: MEEG 2101, MEEG 2303, MEEG 3013, and MEEG 3503 or instructor consent. (Typically offered: Spring)

MEEG 5733. Advanced Numerical Methods. 3 Hours.
Numerical methods for the solution of linear and non-linear ordinary and partial differential equations; initial and boundary value problems; one-step and multi-step methods; predominantly finite difference but also finite element and control volume techniques; and computer applications. Graduate standing in Engineering or consent of instructor. (Typically offered: Irregular)

MEEG 5833. Aerospace Propulsion. 3 Hours.
(Formerly MEEG 4433.) Principles, operation, and characteristics of gas turbine and rocket engines. Brief study of novel spacecraft propulsion systems. Graduate degree credit will not be given for both MEEG 4433 and MEEG 5833. Prerequisite: MEEG 3503. (Typically offered: Irregular)

MEEG 5853. Industrial Waste and Energy Management. 3 Hours.
(Formerly MEEG 4453.) Applications of thermodynamics, heat transfer, fluid mechanics, and electric machinery to the analysis of waste streams and energy consumption for industrial facilities. Current techniques and technologies for waste minimization and energy conservation including energy-consuming systems and processes, utility rate analysis, economic analysis and auditing are taught. Graduate degree credit will not be given for both MEEG 4453 and MEEG 5853. Prerequisite: MEEG 4413. (Typically offered: Irregular)

MEEG 5873. Indoor Environmental Control. 3 Hours.
(Formerly MEEG 4473.) Gives student a thorough understanding of the fundamental theory of air conditioning design for commercial buildings, including calculating heating and cooling loads along with the proper selection and sizing of air conditioning equipment. Graduate degree credit will not be given for both MEEG 4473 and MEEG 5873. Prerequisite: MEEG 4413. (Typically offered: Irregular)