

Descriptions for Graduate Mechanical Engineering Courses Fall 2023

ENGR 6305 Engineering Materials (3 sch)

Detailed exploration of engineering materials including the strengthening mechanisms and properties of engineering alloys, polymers, and composites; analysis of the effects of processing on material properties; exploration of the material selection process in design.

Prerequisite: graduate standing or permission of the course instructor.

ENGR 6310 Advanced Engineering Analysis (3 sch)

Designed to provide graduate students with the analytical mathematical tools to analyze complex engineering problems. Topics include power series solutions, Laplace transform, eigenvalue problem, Fourier series and integrals, classification, and solutions to partial differential equations (diffusion, wave, and Laplace's equations), and complex variable theory.

Prerequisite: graduate standing or permission of the course instructor.

ENGR 6315 Design of Experiments (3 sch)

Design and analysis of experiments with a focus on process optimization. Simple comparative experiments; experiments with a single factor: the analysis of variance; randomized blocks, Latin squares, and factorial designs; experiments with random factors; nested and split-plot designs.

Prerequisite: graduate standing or permission of the course instructor.

MENG 6320 Heating, Ventilating, and Air Conditioning (3 sch)

This course is designed to enable students to perform fundamental analyses and design of heating, ventilating, and air conditioning (HVAC) systems. The topics covered include moist air properties, basic air conditioning processes, comfort and health design conditions, space heating and cooling load calculations, duct and pipe sizing, and HVAC Systems and Equipment. A comprehensive design project is a requirement of this course.

Prerequisite: graduate standing or permission of the course instructor.

MENG 6325 Optimal Design of Thermo-Fluid Systems (3 sch)

Selection of components in fluid- and energy-processing systems to meet system performance requirements. Modeling of components and systems. Simulation of thermal systems. Economic considerations. Formulation for optimization. Design modeling of thermal systems and its methods of optimization. Calculus based methods of optimization. Direct search methods of optimization.

Prerequisite: graduate standing or permission of the course instructor.

MENG 6330 Intermediate Mechanics of Materials (3 sch)

Topics covered in this course are analysis of stress and strain, introduction to the theory of elasticity, Airy's stress function, Hertz contact stresses, failure criteria, bending of asymmetrical cross sections, bending of curved beams, Saint Venant's theory of torsion, axisymmetrically loaded members, beams on elastic foundations, energy methods, elastic stability, and an introduction to stresses in plates and shells.

Prerequisite: graduate standing or permission of the course instructor.

MENG 6335 Intermediate Dynamics (3 sch)

Dynamics of a particle and systems of particles, Lagrange's equations, kinematics, and dynamics of rigid bodies in two and three-dimensions. Prerequisite: graduate standing or permission of the course instructor.

MENG 6340 Intermediate Fluid Mechanics (3 sch)

Deformation, stress, and pressure distribution in fluids. Integral relations for a control volume. Differential relations of fluid flow. Navier-Stokes equation and theory of viscous flow. Laminar boundary layer theory and von Karman momentum integral method. Turbulence. Dimensional analysis and similarity. Prerequisite: graduate standing or permission of the course instructor.

MENG 6345 Engineering Optimization (3 sch)

Advanced optimal design of mechanical systems. Unconstrained optimization in several variables (e.g., gradient search, random search), constrained optimization in several variables (e.g., linear programming, nonlinear programming, Lagrange multipliers, geometric programming), and problems structured for multistage decision (e.g., dynamic programming). Formulation of problems which can be solved by these techniques. Project involving the application of one or more optimization methods. Prerequisite: graduate standing or permission of the course instructor.

MENG 6350 Applied Finite Element Analysis (3 sch)

This course assists graduate students new to the field of structural analysis using finite element analysis (FEA). The course focuses on mechanical design and strength of materials applications using FEA, and particular emphasis is placed in hands-on experience of a large-scale, general purpose commercial software package. Topics covered in the course are introduction to FEA, trusses, axial members, beams and frames, fundamental of stress analysis, plane stress problems, three-dimensional stress analysis, and dynamic problems. Prerequisite: graduate standing or permission of the course instructor.

MENG 6355 Advanced Heat Transfer (3 sch)

This course is designed to enable students to analyze general problems of heat transfer by conduction, convection, and radiation. The topics include analytical and approximate solutions of steady and unsteady conduction, fully developed and developing internal and external laminar and turbulent forced and natural convection, radiation in absorbing and transmitting media, and boiling and condensation. Prerequisite: graduate standing or permission of the course instructor.

MENG 6360 Fatigue Design and Fracture Mechanics (3 sch)

This course is concerned with the design, development, and failure analysis of components, structures, and vehicles subjected to cyclic loading or when structural design decisions are based on fatigue resistance and durability. The course covers the following topics fatigue as phenomenon-in the material, stress-life approach, strain-life method, fracture mechanics, notches and their effects, variable amplitude loading, and multiaxial stresses in fatigue. Prerequisite: graduate standing or permission of the course instructor.

MENG 6389 Special Topics in Mechanical Engineering (3 sch)

Occasionally offered special topics course in Mechanical Engineering to be used as an elective course in the master's degree program. Prerequisite: graduate standing or permission of the course instructor.

MENG 6399 Master's Thesis (3 sch)

This course meets the research requirements for the thesis option in the master's degree program. Prerequisite: graduate standing or permission of the course instructor.