

- 816. Radiative Heat Transfer**  
Fall. 3(3-0)  
P: ME 410.  
Electromagnetic theory of radiation. Spectral properties of diffuse and nondiffuse surfaces. Radiation exchange. Radiative transfer in media. Gaseous radiation exchange. Combined modes.  
QP: ME 411 QA: ME 814
- 822. Combustion**  
Spring. 3(3-1)  
P: ME 490, ME 802.  
Thermodynamics and chemical kinetics. Multicomponent systems. Premixed and diffusion flames, flame radiation.  
QP: ME 815, ME 490 QA: ME 863
- 830. Fluid Mechanics I**  
Fall. 3(3-0)  
P: ME 432.  
Integral and differential conservation laws, Navier-Stokes' equations, and exact solutions. Laminar boundary layer theory, similarity solutions, and approximate methods. Thermal effects and instability phenomena.  
QP: ME 333 QA: ME 844
- 832. Fluid Mechanics II**  
Spring. 3(3-0)  
P: ME 830, MTH 425.  
Inviscid flow, vortex motion, flow past bodies. Complex variables and conformal mapping. One-dimensional steady and unsteady compressible flow, shock waves and Prandtl-Meyer expansion. Small perturbations theory and method of characteristics.  
QP: ME 844, MTH 423, ME 830, ME 333 QA: ME 841, ME 842
- 834. Fundamentals of Turbulence**  
Spring. 3(3-0)  
P: ME 432.  
Statistical descriptions of turbulent flows: isotropic, free shear and wall bounded. Correlation and spectral descriptions. Conditional probabilities and coherent motions. Experimental methods. Scaling relationships.  
QP: MMM 810 QA: ME 843
- 836. Experimental Methods in Fluid Mechanics**  
Fall. 3(1-4)  
P: ME 432.  
Modern techniques of fluid mechanics measurement and data analysis. Pressure, temperature and velocity measurement techniques. Optical diagnostics.  
QP: ME 333
- 852. Intermediate Control Systems**  
Spring. 3(3-0)  
P: ME 451.  
Design of controllers for dynamic systems in mechanical engineering. Modeling, analysis and simulation.  
QP: ME 458 QA: ME 852
- 855. Digital Data Acquisition and Control**  
Spring of even-numbered years. 3(2-3)  
P: ME 451.  
Real-time digital measurement and control programming 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.  
QP: ME 458 QA: ME 855
- 857. Modeling and Simulation of Dynamic Systems**  
Fall. 3(3-0)  
P: ME 451.  
Energy-based methods for modeling dynamic engineering components and systems. Systematic formulation of nonlinear state-space equations. Qualitative aspects of response: equilibrium points, linearization. Simulation techniques and design projects.  
QP: ME 458 QA: ME 851
- 860. Theory of Vibrations**  
Fall. 3(3-0) Interdepartmental with Materials Science and Mechanics.  
P: ME 452.  
Discrete systems and continua. Analytical mechanics. Variational principles. Modal analysis. Function spaces. Eigenfunction expansions. Integral transforms. Stability. Approximations. Perturbations.  
QP: ME 455 QA: ME 823
- 863. Nonlinear Vibrations**  
Spring of odd-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.  
QP: ME 455 QA: ME 825
- 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 even-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 odd-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.  
QP: MTH 334, ME 455, MMM 809 QA: ME 856
- 892. Parameter Estimation**  
Spring. 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.  
QP: STT 421, STT 441 QA: ME 860
- 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.  
QA: ME 899
- 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, adjoint methods, numerical methods in conduction. Moving boundaries, ablation, phase change, Green's functions and integral transforms.  
QP: ME 817, CHE 826, MTH 841 QA: ME 917
- 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.  
QP: ME 841
- 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.  
QP: ME 333 QA: ME 843
- 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.  
QP: ME 813, ME 814, ME 817 QA: ME 980
- 952. Advanced Control Systems**  
Fall. 3(3-0)  
P: ME 852.  
Current topics in control theory with potential for improving mechanical systems design.  
QP: ME 852
- 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.  
QP: ME 823
- 963. Wave Phenomena**  
Spring of odd-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.  
QA: ME 870
- 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.  
QA: ME 925
- 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.  
QA: ME 999

## 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.  
C: MT 213  
Chemical, biological and instrumental laboratory analyses: method evaluation, quality assurance, and predictive value theories.  
QP: MTH 109 or MTH 111, CEM 142 QA: MT 210, MT 110
- 213. Application of Clinical Laboratory Principles**  
Fall. 1(0-3)  
C: MT 212  
Microscopy, pipetting. Specimen collection, handling and processing. Laboratory safety, quality control, and method evaluation.  
QA: MT 211
- 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.  
QP: PSL 241, MT 210, BCH 401 QA: MT 300, MT 440

**Descriptions—Medical Technology  
of  
Courses**

- 415. Clinical Chemistry and Body Fluid Analysis Laboratory**  
Spring, 1(0-3)  
P: MT 213; C: MT 414 R: Open only to Clinical Laboratory Sciences majors.  
Quantitative analysis of blood and body fluids. Spectrophotometry, electrophoresis, chromatography, enzymatic assays, and immunoassays.  
QA: MT 401, MT 441
- 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.  
QA: MT 412, MT 410
- 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.  
QP: MT 210 QA: MT 420, MT 440
- 423. Hematology and Hemostasis Laboratory**  
Fall, 1(0-3)  
P: MT 213; C: MT 422 R: Open only to Clinical Laboratory Sciences majors.  
Diagnostic assessment of blood cells and hemostatic function.  
QA: MT 421, MT 441
- 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.  
QP: MT 210 QA: MT 430, MPH 427
- 433. Clinical Immunology and Immunohematology Laboratory**  
Spring, 1(0-3)  
P: MT 213; C: MT 432 R: Open only to majors in Clinical Laboratory Sciences.  
Immunologic methods for disease detection. Methods of blood typing and pre-transfusion testing.  
QP: MT 430 QA: MT 431
- 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.  
QA: MT 400, ACC 230, PSY 255
- 454. Problem Solving Across Clinical Laboratory Disciplines**  
Spring, 4(4-0)  
P: MT 212, MT 213, MT 414, MT 415, MT 416, MT 422, MT 423, MT 432, MT 433, MPH 463, MPH 464.  
R: Open only to seniors in Clinical Laboratory Sciences.  
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.  
QA: MT 451, MT 452, MT 453
- 471. Advanced Clinical Chemistry Laboratory**  
Fall, Spring, Summer, 3 credits.  
C: MT 472 R: Open only to seniors in Clinical Laboratory Sciences.  
Application and integration of theory and technical skills of chemistry and biochemistry.  
QA: MT 481
- 472. Advanced Clinical Chemistry**  
Fall, Spring, Summer, 1 credit.  
C: MT 471 R: Open only to seniors in Clinical Laboratory Sciences.  
Theoretical aspects of clinical chemistry. Chemical and biochemical reactions. Statistical analysis, pathophysiological relationships, and methodologies.  
QA: MT 481
- 473. Advanced Clinical Hematology and Body Fluids Laboratory**  
Fall, Spring, Summer, 4 credits.  
C: MT 474 R: Open only to seniors in Clinical Laboratory Sciences.  
Application of the theory of hematology, hemostasis, and body fluid analysis.  
QA: MT 482, MT 486, MT 487
- 474. Advanced Clinical Hematology and Body Fluids**  
Fall, Spring, Summer, 1 credit.  
C: MT 473 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.  
QA: MT 482, MT 486, MT 487
- 475. Advanced Clinical Immunology and Immunohematology Laboratory**  
Fall, Spring, Summer, 2 credit.  
C: MT 476 R: Open only to seniors in Clinical Laboratory Sciences.  
Application of immunology and immunohematology principles.  
QA: MT 483, MT 485
- 476. Advanced Clinical Immunology and Immunohematology**  
Fall, Spring, Summer, 1 credit.  
C: MT 475 R: Open only to seniors in Clinical Laboratory Sciences.  
Theory of immunology and immunohematology. Integration of cognitive material with test results.  
QA: MT 483, MT 485
- 477. Advanced Clinical Microbiology Laboratory**  
Fall, Spring, Summer, 3 credits.  
C: MT 478 R: Open only to seniors in Clinical Laboratory Sciences.  
Application of clinical microbiology.  
QA: MT 484
- 478. Advanced Clinical Microbiology**  
Fall, Spring, Summer, 1 credit.  
C: MT 477 R: Open only to seniors in Clinical Laboratory Sciences.  
Theory of clinical microbiology. Integration of cognitive material with laboratory results.  
QA: MT 484
- 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.  
QA: MT 495
- 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.  
QA: MT 800
- 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.  
QA: MT 810
- 812. Advanced Clinical Chemistry**  
Spring of odd-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.
- 830. Concepts in Molecular Biology**  
Spring of even-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.  
QP: MT 440 QA: MT 840
- 860. Clinical Laboratory Diagnosis of Infectious Diseases**  
Spring of odd-numbered years, 2(2-0)  
Interdepartmental with Pathology.  
P: MPH 451, MPH 464.  
Laboratory techniques for diagnosing infectious diseases in humans. Emphasis on differential diagnosis and correlation of microbiological results with serology, hematology, and clinical chemistry.  
QP: MPH 301, MPH 302, MPH 406
- 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.  
QA: MT 899

**MEDICINE**

**MED**

**Department of Medicine  
College of Human Medicine**

- 512. Infectious Diseases**  
Spring, 4 credits. Interdepartmental with Microbiology.  
P: MPH 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.  
QA: MED 512
- 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.  
QA: MED 590
- 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.  
QP: FMP 602 QA: MED 608