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

MATH 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

MEEN 5110. Alternative Energy. 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.

MEEN 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.

MEEN 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.

MEEN 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.

MEEN 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.

MEEN 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.

MEEN 5300. Advanced Thermodynamics. 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.

MEEN 5310. Conduction and Radiation Heat Transfer. 3 hours. Includes heat conduction for 1-, 2- and 3-dimensional systems; separation of variables; Duhamel's theorem; Green's function; Laplace transforms; radiative properties of particulate media, semi-transparent media, and 1-dimensional gray media; and integro-differential equations. Prerequisite(s): consent of department.

MEEN 5311. Convection Heat Transfer II. 3 hours. Explores fundamental equations of fluid flow and heat transfer; internal and external heat transfer; laminar and turbulent heat transfer; similarity solutions; integral method; and boundary layer equations. Prerequisite(s): consent of department.

MEEN 5315. Nanoscale Energy Transport. 3 hours. Explores microscopic heat carriers and transport; material waves; energy states in solids; statistical description of thermodynamics; waves; particle transport process; semiconductor materials; and interfacial phenomena for non-coventional liquids. Prerequisite(s): consent of department.

MEEN 5320. Biofluid Dynamics. 3 hours. Review of basic fluid mechanics and heat and mass transfer; blood rheology; basic physiology as it relates to biotransport phenomena; and circulatory and respiratory systems. Prerequisite(s): consent of department.

MEEN 5330. Combustion Science and Engineering. 3 hours. Examines fuels and combustion; combustion stoichiometry; chemical equilibrium; adiabatic flame temperature; reaction kinetics; transport processes; conservation laws; ignition processes; gas flames classification; premixed flames; laminar and turbulent regimes; flame propagation; deflagrations and detonations; diffusion flames; pollutant formation; atmospheric impacts; engine combustion; solid phase combustion; combustion diagnostics; and combustion applications. Prerequisite(s): MEEN 3110 or consent of department.

MEEN 5340. Advanced Fluid Mechanics. 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. Prerequisite(s): consent of department.

MEEN 5350. 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.

MEEN 5351. Multiphase Flow Modeling. 3 hours. Covers a broad spectrum of numerical techniques for multiphase flow modeling, ranging from the continuum fluid model to discrete particle method. Examines the fundamentals of multiphase flows, including motion of a single particle in a viscous fluid, particle fluidization, and flow in porous media. Prerequisite(s): consent of department.

MEEN 5410. Introduction to Solid Mechanics. 3 hours. Explores tensor analysis; kinematics and kinetics of motion; material constitutive law; 2- and 3-dimensional stress analysis; stress concentration; fracture mechanics; contact mechanics; plates and shells; finite element methods; and wave propagation. Prerequisite(s): consent of department.

MEEN 5420. Continuum Mechanics. 3 hours. Describes the fundamental law of physics applicable to a continuous medium and develops the linear theory. Introduces Cartesian tensors, state of stress, kinematics of deformation, and constitutive equations of mechanics and thermodynamics. Prerequisite(s): consent of department.

MEEN 5800-MEEN 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.

MEEN 5890. Directed Study in Mechanical and Energy Engineering. 1–3 hours. Study by individuals or small groups. Plan of study must be approved by supervising faculty. Written report is required. May be repeated for 6 credit hours, but a maximum of 3 credit hours can apply to major.

MEEN 5900-MEEN 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.

MEEN 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.

MEEN 5940. Graduate Seminar in Mechanical and Energy Engineering. 1–3 hours. Provides exposure to multidisciplinary research and opinions on current and future issues from industrial, scientific, academic, governmental and engineering experts from mechanical and energy engineering areas. Prerequisite(s): consent of department.

MEEN 5950. Master's 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*

Merchandising and Hospitality Management

Merchandising and Hospitality Management, SMHM

SMHM 5000. Merchandising and Hospitality Management Study Tour. 1–3 hours. Experiential learning in industry centers for fashion, home furnishings, and/or hospitality provides a context for career development as well as an overview of the industry at work. Students collect and synthesize primary and secondary data into comprehensive analyses for career opportunities, trends, brands and other appropriate elements for the fashion, home furnishings, and hospitality industries. Prerequisite(s): consent of school. Pre-trip and post-trip classes are required. No more than three hours of field study may be used to fulfill degree requirements. (Meets with SMHM 4000.)

SMHM 5010. Merchandising Foundations. 3 hours. A functional analysis of merchandising principles and concepts and their importance in fashion markets in the retail sector. Stresses the importance of margin to the profit function of the enterprise.

SMHM 5080. Merchandising Ventures. 3 hours. Study of entrepreneurship skills and strategies resulting in application to a business plan that establishes a new venture with fashion and/or home furnishings products. Additionally, students independently identify and investigate innovative entrepreneurial ventures that culminate in a comprehensive research product. Prerequisite(s): SMHM 2090 or SMHM 2400 or SMHM 2490; SMHM 3510 or ACCT 2010; or consent of instructor. (Meets with SMHM 4080.)

SMHM 5090. Virtual Merchandising. 3 hours. (2;2) Merchandising application through experiential learning that ultimately results in the development of a product- or service-based web site with an emphasis on target market appeal, appropriate merchandising applications, and a suitable web site infrastructure based on objective research including data collection from a relevant population sample. Students apply theory and critical thinking skills to a virtual merchandising format. Prerequisite(s): SMHM 2090 or SMHM 2400 or SMHM 2490 or consent of instructor. (Meets with SMHM 4090.)

SMHM 5200. Survey of Beverages in the Hospitality Industry. 3 hours. Examination of wines, beers, and distilled spirits with a focus on vinicultural techniques, beer and distilled spirit production and classification, styles of wine and other beverages, and theory of wine and food pairing. Prerequisite(s): students must be 21 years of age or older.

SMHM 5210. Hospitality Cost Controls. 3 hours. Critical analysis of the food, beverage and labor cost control systems used in the hospitality industry. Emphasizes the identification, analysis and evaluation of control systems used for hospitality managerial planning. Develops procedures for successful control of business expenses. Prerequisite(s) undergraduate financial and managerial accounting or consent of department. (Meets with SMHM 4210.)

SMHM 5240. Global Fashion Retailing. 3 hours. A strategic perspective of fashion-oriented products in a dynamic marketplace. Included are case analyses of merchandising principles practiced by representative companies. Interpretations of global trends and issues affecting multi-channel distribution.

SMHM 5250. Restaurant Development. 3 hours. The identification, examination and application of restaurant development principles. Topics include menu planning, service styles, dining room and kitchen design, materials purchasing and receiving, food production techniques, accounting and financial management, and merchandising.

SMHM 5260. Hospitality Business Strategies. 3 hours. Critical thinking and strategic planning processes for hospitality operations. Analyze financial business plans, human resources plans and marketing plans for hospitality organizations; address leadership issues and global dimensions of management for hospitality organizations; analyze ethical issues and legal issues in managing hospitality enterprises, create solutions for hospitality operations from corporate and entrepreneurial perspectives. Utilize case study analysis and computer applications to apply principles.

SMHM 5280. Hotel and Restaurant Operations: Theory and Analysis. 3 hours. A study of hotel and restaurant management operations problems, including the areas of budgeting, human resource scheduling and payroll control, sales forecasting, costing and financial statement analysis. Students will be actively involved in writing and discussing cases on current operations issues.