6620. Algebraic Topology. 3 hours. Topics from algebraic topology such as fundamental group, singular homology, fixed point theorems, cohomology, cup products, Steenrod powers, vector bundles, classifying spaces, characteristic classes and spectral sequences. Prerequisite(s): MATH 5530 and 5620. May be repeated for credit.

6710. Topics in Applied Mathematics. 3 hours. Optimization and control theory, perturbation methods, eigenvalue problems, generalized functions, transform methods and spectral theory. May be repeated for credit.

6810. Probability. 3 hours. Probability measures and integration, random variables and distributions, convergence theorems, conditional probability and expectation, martingales, stochastic processes. May be repeated for credit.

6900-6910. Special Problems. 1–3 hours each.

6940. Individual Research. Variable credit. To be scheduled by the doctoral candidate engaged in research. May be repeated for credit.

6950. Doctoral Dissertation. 3, 6 or 9 hours. To be scheduled only with consent of department. 12 hours credit required. No credit assigned until dissertation has been completed and filed with the graduate dean. Doctoral students must maintain continuous enrollment in this course subsequent to passing qualifying examination for admission to candidacy. May be repeated for credit.

Mechanical and Energy Engineering

Mechanical and Energy Engineering , MEEN

5100. Advanced Energy Conversion. 3 hours. Axiomatic presentation of the law of thermodynamics including corollaries and applications related to energy conversion, the exergy method and entropy dissipation method for the evaluation of thermodynamic systems and cycles, thermodynamic equilibrium and stability, irreversible thermodynamics, chemical equilibria and applications in combustion.

5110. Alternative Energy Sources. 3 hours. Introduction to the physics, systems and methods of energy conversion from non-conventional energy sources, such as solar, geothermal, ocean-thermal, biomass, tidal, hydroelectric, wind and wave energy. Advantages and disadvantages of alternative energy sources and engineering challenges for the harnessing of such forms of energy; energy storage; fuel cells.

5112. Nuclear Energy. 3 hours. Atomic physics and the structure of the atom; radioactivity; interactions of neutrons with matter; nuclear cross-sections; nuclear fuels and fuel elements; elements of nuclear reactors; components and operation of nuclear power plants. Notable accidents of nuclear reactors. Breeder reactors.

5120. Advanced Fluid Dynamics. 3 hours. Fundamentals of vector and tensor notation and formulation of governing equations; model of inviscid and viscous flow, vorticity and circulation; exact solutions; turbulence; boundary layer theory; free surface flow; compressible flow. Prerequisite(s): MATH 2730, MEEN 3120.

5140. Advanced Mathematical Methods for Engineers. 3 hours. Provides an introduction to advanced mathematical methods used in engineering science, such as vector calculus, integral transforms, partial differential equations and numerical methods.

5200. Principles of HVAC. 3 hours. Thermodynamics and psychometrics applied to the HVAC system calculations, energy estimating methods, ducts and piping systems, heat pump and heat recovery systems, air-processing, refrigeration and heating equipment.

5210. Solar Energy. 3 hours. Fundamentals of radiation processes, blackbody and gray-body; and gray-body radiation; solar radiation flat-plate and parabolic collectors; concentration optics and practical solar concentration devices; central receivers, solar ponds, power cycles of solar plants; thermal storage subsystems and system design.

5220. Computational Fluid Dynamics and Heat Transfer. 3 hours. Finite difference, finite volume, and finite element computational methods; techniques for building geometry and meshing; commercial software; modeling and numerically solving real-world fluid flow and heat transfer problems. Prerequisite(s): MEEN 3120, MEEN 3210.

5250. Dispersed Multiphase Flow and Heat Transfer. 3 hours. Characteristics of particles, bubbles and drops; conservation equations, creeping flow solution, flow and heat transfer at higher Reynolds numbers; the treatment of non-spherical particles, bubbles, and drops; effects of rotation and shear; two-way effects of turbulence; effects of higher concentration, molecular and statistical description.

5800-5810. Topics in Mechanical and Energy Engineering. 3 hours. Selected topics of contemporary interest in mechanical engineering. Prerequisite(s): consent of instructor. May be repeated for credit as topics vary.

5900-5910. Special Problems in Mechanical and Energy Engineering. 1–6 hours. Special problems in mechanical and energy engineering for graduate students only. Prerequisite(s): Approval the student's supervisor and/or consent of department. May be repeated for credit.

5920. Cooperative Education in Mechanical and Energy Engineering. 3 hours. Supervised field work in a job directly related to the student's major, professional field of study or career objectives. Summary report required. Prerequisite(s): consent of department.

5950. Masters Thesis. 3 or 6 hours. A minimum of 6 hours of thesis work is required. No credit is assigned until the thesis is filed and approved by the dean of the graduate school. Continuous enrollment is required once thesis work has begun. Prerequisite(s): approval of the student's supervisor and/or consent of department.

Mechanical Engineering Technology

see *Undergraduate Catalog*