

**Descriptions – Mechanical Engineering  
of  
Courses**

**814. Radiative Heat Transfer**  
*Spring. 3(3-0) Approval of department.*

Statistical mechanics and thermodynamics of radiation. Study of spectral properties. Radiative transfer in media. Selected applications.

**815. Advanced Classical Thermodynamics**  
*Fall of odd-numbered years. 3(3-0) ME 416; MTH 422 or MTH 424 or concurrently.*

Postulational treatment of the laws of thermodynamics. Equilibrium and maximum entropy postulates. Development of formal relationships. Principles for general systems. Applications to chemical, magnetic, electric and elastic systems.

**817. Conductive Heat Transfer**  
*Fall. 3(3-0) ME 411, ME 351.*

Theory of steady and unsteady heat conduction in isotropic and anisotropic media. Derivation of various describing equations and boundary conditions. Numerical methods. Nonlinear problems. Heat sources. Extended surfaces. Duhamel's integral.

**823. Theory of Vibrations I**  
*Fall. 4(4-0) ME 455. Interdepartmental with the department of Metallurgy, Mechanics and Materials Science.*

Discrete and continuous parameter systems with linear and nonlinear characteristics. Variational principles; equations of motion. Matrices, quadratic forms; self-adjoint operators; eigenvalues. Transient and random excitations. Theory developed through physical problems.

**826. Kinematics of Machines II**  
*Fall. 3(3-0) ME 320.*

Analysis and synthesis of mechanisms using complex variables. Euler-Savary equation. Polynomial cam design. Synthesis of function generators. Computer mechanisms.

**827. Machine Design III**  
*Spring, Summer. 3(3-0) ME 421.*

Strain energy method for analyzing statically indeterminate machine members, theories of failure, fatigue, use of statistics in selection of tolerances for parts in mass production. Optimum design.

**828. Machine Design IV**  
*Winter. 3(3-0) ME 421.*

Application of design theory to the synthesis of complete mechanical and hydraulic systems. Stress waves due to impact loading. Critical speed.

**832. Refrigeration**  
*Spring. 3(3-0) ME 436.*

Characteristics of refrigerants; application details pertaining to comfort cooling, food refrigeration, and ultra-low temperature units; refrigeration controls, and control systems.

**840. Intermediate Fluid Mechanics**  
*Fall. 3(3-0) ME 332 or CE 321.*

Deformable control volumes, Navier-Stokes equations, dimensionless variables, vorticity and circulation, turbulent flow, inviscid flow, and boundary layer theory.

**841. Advanced Gas Dynamics**  
*Spring. 3(3-0) ME 432; MTH 322 or MTH 422 or MTH 424 or approval of department.*

Compressible subsonic and supersonic flow, shock waves, expansion fans, inviscid equations, perturbation theory, similarity rules, methods of measurement, method of characteristics, hodograph methods.

**842. Inviscid Fluids**  
*Spring. 3(3-0) MMM 810; MTH 322 or MTH 423.*

Kinematics; dynamical equations; potential flows, transformations, Helmholtz flows; added masses, forces and moments; vortex motion; wave motion.

**843. Turbulence**  
*Winter, Summer. 4(4-0) MMM 810 or approval of department.*

Basic equations of turbulent motions including momentum, kinetic energy, scalar contaminants, correlation and spectrum functions. Basic elements of statistical descriptions, isotropic and shear flows, phenomenological theories and hotwire anemometry.

**851. Modeling of Engineering Systems**  
*Fall, 4(4-0) ME 458 or EE 415. Interdepartmental with Systems Science.*

Modeling of engineering devices and components; assembly into systems; bond graph representation; prediction of dynamic behavior by linear, nonlinear and simulation methods; applications to mechanical, electrical, fluid, thermal systems.

**860. Topics in Parameter Estimation**  
*Spring. 4(4-0) May reenroll for a maximum of 8 credits when different topics are taken. STT 421 or STT 441 recommended.*

Nonlinear estimation of parameters in ordinary and partial differential equations. Related concepts in probability and statistics. Least squares, maximum likelihood and other estimators. Sequential methods. Optimum experiment design. Model-building.

**862. Mechanical and Aerospace Optimization**  
*Winter. 3(3-0) MTH 424.*

Elementary fundamentals of calculus of variations, maximum principle. Optimization techniques applied to fluids, gas dynamics, optimization of airfoil shapes, fuel consumption, heat transfer, wave propagation in solids and physical properties in plasmas.

**870. Wave Motion in Continuous Media I**  
*Winter of even-numbered years. 4(4-0) MTH 422, MMM 810 or approval of department.*

Linear and nonlinear waves in bounded and unbounded media. Reflection, refraction, diffraction. Dispersion. Shock and acceleration waves. Waveguides. Acoustical and optical analogies. Application to elastic, viscoelastic, plastic and fluid media.

**890. Special Topics**  
*Fall, Winter, Spring, Summer. 2 to 4 credits. May reenroll for a maximum of 9 credits. Approval of department.*

Special topics in mechanical engineering of current interest and importance.

**899. Master's Thesis Research**  
*Fall, Winter, Spring, Summer. Variable credit. Approval of department.*

**920. Theory of Vibrations II**  
*Winter of odd-numbered years. 4(4-0) MTH 422; ME 823 or approval of department. Interdepartmental with and administered by the Department of Metallurgy, Mechanics and Materials Science.*

Vibrations of one, two, and three-dimensional models of elastic and inelastic continua. Interaction phenomena. Stability. Variational methods. Applications to aeronautics, aerospace and undersea technology.

**921. Theory of Vibrations III**  
*Spring of odd-numbered years, Summer. 4(4-0) MMM 920 or approval of department. Interdepartmental with and administered by the Department of Metallurgy, Mechanics and Materials Science.*

Nonlinear oscillations. Resonance; subharmonics; self-sustained motions; stability. Methods of Poincare, van der Pol, etc. Random vibrations. Parametric excitations; stochastic processes; power spectra. Applications.

**925. Mechanical Engineering Problems**  
*Fall, Winter, Spring, Summer. Variable credit. May reenroll for a maximum of 9 credits. Approval of department.*

Analysis of advanced engineering problems involving design, thermodynamics, fluid dynamics, gas dynamics, space.

**942. Viscous Fluids**  
*Fall of even-numbered years. 3(3-0) MMM 810 or CHE 841.*

Exact solutions of Navier-Stokes equations, i.e., Oscillatory Motion, Laminar Jet, Converging Channel, etc.; Hydrodynamic Stability including free convection, surface tension, gravitational and free-surface instabilities, and Tollmien-Schlichting waves.

**970. Wave Motion in Continuous Media II**  
*Spring of even-numbered years. 4(4-0) ME 870 or approval of instructor. Continuation of ME 870.*

**999. Doctoral Dissertation Research**  
*Fall, Winter, Spring, Summer. Variable credit. Approval of department.*

**MEDICAL  
TECHNOLOGY M T**

**College of Human Medicine  
College of Osteopathic Medicine**

**201. Medical Technology**  
*Fall. 1(1-0) Approval of school.*  
Relationship of medical technology to medicine and research, and the necessary interaction with other paramedical sciences.

**401. Seminar in Medical Technology**  
*Spring. 1 credit. Juniors.*  
Acquaints students with the operation and administration of a hospital, the philosophy and understanding of the entire profession of medical technology.

**495. Independent Study**  
*Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 10 credits. Approval of department.*  
Independent study including assigned reading and reviews of appropriate scientific periodicals.