852. Intermediate Control Systems
Spring, 3(3-0) P: ME 451.

855. Digital Data Acquisition and Control B
Spring of odd years. 3(2-3) P: ME 451.
Real-time digital measurement and control programing for mechanical engineering systems. Analog-to-digital and digital-to-analog converters, timer/counters, and instrument interfaces. Open-loop and closed-loop control. Laboratory projects.

857. Modeling and Simulation of Dynamic Systems
Fall. 3(3-0) P: ME 451.

860. Theory of Vibrations
Fall. 3(3-0) Interdepartmental with Materials Science and Mechanics.

863. Nonlinear Vibrations
Spring of even years. 3(3-0) P: ME 461.

871. Elastodynamics of Machinery and Robotic Systems
Fall of even years. 3(3-0)

875. Optimal Design of Mechanical Systems
Spring of even years. 3(3-0) P: ME 461.

892. Parameter Estimation
Fall of odd years. 3(3-0) P: STT 421 or STT 441.

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.

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.

913. Advanced Heat Conduction
Fall of even 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 840.
Current topics in fluid mechanics will be presented.

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.

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
Fall of even years. 3(3-0) P: (ME 857 or ME 860 or ECE 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.

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. R: Open only to Mechanical Engineering majors.
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, Summer. 3(3-0) P: (MTH 103 or MTH 116 or LBS 117) RB: (BS 111L)
Chemical, biological and instrumental concepts in laboratory analyses: quality assurance, laboratory mathematics, safety, health care systems and regulatory issues.

213. Application of Clinical Laboratory Principles
Fall, Summer. 1(0-3) P: (MT 212 or concurrently) RB: (BS 111L) R: Open only to students in Clinical Laboratory Sciences or Medical Technology or Human Biology major or LBS Medical Technology coordinate major.
Lab safety and standards of good laboratory practice including specimen handling and processing. Application of technologies and techniques to the performance of clinical diagnostic testing.

414. Clinical Chemistry I: Laboratory Analysis and Practice
Spring. 3(3-0) P: (STT 200 or STT 201 or STT 231 or STT 231 or STT 421) (MT 212 and MT 213) RB: (PHY 231 and PHY 232)
Concepts and principles of analytic methods commonly used in the clinical laboratory are presented. Emphasis on qualitative and quantitative features of instrumental analysis. Issues of QC, QA, method evaluation and standards of laboratory practice.

415. Clinical Chemistry II: Fluid Analysis Laboratory
Spring. 1(0-3) P: (MT 213) R: Open only to students in the Clinical Laboratory Sciences major. C: MT 414 concurrently.
Quantitative analysis of blood and body fluids. Spectrophotometry, electrophoresis, chromatography, enzymatic assays, and immunosassays.

416. Clinical Chemistry II: Pathophysiology and Body Fluid Analysis
Spring. 3(3-0) P: (MT 212) and (BCH 401 or BCH 462 and (PH 250 or (PSL 431 and PSL 432) RB: (MT 414)
Correlation of laboratory test results with normal physiology and biochemistry and with disease states. Emphasis on metabolic and endocrine systems, and acquired and inherited diseases. Therapeutic drug monitoring, toxicology and urinalysis.

420. Hematology and Hemostasis
Fall. 4(4-0) P: (MT 212 or concurrently) (PSL 250) RB: (BS 111 And BS 111 And BCH 401)
Structure and function of normal blood cells with changes seen in benign and malignant diseases and acquired and hereditary disorders. Mechanisms of hemostasis, fibrinolysis and hemostatic control.

421. Hematology and Hemostasis Laboratory
Fall. 5(5-0) P: (MT 212 or concurrently) RB: (BS 111 and BS 111 and BS 111) (MT 422) RB: (PSL 250)
Structure and function of normal blood cells with changes seen in benign and malignant diseases and acquired and hereditary disorders. Mechanisms of hemostasis, fibrinolysis and hemostatic control.

432. Clinical Immunology and Immunohematology
Spring. 3(3-0) P: (MT 212 and BS 111 and BS 111) (MT 422) RB: (PSL 250)
Cellular and humoral immunity and diseases of immunity. Clinical serology and immunology, blood group serology, and transfusion practices.
433. Clinical Immunology and Immunohematology Laboratory
Spring. 1(0-3) P: (MT 213 and MT 432 or concurrently) R: Open only to students in the Clinical Laboratory Sciences major.
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) P: (MTH 116 or (MTH 163 and MTH 104) or (LBS 117) (STT 200 or STT 201 or STT 231 or STT 351 or STT 421) R: Open only to students in the Clinical Laboratory Sciences major.
Basic principles and concepts in education and management in clinical laboratories. Systematic approach to instructional design, delivery and evaluation. Principles of leadership, personnel management, fiscal management, and regulatory compliance.

454. Problem Solving Across Clinical Laboratory Disciplines (W)
Spring. 4(4-0) P: (MT 414 and MT 416 and MT 422 and MT 432 and MIC 463) RB: (MT 442) R: Open only to seniors in the Clinical Laboratory Sciences major.
Problem-oriented approach integrating topics from previous courses in clinical laboratory sciences. Emphasis on published primary research literature and its critical appraisal.

455. Integrating Clinical Laboratory Science Discipline (W)
Fall, Spring. 2(2-0) P: (MT 414 and MT 416 and MT 422 and MT 432 and MIC 463) R: (MT 442) R: Open only to seniors in the Clinical Laboratory Sciences major.
Problem-oriented approach integrating topics from Medical Technology and laboratory sciences. Emphasis on writing experience in the major and on critical thinking skills.

471. Advanced Clinical Chemistry Laboratory
Fall, Spring, Summer. 3 credits. P: (MT 454)
Application and integration of theory and technical skills in clinical chemistry and biochemistry.

472. Advanced Clinical Chemistry
Fall, Spring, Summer. 1 credit. R: Open only to seniors in the Clinical Laboratory Sciences major.
C: MT 471 concurrently.
Theoretical aspects of clinical chemistry, chemical and biochemical reactions, statistical analysis, and pathophysiological relationships. Integration of cognitive material with clinical laboratory test results.

473. Advanced Clinical Hematology and Body Fluids Laboratory
Fall, Spring, Summer. 4 credits. P: (MT 454)
Application and integration of theory and technical skills in hematology, hemostasis, and body fluid analysis.

474. Advanced Clinical Hematology and Body Fluids
Fall, Spring, Summer. 1 credit. R: Open only to seniors in the Clinical Laboratory Sciences major.
C: MT 473 concurrently.
Theoretical aspects of advanced hematology, hemostasis and body fluid analysis. Integration of cognitive material with clinical laboratory test results.

475. Advanced Clinical Immunology and Immunohematology Laboratory
Fall, Spring, Summer. 2 credits. P: (MT 454)
Application and integration of theory and technical skills in immunology and immunohematology.

476. Advanced Clinical Immunology and Immunohematology
Fall, Spring, Summer. 1 credit. R: Open only to seniors in the Clinical Laboratory Sciences major.
Theoretical aspects of immunology and immunohematology. Integration of cognitive material with clinical laboratory test results.

477. Advanced Clinical Microbiology Laboratory
Fall, Spring, Summer. 3 credits. P: (MT 454)
Application and integration of theory and technical skills in clinical microbiology and infectious disease.

478. Advanced Clinical Microbiology
Fall, Spring, Summer. 1 credit. R: Open only to seniors in the Clinical Laboratory Sciences major.
C: MT 475 concurrently.
Theoretical aspects of clinical microbiology and infectious disease. Integration of cognitive material with clinical laboratory test 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 students in the Clinical Laboratory Sciences or Medical Technology major or LBS Medical Technology coordinate major.
Faculty directed study including assigned readings, reviews of appropriate scientific periodicals, research and 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 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 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 years. 2(2-0) Interdepartmental with Pathology. P: MT 422.
Selected topics in human hematology including pathogenesis, mechanisms and morphological pictures. Emphasis on laboratory tests and interpretation of results.

830. Concepts in Molecular Biology
Spring of odd 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.

831. Clinical Application of Molecular Biology
Summer. 1(2-0) F: (MT 830)
The utilization of molecular biology principles and techniques as a tool to improving diagnostic outcomes within specific clinical laboratory science disciplines.

831L. Molecular Pathology Laboratory Summer. 2(0-4) P: (MT 831 or concurrently)
Equipment operation, DNA extraction and measurement, electrophoresis, hybridization and transfers, amplification and detection including SSOP, ARMS, RFLP and SCP as well as automated sequencing will be covered with specific emphasis on clinical applications.

840. Advanced Hemostasis
Fall of odd years. 2(2-0) Interdepartmental with Pathology. P: BCH 462, MT 422.
Physiology, pathophysiology, and laboratory evaluation of hemostatic disorders.

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—Descriptions of Courses

Department of Medicine
College of Human Medicine

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 692 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.