842 Advanced Turbomachinery  
Spring of even years. 3(3-0) RB: (ME 442)  
R: Open only to seniors and graduate students in Mechanical Engineering and Chemical Engineering. Application of energy, momentum, continuity and heat transfer equations to energy transfer and transformation in turbomachinery.

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

855 Digital Data Acquisition and Control  
Spring of odd years. 3(2-3) RB: (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.

859 Nonlinear Control  
Spring. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. RB: (ECE 826 and ME 857) SA: ECE 827  

860 Theory of Vibrations  
Fall. 3(3-0)  

861 Advanced Dynamics  
Fall. 3(3-0) SA: MSM 801  
Dynamics of systems of particles and rigid bodies. Energy and momentum principles. Lagrangian and Hamiltonian methods. Euler angles. Applications in system dynamics and vibrations.

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

872 Finite Element Method  
Fall, Spring. 3(3-0) Interdepartmental with Civil Engineering. SA: AE 809, MSM 809  
Theory and application of the finite element method to the solution of continuum type problems in heat transfer, fluid mechanics, and stress analysis.

874 Analysis of Metal Forming and Manufacturing Processes  
Fall of odd years. 3(3-0) RB: (ME 471 and MSM 809 and MSM 817 and MSM 810)  
Review of fundamental knowledge in mechanics, materials and numerical analysis. Modeling, simulation and analysis of metal forming and manufacturing processes.

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

891 Selected Topics in Mechanical Engineering  
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department.  
Special topics in mechanical engineering of current importance.

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.

Master's thesis research.

921 Nonlinear Elastocility  
Fall of odd years. 3(3-0) RB: (ME 821) SA: MSM 915  

922 Thermoelasticity and Viscoelasticity  
Spring of even years. 3(3-0) RB: (ME 820 and MTH 443) SA: MSM 918  

925 Optical Methods of Measurement  
Fall of even years. 3(2-3) R: Approval of department. SA: MSM 905  
Measurement of dimension, position, motion, strain, using optical methods including holography, speckle interferometry, Moire, photoelasticity, laser Doppler, electronic imaging, model analysis. Relevant optics theory.

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. RB: (ME 812 and ME 814 and ME 816) R: Open only to Mechanical Engineering majors.


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.

Doctoral dissertation research.

**MT—Medical Technology**

Medical Technology Program  
College of Natural Science

120 Learning in the Biomedical Sciences  
Fall. 1 credit. Not open to students with credit in NSC 201 or NSC 202.  

150 Preview of Biomedical Research  
Spring. 1(1-0) Interdepartmental with Natural Science.  
Exploration of biomedical research careers. Biomedical research in the United States: funding, safety, regulatory agencies, ethics, experimental design, trouble-shooting, and data interpretation.

204 Mechanisms of Disease  
Spring. 3(3-0) P: (BS 111 or LBS 145)  
Pathophysiologic mechanisms of diseases. Selected applications to organ system pathology.
213 Application of Clinical Laboratory Principles
Fall, Summer. 2(1-3) RB: (BS 111L) R: Open only to students in the 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.

220 Preparing for a Health Professions Career
Spring. 1(1-0) Not open to students with credit in MT 212.
Development of skills needed for success in health professions careers. Historical, economic, sociological and ethical perspectives on the U.S. health professions with focus on medical laboratory careers.

324 Fundamentals of Hematology, Hemostasis, and Urinalysis
Fall. 3(3-0) P: (BS 111) Physiology and basic biology of normal hematologic, hemostatic and urinary systems. Principles of diagnostic assays to detect diseases affecting those systems.

324L Introductory Laboratory in Hematology, Hemostasis and Urinalysis
Fall. 1(0-3) P: (MT 324) R: Open only to students in Clinical Laboratory Sciences. SA: MT 423
Routine laboratory assays used to assess the health of the hematological, hemostatic, and urinary systems.

414 Clinical Chemistry I: Laboratory Analysis and Practice
Fall. 3(3-0) P: (STT 200 or STT 201 or STT 231 or STT 351 or STT 421) RB: (PHY 231 and PHY 232) and (MT 213)
Concepts and principles of analytic methods commonly used in the clinical laboratory. Qualitative and quantitative features of instrumental analysis. Issues of quality control and quality assurance, method evaluation and standards of laboratory practice.

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

416 Clinical Chemistry II: Pathophysiology and Body Fluid Analysis
Fall. 4(4-0) P: (MT 213) and (BMB 401 or BMB 461) and (PSL 250 or PSL 432) RB: (MT 414)
Correlation of laboratory test results with normal physiology and biochemistry and with disease states. Metabolic and endocrine systems. Acquired and inherited diseases. Therapeutic drug monitoring, and toxicology.

424 Advanced Hematology, Hemostasis and Urinalysis
Spring. 2(2-0) P: (MT 324) SA: MT 422
Etiology and pathogenesis of diseases of the hematologic, hemostatic and urinary systems including anemias, leukemias, and hemophilias. Diagnostic testing for such diseases.

424L Advanced Laboratory in Hematology, Hemostasis, and Urinalysis
Spring. 1(0-3) P: (MT 424 or concurrently) SA: MT 423
Specialized and advanced assays used in the diagnosis of diseases of the hematological, hemostatic, and urinary systems.

430 Molecular Laboratory Diagnostics
Spring. 2(2-0) P: (BMB 401) or (BMB 461 and BMB 462) and (BS 111 or LBS 145)
Concepts and principles of molecular analysis applied to medical diagnostics and related applications.

433 Clinical Immunology and Immunohematology Laboratory
Spring. 1(0-3) P: (MT 213 and MT 435 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.

434 Clinical Immunology
Fall. 3(3-0) P: (BS 111) SA: MT 432 Not open to students with credit in MGG 451. Concepts of innate, cellular, and humoral immunity; immunodeficiency and autoimmunity. Principles and applications of immunoassays in medical laboratories.

435 Transfusion and Transplantation Medicine
Spring. 3(3-0) P: (MT 434 or MGG 451) SA: MT 432
Principles and practice of transfusion medicine including blood typing, Principles and practices of transplantation medicine. Transplantation immunology, organ procurement, and rejection detection.

442 Education and Management in the Clinical Laboratory
Spring. 3(3-0) P: (MTH 116 or LBS 117) or (MTH 103 and MTH 114) or (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.

450 Eukaryotic Pathogens
Spring. 3(3-0) P: (BS 111) RB: (MGG 205 or MGG 301)
Medically important fungi and parasites. Host-parasite relationships, life cycles, culture, identification, and associated diseases.

455 Integrating Clinical Laboratory Science Discipline (W)
Fall, Spring. 2(2-0) P: (MT 324 and MT 414 and MT 416 or concurrently and MGG 463 or concurrently and MT 435 or concurrently) and completion of Tier I writing requirement. R: Open only to seniors in the Medical Technology major or Clinical Laboratory Sciences undergraduate major.
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. P: (MT 415)
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 pathophysiologic 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 424L)
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 433)
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. C: MT 477 concurrently.
Theoretical aspects of clinical microbiology and infectious disease. Integration of cognitive material with clinical laboratory test results.

477 Advanced Clinical Microbiology Laboratory
Fall, Spring, Summer. 3 credits. P: (MGG 464 and MT 450)
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 477 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.

496 Integrative Correlations in Clinical Laboratory Science I
Fall, Spring. 1(2-0) P: (MT 213) R: Open only to juniors or seniors in the Medical Technology or Clinical Laboratory Science and Lyman Briggs coordinate majors.
Application of the principles and concepts of clinical laboratory science in a problem-based learning format. Ethics, diagnostic value of laboratory tests, social-economic impact of laboratory tests and their regulation.
continued of MT 496.

497 Integrative Correlations in Clinical Laboratory Science
Fall, Spring. 1(2-0) P: (MT 496) R: Open only to juniors or seniors in the Medical Technology or Clinical Laboratory Science and Lyman Briggs coordinate majors.
Continuation of MT 496.

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.

812 Advanced Clinical Chemistry
Spring of even years. 2(2-0) Interdepartmental with Pathology. RB: (BMB 462 and MT 414 and 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
Spring of odd years. 2(2-0) Interdepartmental with Pathology. RB: (MT 424)
Pathogenesis, mechanisms, and morphological pictures. Laboratory tests and interpretation of results.

830 Concepts in Molecular Biology
Fall, Spring. 2(2-0) Interdepartmental with Pathology. RB: 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
Spring, Summer. 2(2-0) P:M: (MT 830) RB: Basic biochemistry, medical or research laboratory experience
Molecular diagnostic principles. Diagnostic outcomes in traditional and non-traditional laboratory disciplines.

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

842 Managing Biomedical Laboratory Operations
Fall. 2(2-0) R: Open only to Biomedical Laboratory Operations majors or approval of department.
Integration of the roles of legislative, regulatory, technological and economic factors that influence the practice and management of biomedical laboratory operations.

844 Topics in Biomedical Laboratory Operations
Spring. 1(1-0) P:M: (MT 842) R: Open only to Biomedical Laboratory Operations majors or approval of department.
Current issues relevant to biomedical laboratory operations from an interdisciplinary perspective with an emphasis on efficient laboratory operations.