

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

**850. Advanced Space and Orbit Ballistics**  
Fall of odd-numbered years. 3(3-0) MMM 306; MTH 215, 309.

Particle motion; missile trajectories; motion of a rocket; orbits; effects of oblateness on satellite orbit; orbital lifetime; rendezvous transfer in earth-moon system; optimization; low thrust space propulsion systems; trip to Mars.

**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.

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

Special topics in mechanical engineering of current interest and importance.

**899. Research**  
(EGR 899.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

**917. Statistical Thermodynamics and Kinetic Theory of Gases**  
Fall of even-numbered years. 3(3-0) 416; MTH 322 or 422; or approval of department.

Relation of statistical mechanics and kinetic theory to thermodynamics. Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics. Information and communication theory. Jayne's formalism. Applications.

**920. Theory of Vibrations II**  
(MMM 904.) Winter of odd-numbered years. 4(4-0) MTH 422; 823 or approval of department. Interdepartmental with and administered by the Metallurgy, Mechanics and Materials Science Department.

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**  
(MMM 903.) Spring of odd-numbered years, Summer. 4(4-0) MMM 920 or approval of department. Interdepartmental with and administered by the Metallurgy, Mechanics and Materials Science Department.

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

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

Linear and non-linear wave propagation. Reflection, refraction, diffraction. Dispersion. Shock and acceleration waves. Acoustical and optical analogies. Applications to elastic, plastic, viscoelastic, fluid, electromagnetic, elastic dielectric, and stochastic media.

**924. Wave Motion in Continuous Media II**  
Spring of even-numbered years. 4(4-0)

923.  
Continuation of 923.

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

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

**930. Seminar**  
Fall, Winter, Spring. 1 credit. May re-enroll for a maximum of 3 credits in master's program; 6 credits in doctoral program. Open to graduate students of all colleges and departments.

Recent developments in space orbit theory, theory of space propulsion, magnetohydrodynamics, re-entry phenomena, ionosphere, space radiation phenomena, design of space vehicles, and developments in the field pertinent to space technology such as external environmental conditions, internal environmental conditions, effects upon space vehicle construction, etc.

**941. Advanced Gas Dynamics II**  
Fall of odd-numbered years. 3(3-0)

841.  
Transonic flows, blunt bodies in supersonic flows, three-dimensional supersonic flows, hodograph methods, characteristics, unsteady phenomena, physical gas dynamics.

**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.

**952. Slip and Free (Newtonian) Molecular Flows**  
Spring. 3(3-0) 412, 432.

Distribution function; Boltzmann equation; solutions of Enskog-Burnett, Grad; slip flow; drag coefficient; heat transfer. Free molecule flow; elastic and inelastic reflections; flow around bodies; resistance coefficient; heat; oblation; meteors.

**953. Plasma Dynamics (Magneto-Gas Dynamics)**  
Winter. 3(3-0) 432; PHY 491.

Fundamental equations of hydrodynamics; Maxwell equations; continuum; channel flow; boundary layer; shocks; Alfvén wave propagation; one and two fluid theories; discrete particle approach; plasma oscillations; flow around bodies and in nozzles; space propulsion systems.

**999. Research**  
(EGR 999.) 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**  
Fall. 1 credit. Seniors.

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 re-enroll for a maximum of 10 credits. Approval of department.

Independent study including assigned reading and reviews of appropriate scientific periodicals.

## MEDICINE MED

### College of Human Medicine

**512. Infectious Diseases**  
Fall. 4(3-3) MPH 511, or approval of department. Interdepartmental with and administered by the Microbiology and Public Health Department.

Infectious diseases of man, including biology of the causative microorganism, epidemiology, pathogenesis, host-parasite relationships, clinical and laboratory diagnosis, and clinical management.

**590. Special Problems in Medicine**  
Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 12 credits. Human Medicine students.

Each student will work under direction of a staff member on an experimental, theoretical or applied problem.

**608. Senior Medical Clerkship**  
Fall, Winter, Spring, Summer. 1 to 17 credits. May re-enroll for a maximum of 43 credits. Primary clerkship, third year Human Medicine students.

Based in community hospitals, this clerkship will stress interviewing skills, history, physical examination, along with problem solving and therapy, and care of the whole patient leading to independence in patient management.

**609. Hematology Clerkship**  
Fall, Winter, Spring, Summer. 1 to 17 credits. May re-enroll for a maximum of 34 credits. H M 603.

Development of skills in data collection, problem solving and management related to common hematologic disorders of children and adults.

**610. Oncology Clerkship**  
Fall, Winter, Spring, Summer. 1 to 17 credits. May re-enroll for a maximum of 34 credits. H M 603.

Development of skills in data collection, problem solving and management of the more prevalent cancers in children and adults.