

- 828. Machine Design IV**  
Winter. 3(3-0) M E 421.  
Application of design theory to the synthesis of complete mechanical and hydraulic systems. Stress waves due to impact loading. Critical speed.
- 829. Fluid Transients**  
Spring of odd-numbered years. 4(4-0) C E 828 or approval of department. Interdepartmental with and administered by Civil Engineering.  
Application of unsteady flow concepts and wave mechanics to hydraulic engineering; method of characteristics; surges and waterhammer in piping systems; unsteady open channel flow; oscillatory waves; similitude and models.
- 830. Intermediate Fluid Mechanics**  
(840.) Fall. 3(3-0) M E 332 or C E 321. Interdepartmental with Civil Engineering.  
Deformable control volumes, Navier-Stokes equations, dimensionless variables, vorticity and circulation, turbulent flow, inviscid flow, and boundary layer theory.
- 832. Refrigeration**  
Spring. 3(3-0) M E 436.  
Characteristics of refrigerants; application details pertaining to comfort cooling, food refrigeration, and ultra-low temperature units; refrigeration controls, and control systems.
- 841. Advanced Gas Dynamics**  
Spring. 3(3-0) M E 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 I**  
Fall. 3(3-0) M E 458 or F E 415. Interdepartmental with Systems Science.  
Modeling of engineering components and dynamic systems; mechanical, electrical, fluid, thermal, and transducer effects. Linear state-space responses, impedance methods. Simulation of linear models. Design project.
- 852. Modeling of Engineering Systems II**  
Winter. 3(3-0) M E 851. Interdepartmental with Systems Science.  
Continuation of M E 851. Modeling of nonlinear dynamic systems. Applications of phase-plane and linearization methods. Simulation of nonlinear systems. Design project.

- 853. Finite Dimensional Dynamical Systems**  
Spring. 3(3-0) M E 851 or SYS 826 or approval of department.  
Transition matrices and matrix exponentials, periodicity and reducibility; controllability and observability, weighting patterns, realizations and minimal realizations, least squares theory, free and fixed endpoint problems, canonical equations, conjugate and focal points.
- 854. Optimization Theory and Applications**  
(862.) Winter. 4(4-0) MTH 424 or approval of department.  
Formulation of optimization problems; projection methods and least squares theory; elementary fundamentals of calculus of variations; techniques applied to problems in dynamics, optimization of airfoil shapes, and fuel consumption.
- 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.
- 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.
- 917. Advanced Heat Conduction**  
Winter of even-numbered years. 3(3-0) M E 817 or CHE 826 or MTH 841.  
Exact analytical techniques including use of Green's function and integral transforms; approximate numerical methods; phase change problems; ablation; inverse heat conduction problems.
- 920. Theory of Vibrations II**  
Winter of odd-numbered years. 4(4-0) MTH 422; M E 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.
- 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.

- 970. Wave Motion in Continuous Media II**  
Spring of even-numbered years. 4(4-0) M E 870 or approval of instructor.  
Continuation of M E 870.
- 999. Doctoral Dissertation Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

## MEDICAL TECHNOLOGY M T

### College of Natural Science

- 110. Clinical Laboratory Science and Health Care Delivery**  
Fall. 2(2-0)  
The history and definition of medical technology, its diagnostic and therapeutic role in health care delivery, and its relationship to other allied health professions.
- 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. Approved through Summer 1984.
- 210. Exploration of the Disciplines of the Clinical Laboratory Sciences**  
Spring. 2(2-0) Sophomores in medical technology.  
Clinical laboratory disciplines including hematology, immunohematology, chemistry, microbiology, cytology, and histology through an examination of laboratory testing and its roles in the assessment, prevention, monitoring of health state.
- 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. Approved through Winter 1984.
- 404. General Pathology**  
(PTH 404.) Fall, Spring. 5(3-6) ANT 420, Junior Medical Technology majors, or approval of department. Interdepartmental with the Department of Pathology. Approved through Winter 1984.
- 410. General Pathology**  
Spring. 3(3-0) ANT 316; PSL 432 or concurrently. Interdepartmental with the Department of Pathology.  
Features of lethal and sublethal cell injury and inflammation and repair process. Definition of the major causes of pathologic change with a consideration of specific associated diseases.
- 411. Basic Histopathology**  
Spring. 2(1-2) ANT 420, PSL 432; M T 410 or concurrently. Interdepartmental with the Department of Pathology.  
Microscopic examination of cell injury and death, inflammation and tissue repair. Pathologic tissue changes in diseases resulting from degenerative changes, abnormal metabolism, neoplasia, immunologic processes, infection, mechanical trauma and malnutrition.

## Descriptions - Medical Technology

### of Courses

#### 420. Hematology

Winter, Summer. 3(3-0) BCH 401, PSL

432.

Physiology, pathophysiology and laboratory assessment of hematological states.

#### 421. Hematology Laboratory

Winter, Summer. 2(0-4) MT 420 or concurrently.

Laboratory techniques in hematology. Normal and abnormal blood cell morphology.

#### 430. Immuno-hematology

Fall, Spring. 3(3-0) MPH 462.

Genetics and immunology pertinent to blood group systems, antibody identification, and compatibility testing. Common practices of transfusion centers. Clinical correlations related to transfusion reactions and to hemolytic disease of the newborn.

#### 431. Immuno-hematology Laboratory

Fall, Spring. 2(0-4) M T 430 or concurrently.

Techniques relevant to practice of immunohematology. Special emphasis on blood typing, antibody screening and identification, compatibility testing, prenatal and postnatal testing, quality assurance and problem solving.

#### 440. Clinical Microscopy and Hemostasis

Winter, Summer. 2(2-0) PSL 432, BCH 401.

Renal physiology pertinent to the physical, chemical, and microscopic analysis of urine. The coagulation and fibrinolytic mechanisms including inherited and acquired diseases, laboratory testing and anticoagulant therapy.

#### 441. Clinical Microscopy and Hemostasis Laboratory

Winter, Summer. 1(0-2) MT 440 concurrently.

Routine urinalysis including the physical, chemical and microscopic examination. Semi-automated procedures for routine coagulation testing including prothrombin times, partial thromboplastin times, and factor assays.

#### 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.

## MEDICINE

## MED

### College of Human Medicine

#### 512. Infectious Diseases

Spring. 4(3-3) MPH 511, or approval of department. Interdepartmental with and administered by the Department of Microbiology and Public Health.

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

#### 520. Biology of Blood Diseases

Fall. 2(2-0) Enrollment in a college of medicine or a graduate program in a biological science.

Correlates basic science and clinical concepts of hematology.

#### 590. Special Problems in Medicine

Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 12 credits. Human Medicine students or approval of department.

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

#### 607. Ambulatory Care Clerkship

Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 9 credits. H M 602. Interdepartmental with the departments of Community Health Science, Family Practice, and Pediatrics and Human Development. Administered by the Department of Family Practice.

Outpatient experience, lasting an equivalent of 34 half-days and extending over a minimum of 26 weeks. Continuous and comprehensive patient care under supervision of appropriate physicians.

#### 608. Senior Medical Clerkship

Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll 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 reenroll for a maximum of 34 credits. MED 608.

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 reenroll for a maximum of 34 credits. MED 608.

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

#### 611. Cardiology Clerkship

Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. H M 602.

A clinical clerkship in which students evaluate in depth patients with cardiac diseases. This includes experiences with special diagnostic procedures including cardiac cuticularization, phonocardiography, echocardiography and electrocardiography.

#### 612. Nephrology/Urology Clerkship

Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. H M 602.

Integrated concepts of renal physiology and pathophysiology of renal disease. Clinical experience.

#### 613. Dermatology Clerkship

Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. H M 602.

Office based experience with a dermatologist to learn clinical skills in dermatology and develop observational and diagnostic skills in skin disease.

#### 614. Medical Chest Clerkship

Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. H M 602.

A clerkship covering four aspects of chest diseases: tuberculosis, diagnosis, pulmonary function, and physiology. The student works with medical residents, utilizing outpatient and hospital facilities.

#### 615. Gastroenterology Clerkship

Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. H M 602.

Referred patients with gastrointestinal problems are seen as either inpatients or outpatients. Many long term problems are followed. Patients with psychosocial problems are seen conjointly with Social Service.

#### 616. Allergy Clerkship

Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. MED 608 and H M 602 or PHD 608.

Office and hospital based experience to learn and develop diagnostic skills in allergy with a review of basic therapeutics as they relate to allergic diseases.

#### 617. Neurology Clerkship

Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. H M 602.

A combined office and inpatient experience that will provide the student with an opportunity to learn the concepts of evaluation and management of neurological disease.

#### 618. Infectious Disease Clerkship

Fall, Winter, Spring, Summer. 1 to 17 credits. May reenroll for a maximum of 34 credits. H M 602 and MED 608 or PHD 608. Interdepartmental with the Department of Microbiology and Public Health.

The clerkship emphasizes acquisition in depth of knowledge and skills essential in solution of clinical problems in infectious and immunologic diseases. Integrated basic science input is afforded through relevant seminars.

#### 620. Endocrinology and Metabolism Clerkship

Fall, Winter, Spring, Summer. 4 to 8 credits. May reenroll for a maximum of 16 credits. H M 602.

Clinical and/or clinical-research clerkship to allow the student to work closely with patients having endocrine diseases, electrolyte abnormalities, endocrine hypertension or diabetes mellitus.

#### 622. Diabetes and Metabolism Clerkship

Fall, Winter, Spring, Summer. 4 credits. H M 602; MED 608 and PHD 608.

Clinical experience with diabetic patients and other related endocrine disorders.

#### 626. Physical Medicine and Rehabilitation Clerkship

Fall, Winter, Spring, Summer. 4 to 8 credits. May reenroll for a maximum of 8 credits. H M 602; MED 608 and PHD 608.

Experience in prescription writing for physical medicine procedures, occupational therapy and rehabilitation skills.

#### 627. Rheumatology Clerkship

Fall, Winter, Spring, Summer. 4 credits. H M 602; MED 608 and PHD 608.

Combined office and hospital consultative clerkship which develops diagnostic skills in areas of rheumatic diseases.