8.32. Refrigeration
Spring, 3(3-0) M E 436.
Characteristics of refrigerants; application
details pertaining to comfort cooling, food
refrigeration, and ultra-low temperature
refrigeration; control systems, and control
principles.
8.41. Advanced Gas Dynamics
Spring, 3(3-0) MTH 422 or MTH 424
or approval of department.
Continuum of M E 851. Modeling of nonli­
or approval of department.
8.42. Turbulence
Winter, Summer. 4(4-0) M M 810 or
acoustic and optical analogies.
8.43. Advanced Topics in Heat Transfer
Fall, 3(3-0) M E 817 or CHE 826 or MTH 841.
Linear and nonlinear waves in bounded and
unbounded media. Reflection, refraction, di­
fraction. Dispersion, Shock and acceleration
waves. Waveguides, acoustical and optical
8.40. Special Topics
Fall, Winter, Spring, Summer. 2 to 4
credits. May reenroll for a maximum of 9
credits. Approval of department.
8.90. 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.
8.95. Mechanical Engineering Problems
Fall, Winter, Spring, Summer. 1 to 5
credits. May reenroll for a maximum of 6
credits. Approval of department.
8.97. Mechanical Engineering Problems
Fall, Winter, Spring, Summer. 1 to 5
credits. May reenroll for a maximum of 12
credits. Approval of department.
8.98. Mechanical Engineering Problems
Fall, 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, interac­
tive combined modes, or combined heat and
mass transfer.
8.99. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Various
credit. Approval of department.
8.80. Topics in Parameter Estimation
Spring, 4(4-0) May reenroll for a maxi­
mum of 6 credits when different topics are taken.
STT 421 or STT 441 recommended.
8.85. Digital Data Acquisition and
Control
Winter. 3(3-0) M E 455, M E 456.
Real-time digital measurement and control pro­
gramming. Analog-to-digital and digital-to­
analog converters. Computer structure, binary
arithmetic, boolean operations, open-loop and
closed-loop control, laboratory projects.
8.60. Topics in Probability and
Statistics
Winter. 3(3-0) MTH 421.
Nonlinear least squares, maximum likelihood
and other estimators. Sequential methods.
Optimum experiment design. Model-building.
8.70. Wave Motion in Continuous
Media I
Winter of even-numbered years. 4(4-0)
MTH 422, MMM 810 or approval of depart­
ment.
Linear and nonlinear waves in bounded and
unbounded media. Reflection, refraction, di­
fraction. Dispersion, Shock and acceleration
waves. Waveguides, acoustical and optical
8.51. Modeling of Engineering Systems I
Fall, 3(3-0) M E 459 or E E 415. Inter­
derpartmental with Systems Science.
Modelling of engineering components and
dynamic systems; mechanical, electrical, fluid,
thermal, and transducer effects. Linear state­
space response, impedance methods. Simulation
of linear models. Design project.
8.52. Modeling of Engineering
Systems II
Winter. 3(3-0) M E 851. Interdepart­
mental with Systems Science.
Continuation of M E 851. Modeling of nonli­
ear dynamic systems. Applications of phase­
plane and linearization methods. Simulation of
nonlinear systems. Design project.
8.53. 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.
8.55. Digital Data Acquisition and
Control
Winter. 3(3-0) M E 455, M E 456.
Real-time digital measurement and control pro­
gramming. Analog-to-digital and digital-to­
analog converters. Computer structure, binary
arithmetic, boolean operations, open-loop and
closed-loop control, laboratory projects.
8.60. Topics in Parameter Estimation
Spring, 4(4-0) May reenroll for a maxi­
mum of 6 credits when different topics are taken.
STT 421 or STT 441 recommended.
Nonlinear least squares, maximum likelihood
and other estimators. Sequential methods.
Optimum experiment design. Model-building.

MEDICAL TECHNOLOGY

College of Natural Science

110. Clinical Laboratory Science and
Health Care Delivery
Winter. 2(2-0)
The history and definition of medical technol­
ogy, its diagnostic and therapeutic role in health
care delivery, and its relationship to other allied
health professions.

Medical Technology — Descriptions of Courses

210. Exploration of the Disciplines of
the Clinical Laboratory Sciences
Fall. 2(2-0) Sophomores in medical
technology.
Clinical laboratory disciplines including hema­
tology, immunohematology, chemistry, micro­
biology, cytology, and histology through an
examination of laboratory testing and its role 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 microbi­
ology, 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 analy­
sis.

400. Clinical Laboratory Sciences
Educational Practices
Spring. 2(2) Clinical Laboratory
Sciences majors, approval of Medical Technology
Program.
Development and implementation of educa­
tional programs for clinical laboratory person­
el. Includes scope of CLS education, adminis­
tration of programs and accreditation standards.

401. Clinical Biochemistry Laboratory
(M T 301.) Spring. 1(0-3) M T 399, M
T 412.
Laboratory techniques in clinical biochemistry,
Emphasis on the quality assurance and clinical
correlation of body fluid analysis.

410. General Pathology
(PTH 414., M T 404.) Spring. 3(3-0)
ANT 316; PSL 432 or concurrently. Interdepart­
mental 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 430, PSL 432; M
T 410 or concurrently. Interdepartmental with the
Department of Pathology.
Microscopic examination of cell injury and
death, inflammation and tissue repair. Patholo­
gistic 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;
CFM 162. Medical Technology and Clinical
Laboratory Sciences majors.
A comprehensive survey of clinical biochemis­
ty, assessment of normal and pathologic physi­
ology.

420. Hematology
Spring, Summer. 3(3-0) BCH 401, PSL
432.
Physiology, pathophysiology and laboratory
assessment of hematological states.

421. Hematology Laboratory
Spring. 1(0-3) or 2(0-4) M T
420 or concurrently.
Laboratory techniques in hematology. Normal
and abnormal blood cell morphology.
430. Immunohematology
Fall. 3(0-0) 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) FSL 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(0-0) 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(0-0) 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(0-0) M T 452.
Continuation of M T 452. Problems of increasing difficulty and based on additional topics from medical parasitology.

461. Medical Immunology and Microbiology
Winter. 5(0-0) 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. Common practices of the immune system, cellular interaction of the in vivo and in vitro reaction, and associated immunopathology. Characterization of infectious agents and their pathogenic processes.

462. 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.

463. Clinical Immunology
Fall, Winter, Spring. Summer. 1 credit. Clinical Laboratory Sciences majors, approval of Medical Technology Program.
Application of the theory and technical skills of immunohematology in a clinical laboratory.

464. Clinical Microbiology
Fall, Winter, Spring. Summer. 6 credits. Clinical Laboratory Sciences majors, approval of Medical Technology Program.
Application of the theory and technical aspects of clinical microbiology 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.

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.

590. Special Problems in Medicine
Fall, Winter, Spring. 1 to 6 credits. May reenroll for a maximum of 12 credits.
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 6 credits.
FMP 602. Interdepartmental with the department of 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.

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.

A-146