825. Nonlinear Oscillations

Spring. 3(3-0) M E 455.

Perturbation methods. Weakly nonlinear ordinary differential equations. Modal interaction; saturation; internal resonances; subharmonic, superharmonic combination resonances; jump phenomenon. Laboratory demonstrations.

826. Kinematics of Machines II

Fall. 3(3-0) M E 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) M E 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) M E 421.

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

829. Fluid Transients

Fall. 3(3-0) M E 333 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; resonance phenomena.

830. Intermediate Fluid Mechanics

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 333 or M E 432 or M E 830 or M E 844 or approval of department.

Thermodynamics of fluid flow, one-dimensional compressible flow, shock waves, Prandtl-Meyer flow, one-dimensional unsteady flow, Riemann invariants, shock tube, small perturbation theory, similarity rules, method of characteristics.

842. Inviscid Flows

Winter. 3(3-0) M E 830 or M E 844; MTH 423 or approval of department.

Kinematics, dynamical equations, potential flow, singularities, vortex motion, virtual mass, flow past bodies, complex variables and conformal mapping, forces and moments.

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, isotroic and shear flows, phenominological theories and hot-wire anemometry.

844. Viscous Flows

Fall. 3(3-0) M E 333 or M E 830 or approval of department.

Kinematics, integral and differential conservation laws, Navier-Stokes equations, vorticity and circulation, similarity and dimensional analysis, laminar viscous flows, laminar boundary layer theory, similarity solutions, approximate methods, separation, thermal effects.

851. Modeling of Engineering Systems I

Fall. 3(3-0) M E 458 or E E 415.

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.

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 E E 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.

855. Digital Data Acquisition and Control

Winter. 3(3-0) M E 458, M E 463.

Real-time digital measurement and control programming. Analog-to-digital and digital-to-analog converters. Computer structure, binary arithmetic, boolean operations, open-loop and closed-loop control, laboratory projects.

856. Optimal Design of Mechanical Systems

Spring. 3(3-0) MTH 334; M E 455 or MMM 402 or approval of department.

Formulation of optimization problems with applications in mechanical and structural design. Optimal design of dynamic systems, sensitivity analysis. Computational methods in optimization.

857. Multibody Mechanics

Winter. 3(3-0) MMM 801 or approval of department.

Multibody mechanics theory and computational methods, rigid and deformable multibody kinematics and dynamics; modeling techniques, coordinate choices, automatic equation generation, solution techniques, linearization, optimization, animation.

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 Continous 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, visoelastic, 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.

925. Mechanical Engineering Problems

Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 9 credits. Approval of department.

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

960. Nonlinear Control

Fall of even-numbered years. 3(3-0) E E 827, M E 458 or E E 413. Interdepartmental with the Department of Electrical Engineering.

Input-output stability of feedback systems; describing function methods; relay control; stabilizing controllers; design techniques selected from variable structure, high-gain, geometric, Lyapunov-based, vibration, feedback linearization and tracking controls.

980. Advanced Topics in Heat Transfer

Spring. 3(3-0) M E 813, M E 814, M E 817 or approval of department.

Advanced topics in conduction, convection, radiation or phase-change heat transfer, interactive combined modes, or combined heat and mass transfer.

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

Winter. 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.

210. Exploration of the Disciplines of the Clinical Laboratory Sciences

Fall. 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.

211. Introduction to the Clinical Laboratory

Fall. 1(0-2) M T 210 or concurrently.

Basic laboratory techniques in clinical microbiology, immunohematology, hematology, hemostasis, clinical chemistry and clinical microscopy.

300. Foundations of Laboratory Practices

Fall. 3(3-0) Clinical Laboratory Sciences majors.

Quality assurance of clinical laboratory analysis.

400. Clinical Laboratory Sciences Educational Practices

Spring. 2(2-0) Clinical Laboratory Sciences majors, approval of Medical Technology Program.

Development and implementation of educational programs for clinical laboratory personnel. Includes scope of CLS education, administration of programs and accreditation standards.

401. Clinical Biochemistry Laboratory

(M T 301.) Spring. 1(0-3) M T 300, MT 412.

Laboratory techniques in clinical biochemistry. Emphasis on the quality assurance and clinical correlation of body fluid analysis.

410. General Pathology

(PTH 404., M T 404.) 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.

412. Clinical Biochemistry

(BCH 412.) Winter. 3(3-0) BCH 401; CEM 162. Medical Technology and Clinical Laboratory Sciences majors.

A comprehensive survey of clinical biochemistry; assessment of normal and pathologic physiology.

420. Hematology

Spring, Summer. 3(3-0) BCH 401, PSL 432.

Physiology, pathophysiology and laboratory assessment of hematological states.

421. Hematology Laboratory

Spring, Summer. 1(0-2) or 2(0-4) M T 420 or concurrently.

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

430. Immunohematology

Fall. 3(3-0) MPH 461.

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. Immunohematology Laboratory

Fall. 1(0-2) or 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. 1(0-2) or 2(0-4) M T 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.

451. Senior Seminar I

Fall. 3(3-0) Clinical Laboratory Sciences majors, approval of Medical Technology Program.

Problem oriented learning approach to develop managerial, scientific and educational leadership for the clinical laboratory. Topics to include clinical chemistry, hematology, immunology, microbiology, hemostasis, quality control, instrumentation.

452. Senior Seminar II

Winter. 3(3-0) M T 451.

Continuation of M T 451. Problems of increasing difficulty and based on additional topics in immunohematology and medical mycology.

453. Senior Seminar III

Spring. 3(3-0) M T 452.

Continuation of M T 452. Problems of increasing difficulty and based on additional topics from medical parasitology.

460. Medical Microbiology

Fall. 3(3-0) MPH 302 or MPH 304, MPH 427 or approval of department. Interdepartmental with and administered by the Department of Microbiology and Public Health.

Characterization of infectious agents and their pathogenic processes.

461. Medical Immunology and Microbiology

Winter. 5(5-0) MPH 301, MPH 302. Students may not receive credit in both MPH 461 and MPH 427. Interdepartmental with and administered by the Department of Microbiology and Public Health.

The immune system, cellular interaction of the in vitro and in vivo reaction, and associated immunopathology. Characterization of infectious agents and their pathogenic processes.

Approved through Fall 1989.

481. Clinical Chemistry

Fall, Winter, Spring, Summer. 6 credits. Clinical Laboratory Sciences majors, approval of Medical Technology Program.

Application of the theory and technical skills of chemistry in a clinical laboratory.

482. Clinical Hematology

Fall, Winter, Spring, Summer. 5 credits. Clinical Laboratory Sciences majors, approval of Medical Technology Program.

Application of the theory and technical skills of hematology in a clinical laboratory.

483. Clinical Immunohematology

Fall, Winter, Spring, Summer. 4 credits. Clinical Laboratory Sciences majors, approval of Medical Technology Program.

Application of the theory and technical skill of immunohematology in a clinical laboratory.

484. Clinical Microbiology

Fall, Winter, Spring, Summer. 6 credits. Clinical Laboratory Sciences majors, approval of Medical Technology Program.

Application of theoretical and technical aspects of clinical microbiology in a clinical laboratory.

485. Clinical Immunology

Fall, Winter, Spring, Summer. 1 credit. Clinical Laboratory Sciences majors, approval of Medical Technology Program.

Application of theoretical and technical aspects of clinical immunology in a clinical laboratory.

486. Clinical Hemostasis

Fall, Winter, Spring, Summer. 1 credit. Clinical Laboratory Sciences majors, approval of Medical Technology Program.

Clinical experience in the area of hemostasis. Structured to achieve proficiency in psychomotor skills, instrumentation, quality assurance, test evaluation and comprehension of concepts and principal in coagulation.

487. Clinical Body Fluid Analysis

Fall, Winter, Spring, Summer. 1 credit. Clinical Laboratory Sciences major, approval of Medical Technology Program.

Application of the theory and technical skills used in the analysis of body fluids in a clinical laboratory.

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.

800. Seminar

Fall Winter, Spring. 1(1-0) May reenroll for a maximum of 2 credits. Approval of Medical Technology Program.

Current research topics in the clinical laboratory sciences.

810. Preparation for Research in the Clinical Laboratory Sciences

Winter. 3(2-3) Approval of Medical Technology Program.

Directed reading and discussions related to research methodology, proposal presentations both written and oral, and research funding. Exposure to medical technology research facilities.

820. Advanced Human Hematology

(PTH 820.) Fall of odd-numbered years. 2(2-0) M T 420, M T 421 or approval of department. Interdepartmental with the Department of Pathology.

Selected topics in hematology including the pathogenesis, mechanisms and morphological picture of hemotologic diseases in humans.

840. Advanced Hemostasis

(PTH 840.) Fall of even-numbered years. 2(2-0) M.S. candidates in Clinical Laboratory Science or approval of department. Interdepartmental with the Department of Pathology.

Physiology, pathophysiology and laboratory evaluation of hemostatic disorders.

899. Master's Thesis Research

Fall, Winter, Spring, Summer. Variable credit. Approval of Medical Technology Program.