MEDICAL LABORATORY SCIENCE (MLS)

Explanation of Course Numbers
- Courses in the 1000s are primarily introductory undergraduate courses
- Those in the 2000s to 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 1040. Introduction to Histotechnology. 1 Credit.
This consolidated course provides a welcome and orientation to the student and provides a tour of the facilities to include the microtomy area, special stains areas, classrooms, and areas of interest. Topics covered in this course include laboratory and environmental safety, mission and organizational structure, medical materials, and administration, professional standards of ethics, HIPPA, and customer service basics. Restricted to histotechnology military contract students.

MLS 1041. Basic Scientific Information. 2 Credits.
This consolidated course introduces the student to comprehensive medical terminology and its application to pathology. Emphasis is placed on word roots, prefixes, suffixes, spelling and analysis of unfamiliar terms. The importance of basic cellular organization and how those structures and processes contribute to tissue function are also emphasized. Students are introduced to basic chemistry vocabulary and concepts such as molecules and molecular compounds, ions and ionic compounds, chemical reaction types, atomic and molecular weights, the periodic table, and nomenclature, electronic structure of atoms, simple periodic properties of the elements, chemical bonding, acids and bases. The microscopy principles include the Kohler illumination, operation, function and maintenance of a compound light microscope and its components. Restricted to histotechnology military contract students.

MLS 1042. Specimen Processing for Histological Study. 1 Credit.
Theories, knowledge, and skills of tissue specimen processing; techniques and theories of tissue fixation, tissue decalcification, tissue dehydration, tissue clearing, and tissue infiltration, and the basic operation of automated tissue processors. The course provides a comprehensive knowledge of tissue processing in a typical histology laboratory. Restricted to histotechnology military contract students only.

MLS 1043. Routine Technical Procedures. 2 Credits.
Introduction to the knowledge and skills in the histological techniques of tissue embedding, microtomy, and frozen sections; the operation, function, and maintenance of the microtome and cryostat; nuclear and cytoplasmic staining theories and chemistry of routine tissue specimens; techniques for coverslipping microscopic slides, the different types of mounting media used, and the proper techniques for repairing damaged glass slides. Restricted to histotechnology military contract students.

MLS 1044. Special Stains for Histologic Study. 3 Credits.
Concepts of laboratory measurements, nomenclature proper use, and maintenance of glassware used in the precise measurement of liquids and compounds; preparation and use of the six different categories of special stains used in the histology laboratory; identifying certain cellular structures based on the reaction of special stains for carbohydrates and amyloid, connective tissue and muscle, microorganisms and pigments, minerals, and cytoplasmic granules. Restricted to histotechnology military contract students.

MLS 1045. Anatomy and Tissue Identification. 3 Credits.
Basic human anatomy and physiology with emphasis on human systems; function and microscopic arrangement of human cells, tissues and organs; identifying the most salient cellular and tissue structures of the human body; macroscopic and microscopic tissue identification; the respiratory, cardiovascular, gastrointestinal tract, skeletal system, digestive accessory organs, and the circulatory, nervous, immune, respiratory, urinary and male reproductive systems. Restricted to histotechnology military contract students.

MLS 1046. Autopsy Procedures. 1 Credit.
Knowledge, skills, terminology, and techniques needed to assist in routine and special postmortem examinations; safety precautions, use of specialized equipment, specimen recovery techniques, and toxicology specimen protocols necessary to perform routine and special autopsies; types of special autopsies, their functions, and support role with the pathologist or medical examiner. Restricted to histotechnology military contract students.

MLS 1047. Cytopreparatory Techniques. 2 Credits.
Basic preparatory techniques of cytological specimens; receiving, fixing, and making cytologic preparations from GYN, NON-GYN, and FNA specimens to include smears, cytospins, thinpreps, and cell; shipment of specimens. Restricted to histotechnology military contract students.

MLS 1048. Immunohistochemistry. 2 Credits.
Fundamentals of immunohistochemistry as applied to the theory and practical techniques in histopathology; how immunology is applied in the development of immunohistochemistry reagents and techniques; clinical significance of diagnostic and prognostic indicators used in immunohistochemistry techniques; the purpose and use of companion diagnostic techniques, such as molecular diagnostics and flow cytometry. Restricted to histotechnology military contract students.
**MLS 1049. Practical Histotechnician Training. 16 Credits.**
Practical experience performing entry-level competencies and using equipment of a typical histology laboratory in preparation for clinical rotations; preparing chemical solutions, accessioning mock specimens, performing basic laboratory administration, performing gross surgical procedures, tissue fixation, decalcification, tissue processing, tissue embedding, routine microtomy, frozen sections, special/routine staining; preventative maintenance on histology equipment and specimen maintenance/disposition. Conducted in a functioning training laboratory where the operation of a histology laboratory is simulated in a controlled environment. Restricted to histotechnology military contract students.

**MLS 1050. Histo Clinical Practicum. 12 Credits.**
Practical course in the daily routine and work flow of patient specimens; grossing, embedding, frozen sectioning, microtomy and histochemical staining and cytopreparatory techniques; didactic review of all courses in preparation for the national board of certification exam. Students work with experienced technicians and pathologists while understanding their duties and responsibilities as a technician. Conducted under the supervision of the clinical preceptors and assisted by METC instructors. at the San Antonio Medical Center (SAMMC), Centers for Disease Detection (CDD), Restricted to histotechnology military contract students.

**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 3000. Clinical Laboratory Mathematics. 3 Credits.**
Basic mathematical techniques used in the clinical laboratory, including exponential and logarithms, measurement systems, solutions and concentrations, proportionality, graphing, statistics and quality control, and method evaluation. Practical applications of the data analysis. Students are expected to have completed a college-level math (algebra or above) or statistics course or HSCI 2117 prior to enrollment. Proctor fee. Restricted to students in the medical laboratory science program.

**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. 5 Credits.**
Histopathology, cytopathology, etiology, diagnosis, staging, and treatment of benign and malignant disease processes of the female reproductive system. Restricted to METC Cytotechnology Program students.

**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. 3 Credits.**
Characteristics of each body site in relation to normal, benign, and malignant cellular changes. Restricted to METC Cytotechnology Program students.

**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 cytopathologic changes associated with benign and malignant processes.

**MLS 4108. Fine Needle Aspiration. 5 Credits.**
Basic principles of cytopathology applied to cellular samples from fine needle aspirations of the head and neck region, breast, lymph nodes, soft tissues, and bone. Restricted to METC Cytotechnology Program students.

**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. 1 Credit.**
Critical review and presentation of published research in the field of cytopathology; completion of an independent research project related to cytopathology. Restricted to METC Cytotechnology Program students.
MLS 4114. Clinical Microbiology. 2 Credits.
Clinical microbiology.

MLS 4115. Parasitology and Mycology. 1 Credit.
Principles and procedures involved in the diagnosis of parasitic and fungal infections; disease causation, specimen collection and handling, laboratory identification, and treatment of medically significant fungi and parasites. Proctor fee.

MLS 4118. Laboratory Operations. 1 Credit.
Basic concepts applicable to all areas of the clinical laboratory, including topics, such as quality assurance, quality control and laboratory safety. Proctor fee.

MLS 4120. Urinalysis and Body Fluids. 1 Credit.
Study of the chemical and formed elements of urine as well as clinical correlation of findings with disease states; analysis of other body fluids such as cerebrospinal fluid and synovial fluid. Proctor fee.

MLS 4123. Clinical Microbiology I. 3 Credits.
Principles of clinical microbiology with emphasis on pathogenic characteristics, isolation, and identification of bacteria and viruses related to human disease; theoretical approach to the current diagnostic techniques and identification systems used in clinical practice; disease causation, specimen collection and handling, laboratory identification, and treatment of medically significant bacteria and viruses. For prerequisites BISC 1115/ BISC 1125 an equivalent biology course and for HSCI 3106 an equivalent general microbiology course may be substituted at the instructor’s discretion. Proctor fee. Recommended background: BISC 1115 and BISC 1125; and HSCI 3106.

MLS 4124. Clinical Microbiology II. 2 Credits.

MLS 4128. Hematology I. 2 Credits.
Blood and blood-forming tissues with emphasis on hematologic techniques and cell identification; anemias and non-malignant leukocyte disorders are also presented. Proctor fee.

MLS 4129. Hematology II. 2 Credits.
Some of the more common hematologic disorders with emphasis on the laboratory diagnosis of these disorders; disorders of the hemostasis system. Proctor fee.

MLS 4136. Clinical Experience I. 2 Credits.
Supervised clinical experience in clinical chemistry. Proctor fee.

MLS 4137. Clinical Experience II. 2 Credits.
Supervised clinical experience in microbiology. Proctor fee.

MLS 4138. Clinical Experience III. 2 Credits.
Supervised clinical experience in hematology, coagulation and urinalysis. Proctor fee.

MLS 4139. Clinical Experience IV. 2 Credits.
Supervised clinical experience in transfusion medicine and serology. Proctor 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 I. 3 Credits.
This course studies the methodologies employed in the chemical analysis of human blood and body fluids. This includes an examination of the fundamentals of measurement and the principles of instrumentation as they relate to the assay of each analyte studied. In addition, the laboratory results are correlated with the clinical significance and pathophysiology which may generate changes in the analyte. Throughout the course, the quality assurance measures required to ensure reliability and validity of the laboratory results will also be emphasized. [add to end of description: Proctor fee.

MLS 4146. Clinical Biochemistry II. 3 Credits.
This second course in clinical biochemistry continues the study of the measurement and interpretation of chemical constituents in human blood and body fluids. The laboratory results of each analyte are correlated with the clinical significance and pathophysiology which may generate changes in the analyte. Throughout the course, the quality assurance measures required to ensure reliability and validity of the laboratory results will also be emphasized.

MLS 4150. Immunohematology. 3 Credits.
The major blood group systems that affect the practice of transfusion medicine and examines the processing and distribution of blood products supplied by transfusion services. Proctor fee.

MLS 4151. Molecular Diagnostics. 3 Credits.
Introduction to the molecular techniques used to diagnose human disease; technology, theory, and methodology of specific molecular protocols that can be used within a clinical laboratory setting to aid in disease diagnostics including those of genetic, oncogenic, and infections origin. Proctor fee.

MLS 4155. Clinical Biochemistry II. 2 Credits.
Clinical Biochemistry II.

MLS 4158. Laboratory Management and Operations. 3 Credits.
Introduction to critical concepts of lab management, including leadership theory, management principles, human resource management, financial management, quality management, and laboratory operations. Proctor fee.

MLS 4159. Capstone Seminar. 1 Credit.
Comprehensive review of medical laboratory science, which prepares students to sit for the board of certification examination. Integration of knowledge gained in didactic and practicum courses within the various laboratory disciplines, including hematology, microbiology, chemistry, and immunohematology. Proctor fee.
MLS 4160. Blood Bank Practicum. 4 Credits.
Clinical practicum in which students apply medical knowledge
and clinical skills gained in MLS 4150. Proctor fee. Prerequisite:
MLS 4150.

MLS 4161. Clinical Biochemistry Practicum. 4 Credits.
Application of the medical knowledge and clinical skills gained
in the didactic clinical biochemistry I and clinical biochemistry II
courses. Proctor fee.

MLS 4162. Hematology Practicum. 2 Credits.
Analyses and laboratory testing of human blood specimens.
Proctor fee.

MLS 4163. Immunology and Serology Practicum. 1 Credit.
Supplemental, hands-on clinical experience applying
medical knowledge and clinical skills gained in the didactic
immunology and serology course. For students who need to
meet additional requirements for state licensure as a medical
laboratory professional. Restricted to students in the medical
laboratory science program.

MLS 4164. Clinical Microbiology Practicum. 4 Credits.
Students apply medical knowledge and clinical skills gained
in MLS 4123 (Clinical Microbiology I), MLS 4124 (Clinical
Microbiology II), and MLS 4151 (Molecular Diagnostics).
Proctor fee.

MLS 4165. Urinalysis Practicum. 1 Credit.
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 4167. Immunology and Serology Practicum. 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 4168. Clinical Parasitology and Mycology Laboratory.
1 Credit.
Practical experience in the identification of medically significant
parasites and fungi.

MLS 4169. 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 4170. 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 4171. Hematology II Laboratory. 1 Credit.
Blood and body fluid analyses that are commonly performed in
a diagnostic hematology laboratory.

MLS 4172. Hematology III 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 4173. 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 4174. Molecular Diagnostics 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 4175. Clinical Biochemistry II Laboratory. 1 Credit.
The measurement and interpretation of chemical constituents
in human blood and body fluids.

MLS 4176. 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 4177. 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 4178. Advanced Clinical Microbiology II. 3 Credits.
Pathogenic characteristics, isolation techniques, specimen
collection and handling, laboratory identification, and
treatment of medically significant bacteria and viruses; current
diagnostic techniques used in clinical practice. For prerequisite
BISC 1115/BISC 1125 an equivalent biology course and for
HSCI 3106 an equivalent general microbiology course may
be substituted at the instructor’s discretion. Laboratory fee.
Prerequisites: BISC 1115 and 1125; and HSCI 3106.
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 6158. Advanced Laboratory Management and Operations. 3 Credits.
An introduction to critical concepts of lab management, including leadership theory, management principles, human resource management, financial management, quality management, and laboratory operations. Prerequisites: HSCI 2100 and HSCI 2117; for HSCI 2100 an equivalent English course and for HSCI 2117 an equivalent college-level math course may be substituted at the instructor’s discretion.

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. Clinial Pract: Blood Banking I. 5 Credits.

MLS 6208. Clinial Pract: Blood BankingII. 5 Credits.

MLS 6209. Clinial Pract:Blood BankingIII. 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 Medical Laboratory Science. 3 Credits.
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 is designed to enhance critical thinking and problem solving skills. Current topics are integrated into the development of a project proposal for the capstone research project that the student completes 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.