MECHANICAL ENGINEERING (MENG)

MENG 8066 AIR CONDITIONING SYSTEM DESIGN (3 credits)
Application of thermodynamic principles to the design of air conditioning systems. A comprehensive design project will be an integral part of the course. (Cross-listed with MENG4060)
Prerequisite(s)/Corequisite(s): MENG3000

MENG 8076 POWER PLANT SYSTEM DESIGN (3 credits)
Application of the thermodynamic and fluid dynamic principles to the design of power plants. A comprehensive design project will be an integral part of the course. (Cross-listed with MENG4070)
Prerequisite(s)/Corequisite(s): MENG3000

MENG 8086 HEAT EXCHANGER DESIGN (3 credits)
Design methodology for various heat exchangers employed in mechanical engineering. Introduction to computer-aided design as applied to heat exchangers. Hands-on exercises in actual design tasks. (Cross-listed with MENG4080)
Prerequisite(s)/Corequisite(s): MENG3000

MENG 8206 HEAT TRANSFER (3 credits)
Heat Transfer by conduction, convection, and radiation. Correlation of theory with experimental data and engineering design. (Cross-listed with MENG4200)
Prerequisite(s)/Corequisite(s): MENG3000

MENG 8226 INDUSTRIAL QUALITY CONTROL (3 credits)
Statistical process control and quality assurance techniques in manufacturing. Control charts, acceptance sampling, and analyses and design of quality control systems. (Cross-listed with MENG4220)
Prerequisite(s)/Corequisite(s): MENG3120 or STAT3800

MENG 8386 MECHANICS OF BIOMATERIALS (3 credits)
Theory, application, simulation, and design of biomaterials that apply mechanical principles for solving medical problems (case studies in artery, brain, bone, etc.). Tentative topics include Mechanical characterization of biomaterials; Bio-manufacturing a tissue; Function-structure relationship; Design and analysis of medical implants; Active response of biomaterials; growth and remodeling mechanism; Cellular behavior and measurements, etc. (Cross-listed with MENG4380)
Prerequisite(s)/Corequisite(s): MENG3430. Not open to nondegree students

MENG 8456 MECHANICAL ENGINEERING DESIGN CONCEPTS (3 credits)
Development of design concepts. Introduction to synthesis techniques and mathematical analysis methods. Application of these techniques to mechanical engineering design projects. (Cross-listed with MENG4450)
Prerequisite(s)/Corequisite(s): MENG200, MENG3420, MENG3500, MENG3100 or CIVE310. Not open to nondegree graduate students.

MENG 8476 MECHANICAL ENGINEERING DESIGN II (2 credits)
Definition, scope, analysis, synthesis, and the design for the solution of a comprehensive engineering problem in any major area of mechanical engineering. (Cross-listed with MENG4470)
Prerequisite(s)/Corequisite(s): MENG4460, not open to nondegree students

MENG 8486 ADVANCED MECHANICS OF MATERIALS (3 credits)
Prerequisite(s)/Corequisite(s): MENG3250 or EMEC3250; and MENG3730 or EMEC3730.

MENG 8496 ADVANCED DYNAMICS (3 credits)
Particle dynamics using Newton's laws, energy principles, momentum principles. Rigid body dynamics using Euler's equations and Lagrange's equations. Variable mass systems. Gyroscopic motion. (Cross-listed with MENG4470)
Prerequisite(s)/Corequisite(s): MENG3730 or EMEC3730; and MATH2350. Not open to nondegree graduate students.

MENG 8506 MECHANICAL ENGINEERING CONTROL SYSTEMS DESIGN (3 credits)
Applications of control systems analysis and synthesis for mechanical engineering equipment. Control systems for pneumatic, hydraulic, kinematic, electromechanical, and thermal systems. (Cross-listed with MENG4500)
Prerequisite(s)/Corequisite(s): MENG3500. Not open to nondegree graduate students.

MENG 8510 INTRODUCTION TO FINITE ELEMENT ANALYSIS (3 credits)
Prerequisite(s)/Corequisite(s): MENG3250 and MENG8806 or permission

MENG 8526 EXPERIMENTAL STRESS ANALYSIS I (3 credits)
Investigation of the basic theories and techniques associated with the analysis of stress using mechanical strain gages, electric strain gages, brittle lacquer, photoelasticity and membrane analogy. (Cross-listed with MENG4520)
Prerequisite(s)/Corequisite(s): MENG3250 or EMEC3250.

MENG 8546 INTRODUCTION TO CONTINUUM MODELING (3 credits)
Basic concepts of continuum modeling. Development of models and solutions to various mechanical, thermal and electrical systems. Thermo-mechanical and electro-mechanical coupling effects. Differential equations, dimensional methods and similarity. (Cross-listed with MENG4540)
Prerequisite(s)/Corequisite(s): MATH2350; MENG3250 or EMEC3250; MENG3730 or EMEC3730. Not open to nondegree graduate students.

MENG 8556 VEHICLE DYNAMICS (3 credits)
Introduction to basic mechanics governing automotive vehicle dynamic acceleration, braking, ride, handling and stability. Analytical methods, including computer simulation, in vehicle dynamics. The different components and subsystems of a vehicle that influence vehicle dynamic performance. (Cross-listed with MENG4550)
Prerequisite(s)/Corequisite(s): MENG3430, MENG3500. Not open to nondegree graduate students.

MENG 8586 DIGITAL CONTROL OF MECHANICAL SYSTEMS (3 credits)
Introduction to digital measurement and control of mechanical systems. Applications of analysis and synthesis of discrete time systems. (Cross-listed with MENG4580)
Prerequisite(s)/Corequisite(s): MENG4500. Not open to nondegree graduate students.

MENG 8706 THEORY AND PRACTICE OF MATERIALS PROCESSING (3 credits)
Theory, practice and application of conventional machining, forming, and non-traditional machining processes with emphasis on tool life, dynamics of machine tools and adaptive control. (Cross-listed with MENG4700)
Prerequisite(s)/Corequisite(s): MENG4740. Not open to nondegree graduate students.

MENG 8746 MANUFACTURING SYSTEMS I (3 credits)
Principles of automated production lines; analysis of transfer lines; machine tools and adaptive control. (Cross-listed with MENG4700)

Prerequisite(s)/Corequisite(s): MENG4070. Not open to nondegree graduate students.
MENG 8750 VIBRATION THEORY AND APPLICATIONS (3 credits)
Variational principles, Lagrange’s Equation. Equations of motion for multi-
degree of freedom systems. Free vibrations, eigenvalue problem; modal
analysis. Forced vibrations: general solutions, resonance, effect of damping,
and superposition. Vibrations of continuous systems: vibrations frequencies
and mode shapes for bars, membranes, beams, and plates. Experimental
methods and techniques.
Prerequisite(s)/Corequisite(s): MENG 3730; and MATH 3350 or MATH
8355
MENG 8766 MANUFACTURING INFORMATION SYSTEMS (3 credits)
An exploration of information systems and their impact in a manufacturing
environment. Software, hardware, database systems, enterprise resource
planning, networking, and the internet. (Cross-listed with MENG 4760)
Prerequisite(s)/Corequisite(s): Senior standing, and CIST 1400 or
CSCI 1620 or CSCI 2240.
MENG 8806 NUMERICAL METHODS IN ENGINEERING (3 credits)
Numerical algorithms and their convergence properties in: solving
nonlinear equations; direct and iterative schemes for linear systems of
equations; eigenvalue problems; polynomial and spline interpolation; curve
fitting; numerical integration and differentiation; initial and boundary
value problems for Ordinary Differential Equations (ODE’s) and systems of
ODE’s with applications to engineering; finite difference methods for partial
differential equations (potential problems, heat-equation, wave-equation).
(Cross-listed with MENG 4800)
Prerequisite(s)/Corequisite(s): MATH2350 or MATH8355
MENG 8836 ENGINEERING ANALYSIS WITH FINITE ELEMENTS (3
credits)
Analysis of engineering systems using finite elements; a critical and
challenging task performed during the design process for many engineering
systems. Four very distinct domains are studied: Structural stress analysis,
heat transfer, fluid flow, and modal analysis. (Cross-listed with MENG 4830)
Prerequisite(s)/Corequisite(s): MENG 3100, MENG 3430, MENG 3500;
Pre/Coreq: MENG4200. Not open to non-degree graduate students.
MENG 8916 SPECIAL TOPICS IN ENGINEERING MECHANICS (1-6
credits)
Treatment of special topics in engineering mechanics by experimental,
computational and/or theoretical methods. Topics will vary from term to
term. (Cross-listed with MENG 4910)
MENG 8986 LABORATORY AND ANALYTICAL INVESTIGATIONS (0-6
credits)
Investigation and written report of research into specific problem in any
major area of mechanical engineering (Cross-listed with MENG 4980)
MENG 9180 FUNDAMENTALS IN FINITE ELEMENTS (3 credits)
Theory of finite elements. Displacement versus force method. Formulation of
element stiffness matrices. Convergence criteria. Solution methods for large
sets of equations. Application to trusses, frames, plates and shells.
Prerequisite(s)/Corequisite(s): MENG 8486, MENG 8806, or CIVE 851
MENG 9210 QUALITY ENGINEERING: USE OF EXPER DESIGN &
TECHNIQUES (3 credits)
Extension of industrial quality control methods and techniques. Off-line
and on-line quality control methods. Development of quality at the design state
through planned experiments and analyses. Experimental design methods
will include factorial, 2k, 3k, and factional factorials designs. The course will
include an applied project in design of quality.
MENG 9250 MANUFACTURING AND DYNAMIC SYSTEMS
MODELING (3 credits)
Difference and differential equation models directly from series of observed
data. Underlying system analysis including impulse response, stability
and feedback interpretation. Forecasting and accuracy of forecasts.
Periodic and exponential trends in seasonal series. Modeling two series
simultaneously. Minimum mean squared error control and forecasting by
leading indicators. Illustrative applications to real life data in science and
engineering.
Prerequisite(s)/Corequisite(s): MATH 8356.
MENG 9300 MECHANICS OF COMPOSITE MATERIALS (3 credits)
Introduction to composite materials. Properties of anisotropic lamina.
Prerequisite(s)/Corequisite(s): MENG 4480 or MENG 8486
MENG 9330 THEORY OF ELASTICITY I (3 credits)
Plane stress and strain. Solution of two-dimensional problems by
polynomials. Two-dimensional problems in polar coordinates. Triaxial stress
and strain. Torsion of noncircular cross section. Bending of prismatical bars.
Hydrodynamical analogies.
Prerequisite(s)/Corequisite(s): MENG 4480 or MENG 8486,
MATH 2350.
MENG 9370 THEORY OF PLATES AND SHELLS (3 credits)
Basic equations for the bending and stretching of thin plates with small
deformations. General theory of deformation of thin shells with small
deflections. Large deformations theories of plates and shells. Effect of edge
conditions.
Prerequisite(s)/Corequisite(s): MENG 8486, MATH 8336
MENG 9420 THEORY OF PLASTICITY (3 credits)
Basic concepts of plasticity. Yield conditions and yield surfaces. Torsion of
cylindrical bars and Saint Venant-Mises and Prandtl-Reuss theories. General
theory of plane strain and shear lines. Steady and pseudo-steady plastic
Prerequisite(s)/Corequisite(s): MENG 9330
MENG 9700 ADVANCED MANUFACTURING PROCESSING (3 credits)
Theory, practice and technology of advanced manufacturing processes,
with emphasis on process mechanism, surface integrity, tool and machine
design, adoptive control and expert systems.
Prerequisite(s)/Corequisite(s): Permission.