MEDICAL LABORATORY SCIENCE (MLS)

Explanation of Course Numbers
• Courses in the 1000s are primarily introductory undergraduate courses
• Those in the 2000–4000s are upper-division undergraduate courses that can also be taken for graduate credit with permission and additional work
• Those in the 6000s and 8000s are for master’s, doctoral, and professional-level students
• The 6000s are open to advanced undergraduate students with approval of the instructor and the dean or advising office

MLS 0190. Blood Banking Exam Review. 0 Credits.
Review of professional knowledge in all areas of blood banking.

MLS 1070. Clinical Laboratory Rotation I. 10 Credits.
MLS 1071. Clinical Laboratory Rotation II. 10 Credits.
MLS 1080. Intro to Laboratory Medicine. 0 Credits.
MLS 1081. Clinical Chemistry I. 6 Credits.
MLS 1082. Clinical Chemistry II. 6 Credits.
MLS 1083. Hematology I. 4 Credits.
MLS 1084. Hematology II. 3 Credits.
MLS 1085. Urinalysis and Body Fluids. 2 Credits.
MLS 1086. Clinical Immunology. 2 Credits.
MLS 1087. Blood Banking I. 4 Credits.
MLS 1088. Blood Banking II. 3 Credits.
MLS 1089. Clinical Microbiology I. 5 Credits.
MLS 1090. Clinical Microbiology II. 5 Credits.
MLS 2000. Biology for Health Sciences. 3 Credits.
This course will cover key concepts in biology with an emphasis on the similarities and differences between organisms and how they interact with their environment and with each other.

MLS 2001. Chemistry for Health Sciences. 3 Credits.
An introduction to basic concepts in general, organic and biological chemistry, including the nature of matter, chemical reactions, stoichiometry, solutions, and the chemistry of biomolecules.

MLS 4101. Introduction to Cytotechnology. 2 Credits.
The history and development of cytology; role and ethical practices of the cytotechnologist in the health care system. Basic cell structure and function with detailed microscopic study of normal squamous, endocervical, and endometrial epithelial cells, as well as other non epithelial cells and contaminants. Principles of microscopy, Kohler illumination, use and maintenance of the microscope. Restricted to METC Cytotechnology Program students.

MLS 4102. Gynecologic Cytology. 3 Credits.
MLS 4103. Abnormal Gynecologic Cytology. 3 Credits.
Histopathology, cytopathology, etiology, diagnosis, staging and treatments of benign and malignant disease processes of the female reproductive system.

MLS 4104. Pulmonary Cytology. 2 Credits.
Epithelial appearances and changes associated with normal, benign and malignant processes of the upper and lower respiratory tracts.

MLS 4105. Cytology of the Gastrointestinal Tract, Liver and Pancreas. 2 Credits.
Characteristics of each body site in relation to normal, benign and malignant cellular changes.

MLS 4106. Urogenital System Cytology. 2 Credits.

MLS 4107. Body Cavity Fluid Cytology. 3 Credits.
Examines the cytopathology of effusions, cerebrospinal fluids and other body fluids and the cytologic changes associated with benign and malignant processes.

MLS 4108. Fine Needle Aspiration. 4 Credits.
Basic principles of cytopathology applied to the cellular samples from fine needle aspirations of the head and neck region, breast, lymph nodes, soft tissues and bone.

MLS 4109. Cytotechnology Clinical Practicum. 18 Credits.
Clinical experience to apply the objectives learned and to develop the critical screening and interpretative skills to function as a cytotechnologist.

MLS 4110. Independent Study in Cytotechnology. 2 Credits.
Critical review and presentation of cytopathology published research, and completion of an independent research project related to cytology.

MLS 4111. Clinical Microbiology. 2 Credits.
MLS 4115. Parasitology and Mycology. 1 Credit.
MLS 4118. Laboratory Operations. 1 Credit.
MLS 4120. Urinalysis & Body Fluids. 1 Credit.
MLS 4122. Clinical Chemistry. 3 Credits.
MLS 4124. Clinical Microbiology II. 2 Credits.
MLS 4126. Immunohematology II. 2 Credits.
MLS 4127. Clinical Immunology. 1 Credit.
MLS 4128. Hematology I. 2 Credits.
MLS 4129. Hematology II. 2 Credits.
MLS 4136. Clinical Experience I. 2 Credits.
This practicum course is an assessment and necessary supervised clinical experience in clinical chemistry. Laboratory fee.

MLS 4137. Clinical Experience II. 2 Credits.
This practicum course is an assessment and necessary supervised clinical experience in microbiology. Laboratory fee.
MLS 4138. Clinical Experience III. 2 Credits.
This practicum course is an assessment and necessary supervised clinical experience in hematology, coagulation and urinalysis. Laboratory fee.

MLS 4139. Clinical Experience IV. 2 Credits.
This practicum course is an assessment and necessary supervised clinical experience in transfusion medicine and serology. Laboratory fee.

MLS 4140. Clinical Laboratory Mgt. 3 Credits.

MLS 4141. Immunology and Serology. 3 Credits.
Principles of the immune system’s components, functions, interactions with microorganisms, and the clinical applications of immunologic assays to human health and disease.

MLS 4145. Clinical Biochemistry. 3 Credits.

MLS 4150. Immunohematology. 3 Credits.

MLS 4151. Molecular Diagnostics. 3 Credits.

MLS 4155. Clinical Biochemistry II. 2 Credits.

MLS 4159. Capstone Seminar. 1 Credit.

MLS 4160. Blood Bank Practicum. 4 Credits.
Clinical practicum in which students apply medical knowledge and clinical skills gained in MLS 4150. Prerequisites: MLS 4150.

MLS 4161. Clinical Biochemistry Practicum. 4 Credits.

MLS 4162. Hematology and Hemostasis Practicum. 2 Credits.

MLS 4163. Immunology and Serology Practicum. 1 Credit.

MLS 4164. Clinical Microbiology Practicum. 4 Credits.

MLS 4165. Urinalysis Practicum. 1 Credit.
Required one-week clinical rotation for students in the BSHS in MLS or post-baccalaureate MLS certificate program. During this practicum course, the student actively engages in applying the medical knowledge and clinical skills gained in MLS 4120.

MLS 4166. Coagulation Practicum. 1 Credit.
One-week required rotation for students in the Bachelor of Science in Health Science in Medical Laboratory Science (MLS), Post-baccalaureate MLS, or Post-baccalaureated in Hematology for MLS certificate programs. Focus on analyses and laboratory testing of human blood specimens.

MLS 4214. Clinical Microbiology I Laboratory. 1 Credit.
Observation of many of the medically important organisms and practical experience in current diagnostic techniques and identification systems used in clinical practice. Principles, procedures, techniques, and data interpretation for the isolation and identification of clinically significant organisms.

MLS 4215. Clinical Parasitology and Mycology Laboratory. 1 Credit.
Practical experience in the identification of medically significant parasites and fungi.

MLS 4224. Clinical Microbiology II Laboratory. 1 Credit.
Practical experience using patient samples commonly submitted to the microbiology laboratory. Current diagnostic techniques and identification systems used in clinical practice. Principles, procedures, techniques, and data interpretation for the isolation and identification of clinically significant organisms from patient specimens.

MLS 4228. Hematology I Laboratory. 1 Credit.
Diagnostic analyses used to evaluate disease states associated with human blood cells. Emphasis on quality assurance in the hematology laboratory and on the evaluation of stained blood smears and microscopic differentiation of blood cells.

MLS 4229. Hematology II Laboratory. 1 Credit.
Blood and body fluid analyses that are commonly performed in a diagnostic hematology laboratory.

MLS 4245. Clinical Biochemistry I Laboratory. 1 Credit.
Introduction to the principles of various diagnostic testing procedures performed in the clinical biochemistry laboratory. The physiological basis, principles and procedures, and clinical significance of biochemical test results, including quality control and reference values.

MLS 4250. Immunohematology Laboratory. 1 Credit.
Performance of routine blood banking procedures, including blood group and Rh typing, antibody screens, antibody identification, cross matching, and elution and absorption techniques. Prerequisites: Program Standing.

MLS 4251. Molecular Diagnostics Laboratory. 1 Credit.
An introduction to the theory of and laboratory techniques in molecular biology with an emphasis on molecular and serological techniques, including DNA extraction and quantitation, restriction enzyme digestion, polymerase chain reaction, agarose gel electrophoresis, flow cytometry, and ELISA. Prerequisites: Program Standing.

MLS 4255. Clinical Biochemistry II Laboratory. 1 Credit.
The measurement and interpretation of chemical constituents in human blood and body fluids.

MLS 6114. Advanced Clinical Microbiology I. 2 Credits.
Pathogenic characteristics, isolation techniques, specimen collection and handling, laboratory identification, and treatment of medically significant bacteria and viruses with emphasis on current diagnostic techniques used in clinical practice.

MLS 6115. Advanced Clinical Parasitology and Mycology. 1 Credit.
A systematic approach to the biology and epidemiology of human parasitic and fungal diseases. The symptomology, pathology, diagnostic procedures, and treatment of the various parasites and fungi that infect humans. Other topics include disease causation and specimen collection/handling.
MLS 6124. Advanced Clinical Microbiology II. 2 Credits.
The etiology of infectious diseases in different body sites using a case study approach. The epidemiology, pathogenic mechanisms, and laboratory identification of suspected etiologic agents. Commonly encountered clinical species are discussed using case studies that include clinical history, signs and symptoms, and laboratory test results of diseases produced by the etiologic agents.

MLS 6140. Advanced Laboratory Management. 3 Credits.
A problem-based approach to the principles of laboratory management with focus on managerial concepts that provide opportunities to apply theoretical management models to real-life situations in the clinical laboratory.

MLS 6141. Advanced Immunology and Serology. 3 Credits.
Principles of the immune system and the clinical applications of immunology related to the diagnosis of human diseases. Components of the immune system and the functions of each. The various immune-related diseases and how immunologic assays are used in the clinical setting to diagnose and monitor various disease states.

MLS 6151. Advanced Molecular Diagnostics. 3 Credits.
An overview of molecular biology and genetic concepts as well as the molecular techniques used to diagnose human diseases. The technology, theory, and methodology of molecular protocols utilized within a clinical and research laboratory setting.

MLS 6166. Molecular Diagnostics Practicum. 3 Credits.
During this practicum course, the student will actively engage in applying molecular techniques to diagnose various human diseases.

MLS 6201. Advanced Clinical Biochemistry. 3 Credits.
The structure and function of biological molecules, including proteins, carbohydrates, lipids, nucleic acids, vitamins, hormones, and buffers as well as their anabolism, catabolism, and regulatory mechanisms. The role of these molecules with regard to human health and the manifestation of disease.

MLS 6203. Clinical Immunohematology I. 5 Credits.
MLS 6204. Clinical Immunohematology II. 5 Credits.
MLS 6207. Clinic Pract: Blood Banking I. 5 Credits.
MLS 6208. Clinic Pract: Blood Banking II. 5 Credits.
MLS 6209. Clinic Pract: Blood Banking III. 5 Credits.
MLS 6210. Clinic Immun: Prin & Lab Diag. 4 Credits.
MLS 6211. Hematopoiesis & Blood Pathophys. 2 Credits.
MLS 6212. Organiz & Mgt of Blood Banks. 3 Credits.
MLS 6213. Seminar in Immunohematology. 2 Credits.
MLS 6214. Specialized Practicum. 4 Credits.
MLS 6215. Research Project. 3 Credits.
MLS 6216. Microbial Pathogenesis. 3 Credits.
A comprehensive overview of the molecular basis of diseases caused by microbial pathogens with a focus on model microbial systems to illustrate mechanisms of the human infectious disease process.

MLS 6217. Medical Biotechnology. 2 Credits.
A comprehensive overview of current molecular technologies and how they are used in modern medicine.

MLS 6218. Genetics. 3 Credits.
This course will cover hereditary and molecular genetics, with an emphasis on genomics and human diseases.

MLS 6219. Molecular Biology. 3 Credits.
This course will emphasize the molecular mechanisms of DNA replication, repair, transcription, translation and gene regulation in prokaryotic and eukaryotic cells.

MLS 6242. Molecular Pathology. 3 Credits.
This course will investigate human disease processes with an emphasis on the molecular and genetic mechanisms of disease. The goal of this class is to advance students’ understanding of how molecular, cellular and genetic approaches are used to investigate human diseases. Current knowledge of the molecular and cellular events which lead to various human diseases will be covered, including cardiovascular, neurological and musculoskeletal abnormalities, autoimmunity, endocrine defects, infectious disease and cancer. Through lectures, assigned readings and discussions, current applications and limitations of modern diagnostic medicine and the importance of basic and applied research to further the understanding of human disease will be addressed.
MLS 6243. Education & Assessment in MLS. 3 Credits.
This course studies the process of instructional design and applied to the education and training of MLS professionals. Topics include a fundamental review of instructional strategies, needs assessment, task analysis, analysis of subject-matter content, the development of goals and objectives, lesson design, and the assessment of instructional outcomes. This is a project-oriented course in which students will design, develop, and evaluate a set of MLS instructional materials and assessment tools. In addition, current trends in instructional design as applied to the MLS field will be explored.

MLS 6244. Research Ethics & Integrity. 3 Credits.
This course will address traditional and modern topics in research ethics and scientific integrity. The purpose of this course is to emphasize ethical theory and principles of bioethics while planning and conduction scientific studies. Through lectures, reading assignments, case studies and discussion sessions, the following topics will be covered: ethical theory and principles, scientific and academic integrity, informed consent in research; Intuitional Review Boards and the use of human subjects in research. IACUC and the use of animals in research, Institutional Biosafety Committees and the use of recombinant DNA in research; conflicts of interest and commitment; authorship and publication; the peer-review process; collaboration and mentoring; methodology, data reporting and data management; ownership of data and intellectual property; whistleblowing and dispute resolution; and privacy and confidentiality. Students will learn to conduct unbiased peer-review, conduct research and report on an independent examination of a case of research misconduct or other ethical issue, and participate in oral scientific and ethical discussions.

MLS 6245. Current Topics in MLS. 3 Credits.
This course covers novel findings within each area of the medical laboratory science field, including Hematology and Hemostasis, Immunology and Serology, Clinical Microbiology, Immunohematology, Clinical Chemistry, Molecular Diagnostics, and Laboratory Operations and Management. The course will broaden the student’s awareness of novel trends and findings and afford the opportunity for students to stay current in the ever-changing filed of laboratory medicine. The overall goal of this course is to enhance critical thinking and problem solving skills. The current topics will be integrated into the development of a required project proposal for the capstone research project that the student will complete the following semester.

MLS 6246. Capstone Project. 3 Credits.
This course will allow students to apply the knowledge gained throughout the program through the completion of an independent, mentored project. A proposal for the capstone project will have been developed by the student as a component of the Current Topics course during the previous semester.