

**Descriptions —Mechanical Engineering
of
Courses**

860. Theory of Vibrations
Fall. 3(3-0) Interdepartmental with Materials Science and Mechanics.
Discrete systems and continua. Analytical mechanics. Variational principles. Modal analysis. Function spaces. Eigenfunction expansions. Integral transforms. Stability. Approximations. Perturbations.

863. Nonlinear Vibrations
Spring of even-numbered years. 3(3-0)
P: ME 461.
Perturbation methods. Weakly nonlinear partial and ordinary differential equations. Modal interactions, internal tuning, saturation, sub/super/composition resonances, jump phenomenon. Nonlinear normal modes.

871. Elastodynamics of Machinery and Robotic Systems
Fall of even-numbered years. 3(3-0)
Rigid-body kinematic analysis. Linkage synthesis. Variational formulations, nonlinear phenomena, composites and smart materials.

873. Design-for-Manufacture Strategies for Composite Materials
Spring of odd-numbered years. 3(3-0)
Modeling of fibrous composite materials. Processing techniques for thermoplastics and thermosets. Design-for-Manufacture (DFM) strategies.

875. Optimal Design of Mechanical Systems
Spring of even-numbered years. 3(3-0)
P: ME 461.
Optimal design for static and dynamic response of mechanical and structural systems. Necessary and sufficient conditions for optimality. Discrete and continuous parameter problems. Sensitivity of response to design variations. Algorithms.

892. Parameter Estimation
Fall of odd-numbered years. 3(3-0)
P: STT 421 or STT 441.
Nonlinear estimation of parameters in ordinary and partial differential equations. Related concepts in probability and statistics. Least squares and other estimators. Sequential methods. Optimum experiment design.

898. Master's Project Research
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 7 credits in all enrollments for this course.
R: Open only to master's students in the Mechanical Engineering major. Approval of department.
Master's degree Plan B individual student project: original research, research replication, or survey and reporting on a topic such as system design and development, or system conversion of installation.

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 24 credits in all enrollments for this course.

902. Random Vibration of Structural and Mechanical Systems
Spring of odd-numbered years. 3(3-0) Interdepartmental with Civil Engineering, and Materials Science and Mechanics. Administered by Civil Engineering.
P: CE 802 or ME 860; CE 810.
Probabilistic modeling of random excitations (e.g., earthquake, aerodynamic, and ocean wave loadings). Response of single and multiple degree-of-freedom systems to random excitation. Designing against failure. Nonstationary and nonlinear problems.

913. Advanced Heat Conduction
Fall of even-numbered years. 3(3-0)
P: ME 812 or MTH 849.
Inverse and ill-posed problems in heat transfer: function estimation, regularization, and adjoint methods in conduction.

930. Selected Topics in Fluid Mechanics
Fall. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
P: ME 830.
Current topics in fluid mechanics will be presented.

934. Application of Turbulence Fundamentals
Spring. 3(3-0)
P: ME 834.
Fundamental physics of turbulence from dimensional analysis approach. Classical and coherent structure analysis.

940. Selected Topics in Thermal Science
Spring. 1 to 3 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: ME 812, ME 814, ME 816. R: Open only to Mechanical Engineering majors.
Conduction, convection, radiation, phase change and interactive combined modes of heat transfer. Mass transfer. Irreversible thermodynamics.

952. Advanced Control Systems
Fall. 3(3-0)
P: ME 852.
Current topics in control theory with potential for improving mechanical systems design.

960. Selected Topics in Vibrations
Fall. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
P: ME 860.
Current topics of interest to the student and faculty.

961. Nonlinear Dynamics and Chaos
Spring of odd-numbered years. 3(3-0)
P: ME 857 or ME 860 or EE 826 or MTH 441
Qualitative theory of dynamical systems applied to physical system models. Bifurcation theory for continuous and discrete-time systems, chaos, the Smale horseshoe, Melnikov's method, and nonlinear data analysis.

963. Wave Phenomena
Spring of even-numbered years. 3(3-0)
R: Approval of department.
Linear and non-linear waves in bounded and unbounded media. Reflection, refraction, diffraction. Dispersion. Shock and acceleration waves. Waveguides. Acoustical and optical analogies. Fluid and solid continua.

971. Intelligent Materials and Smart Structures: Applications
Fall of odd-numbered years. 3(3-0)
P: ME 873.
Design-for-manufacture issues in smart materials: biomimetics, nanotechnology, electro-rheological fluids, shape memory alloys, piezoelectric materials, fiberoptics, neural networks.

990. Independent Study in Mechanical Engineering
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
Individualized study of a current problem in mechanical engineering.

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 72 credits in all enrollments for this course.

MEDICAL TECHNOLOGY MT

**Medical Technology Program
College of Natural Science**

212. Fundamentals of Laboratory Analysis
Fall. 3(3-0)
P: MTH 103 or MTH 116; CEM 141 and CEM 161.
Chemical, biological and instrumental laboratory analyses: method evaluation, quality assurance, and predictive value theories.

213. Application of Clinical Laboratory Principles
Fall. 1 credit.
C: MT 212 concurrently. R: Open only to students in Clinical Laboratory Sciences, and Medical Technology. Microscopy, pipetting. Specimen collection, handling and processing. Laboratory safety, quality control, and method evaluation.

414. Clinical Chemistry and Body Fluid Analysis
Spring. 4(4-0)
P: BCH 401, MT 212, PSL 250; STT 200 or STT 201.
Analytical methods in clinical chemistry and urinalysis. Correlation of laboratory test results with physiology and diseases of renal, hepatic and cardiac systems.

415. Clinical Chemistry and Body Fluid Analysis Laboratory
Spring. 1 credit.
P: MT 213. C: MT 414 concurrently. R: Open only to Clinical Laboratory Sciences majors.
Quantitative analysis of blood and body fluids. Spectrophotometry, electrophoresis, chromatography, enzymatic assays, and immunoassays.

416. Clinical Chemistry
Fall. 4(4-0)
P: MT 212, BCH 401.
Analytical methods in clinical chemistry. Correlation of laboratory test results with physiology and diseases of the endocrine system, pregnancy, and cancer. Therapeutic drug monitoring and automation.

422. Hematology and Hemostasis
Fall. 4(4-0)
P: MT 212; BCH 401 or concurrently.
Structure and function of normal blood cells with changes seen in benign and malignant diseases, and in acquired and hereditary diseases.

423. Hematology and Hemostasis Laboratory
Fall. 1 credit.
P: MT 213. C: MT 422 concurrently. R: Open only to Clinical Laboratory Sciences majors.
Diagnostic assessment of blood cells and hemostatic function.

432. Clinical Immunology and Immunohematology
Spring. 5(5-0)
P: MT 212.
Cellular and humoral immunity, diseases of immunity. Clinical serology and immunology, blood group serology, and transfusion practices.

433. Clinical Immunology and Immunohematology Laboratory
Spring. 1 credit.
P: MT 213. C: MT 432 concurrently. R: Open only to majors in Clinical Laboratory Sciences.
Immunologic methods for disease detection. Methods of blood typing and pre-transfusion testing.

- 442. Education and Management in the Clinical Laboratory**
Fall, 3(3-0)
R: Open only to majors in Clinical Laboratory Sciences. Concepts of management in clinical laboratory practice. Program accreditation and certification. Government regulation. Personnel recruitment and selection. Performance evaluation. Financial management.
- 444. Problem Solving Across Clinical Laboratory Disciplines (W)**
Spring, 4(4-0)
P: MT 212, MT 213, MT 414, MT 415, MT 416, MT 422, MT 423, MT 432, MT 433, MIC 463, MIC 464. R: Open only to seniors in Clinical Laboratory Sciences. Completion of Tier I writing requirement.
Problem-oriented approach integrates topics from previous courses in clinical laboratory sciences, social sciences, and humanities. Emphasis on published primary research literature and its critical appraisal.
- 445. Integrating Clinical Laboratory Science Discipline (W)**
Spring, 2(2-0)
P: MT 414, MT 416, MT 422, MT 432, MIC 463. R: Open only to seniors in Medical Technology. Completion of Tier I writing requirement.
Problem oriented approach integrating topics from Medical Technology courses with emphasis on writing experience in the major and on critical thinking skills.
- 471. Advanced Clinical Chemistry Laboratory**
Fall, Spring, Summer, 3 credits.
C: MT 472 concurrently. R: Open only to seniors in Clinical Laboratory Sciences.
Application and integration of theory and technical skills of chemistry and biochemistry.
- 472. Advanced Clinical Chemistry**
Fall, Spring, Summer, 1 credit.
C: MT 471 concurrently. R: Open only to seniors in Clinical Laboratory Sciences.
Theoretical aspects of clinical chemistry. Chemical and biochemical reactions. Statistical analysis, pathophysiological relationships, and methodologies.
- 473. Advanced Clinical Hematology and Body Fluids Laboratory**
Fall, Spring, Summer, 4 credits.
C: MT 474 concurrently. R: Open only to seniors in Clinical Laboratory Sciences.
Application of the theory of hematology, hemostasis, and body fluid analysis.
- 474. Advanced Clinical Hematology and Body Fluids**
Fall, Spring, Summer, 1 credit.
C: MT 473 concurrently. R: Open only to seniors in Clinical Laboratory Sciences.
Theoretical aspects of advanced hematology, hemostasis and body fluid analysis. Integration of cognitive material with test results.
- 475. Advanced Clinical Immunology and Immunohematology Laboratory**
Fall, Spring, Summer, 2 credits.
C: MT 476 concurrently. R: Open only to seniors in Clinical Laboratory Sciences.
Application of immunology and immunohematology principles.
- 476. Advanced Clinical Immunology and Immunohematology**
Fall, Spring, Summer, 1 credit.
C: MT 475 concurrently. R: Open only to seniors in Clinical Laboratory Sciences.
Theory of immunology and immunohematology. Integration of cognitive material with test results.
- 477. Advanced Clinical Microbiology Laboratory**
Fall, Spring, Summer, 3 credits.
C: MT 478 concurrently. R: Open only to seniors in Clinical Laboratory Sciences.
Application of clinical microbiology.
- 478. Advanced Clinical Microbiology**
Fall, Spring, Summer, 1 credit.
C: MT 477 concurrently. R: Open only to seniors in Clinical Laboratory Sciences.
Theory of clinical microbiology. Integration of cognitive material with laboratory results.
- 495. Directed Study**
Fall, Spring, Summer, 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
R: Open only to Clinical Laboratory Science and Medical Technology majors.
Faculty directed study including assigned readings, reviews of appropriate scientific periodicals, and research laboratory experience.
- 801. Medical Technology Seminar**
Spring, 1(1-0) A student may earn a maximum of 2 credits in all enrollments for this course.
R: Open only to graduate students in Clinical Laboratory Sciences.
Current research topics in clinical laboratory sciences.
- 810. Research Planning in the Clinical Laboratory Sciences**
Fall of odd-numbered years, 2(2-0)
R: Open only to graduate students in Clinical Laboratory Sciences.
Directed reading and discussions on research methodology and research funding. Written and oral proposal presentations.
- 812. Advanced Clinical Chemistry**
Spring of even-numbered years, 2(2-0) Interdepartmental with Pathology.
P: BCH 462, MT 414, MT 416.
Biochemical basis of selected pathologic conditions including inborn errors of metabolism, endocrine and other genetic disorders. Emphasis on current diagnostic techniques.
- 820. Advanced Human Hematology**
Fall of even-numbered years, 2(2-0) Interdepartmental with Pathology.
P: MT 422.
Selected topics in hematology including pathogenesis, mechanisms and morphological pictures. Emphasis on laboratory tests and interpretation of results.
- 830. Concepts in Molecular Biology**
Spring of odd-numbered years, 2(2-0) Interdepartmental with Pathology.
P: One course in Biochemistry or concurrently.
Techniques and theories of molecular biology, nucleic acid synthesis and isolation, enzymatic digestion and modification, electrophoresis, hybridization, amplification, library construction, and cloning.
- 840. Advanced Hemostasis**
Fall of odd-numbered years, 2(2-0) Interdepartmental with Pathology.
P: BCH 462, MT 422.
Physiology, pathophysiology, and laboratory evaluation of hemostatic disorders.
- 860. Clinical Laboratory Diagnosis of Infectious Diseases**
Spring of even-numbered years, 2(2-0) Interdepartmental with Pathology.
P: MIC 451, MIC 464.
Laboratory techniques for diagnosing infectious diseases in humans. Emphasis on differential diagnosis and correlation of microbiological results with serology, hematology, and clinical chemistry.
- 890. Selected Problems in Clinical Laboratory Science**
Fall, Spring, Summer, 1 to 6 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate students in Clinical Laboratory Sciences.
Non-thesis research for Plan B master's students.
- 899. Master's Thesis Research**
Fall, Spring, Summer, 1 to 10 credits. A student may earn a maximum of 24 credits in all enrollments for this course.
R: Open only to graduate students in Clinical Laboratory Sciences.

MEDICINE

MED

Department of Medicine College of Human Medicine

- 450. Cancer Biology**
Spring, 3(3-0) Interdepartmental with Zoology. Administered by Zoology.
P: BCH 200 or BCH 401; ZOL 221.
Cancer biology: cellular and molecular aspects. Applications of modern biotechnology to cancer research. Causes, treatment and prevention of cancer. World distribution and risk factors of cancer.
- 512. Infectious Diseases**
Spring, 4 credits. Interdepartmental with Microbiology.
P: MIC 511 or approval of department. R: Open only to graduate-professional students in College of Human Medicine.
Infectious diseases of humans. Biology of the causative microorganism, epidemiology, pathogenesis, host-parasite relationships. Clinical and laboratory diagnosis, and clinical management.
- 590. Special Problems in Medicine**
Fall, Spring, Summer, 1 to 6 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
R: Open only to graduate-professional students in College of Human Medicine.
Supervised work on an experimental, theoretical, or applied problem.
- 608. Internal Medicine Clerkship**
Fall, Spring, Summer, 2 to 18 credits. A student may earn a maximum of 42 credits in all enrollments for this course.
P: FMP 602. R: Open only to graduate-professional students in College of Human Medicine.
Community hospital clerkship. Interviewing skills, history, physical examination. Problem solving and therapy. Care of the whole patient leading to independence in patient management.
- 609. Hematology Clerkship**
Fall, Spring, Summer, 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Data collection, problem solving, and management related to common hematologic disorders of children and adults.
- 610. Oncology Clerkship**
Fall, Spring, Summer, 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Data collection, problem solving and management of prevalent cancers in children and adults.