

# BIOMEDICAL LABORATORY DIAGNOSTICS

BLD

## Biomedical Laboratory Diagnostics Program College of Natural Science

- 204 Mechanisms of Disease**  
Spring. 3(3-0) P: BS 161 or LB 145 or BS 181H SA: MT 204  
Pathophysiological mechanisms of diseases. Selected applications to organ system pathology.
- 213 Application of Clinical Laboratory Principles**  
Fall, Summer. 2(2-2) P: (CEM 141 and CEM 161) or (LB 171 and LB 171L) RB: BS 171 R: Open to students in the Human Biology Major or in the Biomedical Laboratory Science Major or in the Clinical Laboratory Sciences Major or in the Lyman Briggs Biomedical Laboratory Science Coordinate Major. SA: MT 213  
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.
- 214L Biomedical Laboratory Research Techniques**  
Summer. 2(1-3) P: MTH 103 or MTH 116 or MTH 124 or approval of department  
Basic techniques, skills and safety in biomedical research. Ethical conduct of research and regulatory principles such as Good Laboratory Practice. Maintaining a research notebook for legal and intellectual property purposes. Offered second half of semester.
- 220 Preparing for a Health Professions Career**  
Spring. 1(1-0) R: Open to sophomores or juniors. SA: MT 220  
Development of skills needed for success in a health professions career. 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 161 or concurrently) or (LB 145 or concurrently) or (BS 181H or concurrently) RB: (PSL 310 or concurrently) or (PSL 250 or concurrently) or (PSL 431 or concurrently) SA: MT 324  
Physiology and biochemistry 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: BLD 324 or concurrently R: Open to students in the Clinical Laboratory Sciences major.  
Routine laboratory assays used to assess the health of the hematological, hemostatic, and urinary systems.
- 413 Advanced Biomedical Laboratory Diagnostics Laboratory**  
Spring. 1(0-3) P: BLD 213 and BLD 324 and BLD 434 and BLD 435 and MMG 463 RB: BLD 424 and BLD 430 R: Open to students in the Diagnostic Molecular Science major or in the Biomedical Laboratory Science major or in the Lyman Briggs Diagnostic Molecular Science Coordinate Major or in the Lyman Briggs Biomedical Science Coordinate major.  
Diagnostic assays across various disciplines within the clinical laboratory (microbiology, immunohematology, hematology and molecular diagnostics) as well as data interpretation and problem solving skills.
- 414 Clinical Chemistry Analysis and Practice**  
Spring. 3(3-0) P: BLD 213 and (STT 200 or STT 201 or STT 231 or STT 351 or STT 421) RB: PHY 231 or LB 273 R: Open to students in the Biomedical Laboratory Science major or in the Lyman Briggs Biomedical Science Coordinate major. SA: MT 417 Not open to students with credit in BLD 417.  
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.
- 416 Clinical Chemistry**  
Fall. 4(4-0) P: BLD 213 and (BMB 401 or BMB 461) and (PSL 250 or PSL 310 or PSL 431) RB: BLD 414 or (BLD 417 and CEM 333) SA: MT 416  
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.
- 417 Quality Processes in Diagnostic Laboratory Testing**  
Spring. 2(2-0) P: BLD 213 and (STT 200 or STT 201 or STT 231 or STT 351 or STT 421) RB: PHY 231 or LB 273 R: Open to students in the Clinical Laboratory Sciences Major. SA: MT 414, MT 417 Not open to students with credit in BLD 414.  
Statistical methods for validating diagnostic laboratory tests including quality control processes, proficiency testing, method evaluation, related regulatory requirements, laboratory information systems, and laboratory mathematics.
- 424 Advanced Hematology, Hemostasis and Urinalysis**  
Spring. 2(2-0) P: BLD 324 RB: ((PSL 310 or concurrently) or (PSL 250 or concurrently) or (PSL 431) and (BLD 416 and (BLD 430 or concurrently) and BLD 434 and (BLD 435 or concurrently)) SA: MT 422, MT 424  
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: BLD 324L and (BLD 424 or concurrently)  
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: BS 161 or LB 145 or BS 181H SA: MT 430  
Concepts and principles of molecular analysis applied to medical diagnostics and related applications.
- 433 Clinical Immunology and Immunoematology Laboratory**  
Spring. 1(0-3) P: BLD 213 and (BLD 435 or concurrently) R: Open to students in the Clinical Laboratory Sciences major. SA: MT 433  
Immunologic methods for disease detection. Methods of blood typing and pre-transfusion testing.
- 434 Clinical Immunology**  
Fall, Spring, Summer. 3(3-0) Summer: Grand Rapids. P: BS 161 or LB 145 or BS 181H RB: (PSL 310 or PSL 250 or PSL 431) and (BLD 204 and BLD 213 and MMG 201) SA: MT 432, MT 434 Not open to students with credit in MMG 451.  
Concepts of innate, cellular, and humoral immunity. Immunodeficiency and autoimmunity. Principles and applications of immunoassays in medical laboratories.
- 435 Transfusion Medicine**  
Spring. 2(2-0) P: BLD 434 or MMG 451 SA: MT 435, MT 432  
Principles and practice of transfusion medicine including blood typing. Offered first ten weeks of semester.
- 437 Clinical Applications of Diagnostic Molecular Science**  
Spring. 2(2-0) P: BLD 436 SA: MT 437 Not open to students with credit in BLD 831.  
Application of molecular diagnostic methods in clinical and other types of laboratory disciplines.
- 438 Molecular Diagnostic Laboratory**  
Fall. 2(0-6) P: BLD 436 SA: MT 438 Not open to students with credit in BLD 832.  
Laboratory in molecular techniques with emphasis on clinical and diagnostic applications.
- 439 Histocompatibility and Immunogenetics**  
Spring. 1(1-0) P: BLD 434 or MMG 451  
The theory and principles of histocompatibility and immunogenetics as applied to transplant medicine.
- 442 Education and Management in the Clinical Laboratory**  
Spring. 2(2-0) P: (MTH 103 or MTH 116) or (STT 200 or STT 201 or STT 231 or STT 351 or STT 421) RB: BLD 220 R: Open to students in the Clinical Laboratory Sciences Major. SA: MT 442  
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.
- 450 Eukaryotic Pathogens**  
Spring. 3(3-0) P: (BS 161 or LB 145 or BS 181H) and (CEM 141 or CEM 151 or CEM 181H or LB 171) RB: MMG 201 or MMG 301 SA: MT 450  
Medically important fungi and parasites. Host-parasite relationships, life cycles, culture, identification, and associated diseases.

## Biomedical Laboratory Diagnostics—BLD

- 455 Integrating Clinical Laboratory Science Discipline (W)**  
Fall, Spring. 2(2-0) P: ((BLD 324 or concurrently) or (BLD 417 or concurrently) or (BLD 416 or concurrently) or (MMG 463 or concurrently) or (BLD 435 or concurrently) or (BLD 436 or concurrently)) and completion of Tier I writing requirement R: Open to undergraduate students in the Clinical Laboratory Sciences major or in the Biomedical Laboratory Science major or in the Diagnostic Molecular Science major. SA: MT 455
- Problem oriented approach integrating topics from biomedical laboratory diagnostics courses with emphasis on writing experience in the major and on critical thinking skills.
- 463 Medical Microbiology**  
Fall. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics. Administered by Microbiology and Molecular Genetics. P: MMG 301 or (MMG 201 and BS 161) or (MMG 201 and LB 145) or (MMG 201 and BS 181) RB: MMG 451 or BLD 434 R: Open to juniors or seniors in the Biomedical Laboratory Diagnostics Program or in the Department of Microbiology and Molecular Genetics or in the Biomedical Laboratory Science Major or in the Lyman Briggs Biomedical Laboratory Science Coordinate Major or in the Lyman Briggs Environmental/Biology/Microbiology Coordinate Major or in the Environmental Biology/Microbiology Major or in the Genomics and Molecular Genetics Major or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major or in the Lyman Briggs Human Biology Coordinate Major or in the Human Biology Major or in the Microbiology Major or in the Lyman Briggs Microbiology Coordinate Major. SA: MIC 463
- Properties of pathogenic bacteria and viruses and their mechanisms of pathogenicity and clinical diagnoses.
- 464 Diagnostic Microbiology Laboratory**  
Fall. 2(0-4) Interdepartmental with Microbiology and Molecular Genetics. Administered by Microbiology and Molecular Genetics. P: MMG 463 or concurrently R: Open to juniors or seniors in the Biomedical Laboratory Diagnostics Program or in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Biomedical Laboratory Science Coordinate Major or in the Lyman Briggs Genomics and Molecular Genetics Coordinate Major or in the Lyman Briggs Microbiology Coordinate Major. SA: MIC 464
- Clinical laboratory diagnostic procedures for the identification of pathogenic microbes.
- 471 Advanced Clinical Chemistry Laboratory**  
Fall, Spring, Summer. 3 credits. P: CEM 333 R: Open to students in the Clinical Laboratory Sciences major. SA: MT 471
- Application and integration of theory and technical skills in clinical chemistry and biochemistry.
- 472 Advanced Clinical Chemistry**  
Fall, Spring, Summer. 1 credit. P: BLD 416 and BLD 417 R: Open to seniors in the Clinical Laboratory Sciences major. SA: MT 472
- 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. 3 credits. P: BLD 424L R: Open to seniors in the Clinical Laboratory Sciences major. SA: MT 473
- 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. P: BLD 424 R: Open to seniors in the Clinical Laboratory Sciences major. SA: MT 474
- 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: BLD 433 R: Open to seniors in the Clinical Laboratory Sciences major. SA: MT 475
- Application and integration of theory and technical skills in immunology and immunohematology.
- 476 Advanced Clinical Immunology and Immunohematology**  
Fall, Spring, Summer. 1 credit. P: BLD 433 and BLD 434 and BLD 435 R: Open to seniors in the Clinical Laboratory Sciences major. SA: MT 476
- 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: MMG 464 and BLD 450 R: Open to seniors in the Clinical Laboratory Sciences major. SA: MT 477
- Application and integration of theory and technical skills in clinical microbiology and infectious disease.
- 478 Advanced Clinical Microbiology**  
Fall, Spring, Summer. 1 credit. P: MMG 463 and BLD 450 and BLD 498 R: Open to seniors in the Clinical Laboratory Sciences major. SA: MT 478
- Theoretical aspects of clinical microbiology and infectious disease. Integration of cognitive material with clinical laboratory test results.
- 479 Professional Behavior in Clinical Laboratory Science**  
Fall, Spring, Summer. 1(0-2) P: (BLD 220 and BLD 442) and ((BLD 471 or concurrently) or (BLD 473 or concurrently) or (BLD 475 or concurrently) or (BLD 477 or concurrently)) R: Open to students in the Clinical Laboratory Sciences major. SA: MT 479
- Application of professional behavior principles to practical experiences in clinical laboratory science.
- 482 Advanced Diagnostic Molecular Science**  
Spring. 2 credits. R: Open to students in the Diagnostic Molecular Science major. SA: MT 482 C: BLD 483 concurrently or BLD 484 concurrently or BLD 485 concurrently or BLD 486 concurrently.
- Integration of principles and concepts in diagnostic molecular science with diagnostic laboratory test results.
- 483 Molecular Diagnostic Experience in Hematopathology and Oncology**  
Spring. 2 credits. P: BLD 438 R: Open to students in the Diagnostic Molecular Science major. SA: MT 483 C: BLD 482 concurrently.
- Clinical experience in molecular diagnostic laboratories with applications in hematopathology and oncology.
- 484 Molecular Diagnostic Experience in Infectious Disease**  
Spring. 2 credits. P: BLD 438 R: Open to students in the Diagnostic Molecular Science major. SA: MT 484 C: BLD 437 concurrently.
- Clinical experience in molecular diagnostic laboratories with applications to infectious disease diagnosis.
- 485 Molecular Diagnostic Experience in Inherited and Predictive Genetics**  
Spring. 2 credits. P: BLD 438 R: Open to students in the Diagnostic Molecular Science major. SA: MT 485 C: BLD 482 concurrently.
- Clinical experience in molecular diagnostic laboratories with applications in inherited and predictive genetics.
- 486 Molecular Diagnostic Experience in Genotyping and Individual Identification**  
Spring. 2 credits. P: BLD 438 R: Open to students in the Diagnostic Molecular Science major. SA: MT 486 C: BLD 482 concurrently.
- Clinical experience in molecular diagnostic laboratories with applications to genotyping and identification of individuals.
- 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 to students in the Clinical Laboratory Sciences major or in the Diagnostic Molecular Science major or in the Lyman Briggs School-Medical Technology Coordinate Major or in the Medical Technology major. SA: MT 495
- Faculty directed study including assigned readings, reviews of appropriate scientific periodicals, research, and laboratory experience.
- 498 Focused Problems in Clinical Laboratory Science**  
Spring. 2(1-2) P: BLD 417 and BLD 434 and (BLD 424 or concurrently) and (BLD 450 or concurrently) R: Open to students in the Clinical Laboratory Sciences major. SA: MT 454, MT 498
- Case study problems of medical microbiology, hematology, and clinical chemistry.
- 498L Infectious Disease Diagnostic Laboratory**  
Spring. 1(0-3) P: MMG 464 and (BLD 450 or concurrently) RB: BLD 430 and BLD 434 R: Open to undergraduate students in the Clinical Laboratory Sciences major.
- Applying pre-analytical, analytical, and post-analytical principles to the identification of infectious agents in unknown samples.
- 801 Biomedical Laboratory Diagnostics Seminar**  
Fall, Spring. 1(1-0) A student may earn a maximum of 2 credits in all enrollments for this course. SA: MT 801
- Current research topics in clinical laboratory sciences.

- 805 Communication in the Sciences**  
Fall, Summer. 2(2-0)  
Professional communication in clinical laboratory science, including article and proposal writing, thesis writing, posters, and presentations.
- 811 Fundamentals of Scientific Research**  
Fall. 1(1-0) R: Open to master's students in the Biomedical Laboratory Diagnostics Program. SA: MT 810  
Best practices for the research enterprise. Ethical conduct of research. Critical evaluation of scientific literature.
- 815 Cell Biology in Health and Disease I**  
Spring. 2(2-0) RB: Undergraduate course in Biochemistry and Physiology.  
Experience in a clinical laboratory  
Principles and theories of cell biology and biochemistry are presented with a focus on applications to clinical pathology.
- 816 Cell Biology in Health and Disease II**  
Summer. 2(2-0) P: BLD 815 RB: Undergraduate course in biochemistry and physiology.  
Experience in a clinical laboratory  
Continuation of BLD 815.
- 830 Concepts in Molecular Biology**  
Fall, Spring. 2(2-0) Interdepartmental with Pathobiology and Diagnostic Investigation. Administered by Biomedical Laboratory Diagnostics. RB: One course in biochemistry or concurrently. SA: MT 830  
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: BLD 830 RB: Basic biochemistry, medical or research laboratory experience SA: MT 831  
Molecular diagnostic principles. Diagnostic outcomes in traditional and non-traditional laboratory disciplines.
- 832 Molecular Pathology Laboratory**  
Summer. 2(0-4) P: BLD 831 or concurrently  
Equipment operation, DNA extraction and measurement, electrophoresis, hybridization and transfers, amplification and detection including techniques and automated sequencing. Clinical applications.
- 835 Hemostasis, Thrombosis and Effective Resource Management**  
Fall. 3(3-0) RB: Background in hemostasis, thrombosis and blood product management.  
Theories of coagulation, thrombosis and effective blood product management. Needs and particular stresses during an active bleeding crisis.
- 836 Adverse Transfusion Outcomes: Detection, Monitoring and Prevention**  
Spring, Summer. 2(2-0) RB: Medical technology and clinical laboratory sciences laboratory professionals.  
Adverse transfusion outcomes (ATO) covering cause, methods of detection, monitoring paradigms and prevention.
- 837 Transfusion Service Operations and Management**  
Fall, Spring. 1(1-0) RB: Clinical transfusion service practical experience.  
Management and operational practices needed to meet both the fiscal and regulatory oversight of a transfusion service.
- 838 Clinical Context of Blood Product Management**  
Summer. 1(1-0) RB: Experience in transfusion medicine  
Effective blood product management in the context of high use, high demand clinical settings.
- 839 Problems in Histocompatibility and Immunogenetics**  
Summer. 2(2-0)  
Application of transplant immunology to case studies and data analysis.
- 842 Managing Biomedical Laboratory Operations**  
Fall, Spring. 2(2-0) R: Open to graduate students or lifelong graduate students or approval of department. SA: MT 842  
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: BLD 842 R: Open to graduate students or lifelong graduate students or approval of department. SA: MT 844  
Current issues relevant to biomedical laboratory operations from an interdisciplinary perspective with an emphasis on efficient laboratory operations.
- 846 Decision Processes for Biomedical Laboratory Operations**  
Fall. 2(2-0) P: BLD 842 R: Open to master's students or lifelong graduate students or approval of department. SA: MT 846  
Integrative case studies presented in a problem-based learning format. Strategies for decision-making in the operations of a biomedical laboratory. Cases integrate scientific principles, management principles and regulatory factors.
- 850 Concepts in Immunodiagnosics**  
Fall, Spring. 2(2-0) RB: An undergraduate course in biochemistry or cell biology. SA: MT 850  
Immunology principles and theory applied to diagnostic evaluation of the host immune response during health and disease.
- 851 Clinical Application of Immunodiagnostic Principles**  
Spring, Summer. 2(2-0) P: BLD 850 SA: MT 851  
Immunodiagnostic theories and principles applied to clinical assay development and method evaluation.
- 852 Immunodiagnosics Laboratory**  
Summer. 2(2-0) P: BLD 850  
Performance of immunopurifications, in vitro diagnostic assays and basic flow cytometry. Data analysis and quality control evaluation.
- 853 Advanced Flow Cytometry**  
Summer. 2(2-0) P: BLD 850 and BLD 851 and (BLD 852 or concurrently) or approval of department  
Flow cytometry systems, software and reagents. Data analysis and experimental design of complex flow cytometric assays. Flow cytometry applications in medicine and research.
- 861 Emerging Infections, Emerging Technology**  
Summer. 2(2-0) P: MMG 463 or approval of department RB: Undergraduate degree in medical laboratory science, microbiology or epidemiology  
Use of recent cases in infectious diseases to investigate the causes for disease emergence and the laboratory technologies used to identify the microbial causes, to describe epidemiology and to develop surveillance systems and prevention.
- 870 Clinical Mass Spectrometry Theory**  
Fall. 2(2-0) RB: One course in Biochemistry or concurrent.  
The theory and principles of mass spectrometry. Principles of instrumentation, liquid and gas chromatography theory and data analysis as it applies to the clinical laboratory.
- 871 Applied Clinical Mass Spectrometry**  
Spring. 2(2-0) P: BLD 870 or approval of department RB: One course in protein chemistry or concurrent  
Data interpretation and quality control in clinical mass spectrometry. Principles of sample preparation, platform selection, data analysis, and clinical applications as it applies to the clinical laboratory.
- 872 Clinical Mass Spectrometry Laboratory**  
Summer. 2(1-2) P: BLD 870 and BLD 871 or approval of department RB: One course in protein chemistry or concurrent enrollment in same.  
Sample preparation, instrument operation, data interpretation, and instrument maintenance as it relates to the clinical practice.
- 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 to graduate students in the Clinical Laboratory Sciences major. SA: MT 890  
Non-thesis research for Plan B master's students.
- 895 Projects in Biomedical Laboratory Operations**  
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to master's students in the Biomedical Laboratory Operations major or approval of department. SA: MT 895  
Completion of a significant on-site project in cooperation with an industrial/clinical partner.
- 899 Master's Thesis Research**  
Fall, Spring, Summer. 1 to 10 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open to graduate students in the Clinical Laboratory Sciences major. SA: MT 899  
Master's thesis research.