Medical Laboratory Science

Bachelor of Science

Pre-Medical Concentration
Medical Laboratory Technician (MLT) - Medical Laboratory Science (MLS) Articulation

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MLS Goals and Objectives

A Bachelor of Science degree in Medical Laboratory Science provides exciting opportunities for individuals with an interest in science who wish to pursue a career in a health/medical profession or other laboratory-related field. This major recently changed its name from Clinical Laboratory Science (CLS) to Medical Laboratory Science. Medical laboratory scientists analyze blood and other body fluids using a variety of methods and sophisticated biomedical instruments. The results of these analyses are used to determine the presence or absence of disease, help determine appropriate medical treatment, monitor therapy, and assess health. Medical laboratory science encompasses such disciplines as hematology, clinical chemistry, immunohematology (blood banking), microbiology, immunology, and molecular diagnostics. Medical laboratory scientists are proficient at problem-solving, integration, organization, and quality management. In addition to performance and interpretation of laboratory procedures, medical laboratory scientists may be involved in the selection of lab methods or analyzers, as well as training, supervision, and consultation with other health care professionals.

An MLS education provides an excellent preparation for medical and graduate schools, and also prepares the graduate for employment opportunities outside the hospital setting. Recent graduates have gone on to medical school, law school, and programs in physical therapy, pathologists’ assistant, and public health. Diverse job opportunities include employment in research laboratories, forensic science laboratories, veterinary laboratories, fertility centers, and employment as laboratory computer specialists, educators, and laboratory consultants.

Completion of the degree leads to eligibility for certification as a Medical Laboratory Scientist by the Board of Certification of the American Society of Clinical Pathology. Issuing of the degree is not contingent on passing any type of external certification or licensure examination. The UIS MLS Program has 100% employment of graduates seeking jobs in medical laboratories. The UIS Medical Laboratory Science Program is accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS), 5600 N. River Rd., Suite 720, Rosemont, IL 60018 (773) 714-8880. UIS’ full ten-year accreditation is the result of two consecutive accreditation cycles with no deficiencies.

Program Features/Requirements

The Medical Laboratory Science curriculum at UIS provides outstanding preparation for certification as a medical laboratory scientist. The first two years of the four-year major are considered the PreProfessional Phase. During this time, the student completes the general education requirements of the university and the prerequisites for the Professional Phase. The last two years, including the summer between the last two years, are considered the Professional Phase of the MLS Program which is accredited by NAACLS (see above).

Both UIS students and transfer students must submit an application for the Professional Phase of the MLS Program. Students must meet the Essential Functions and health requirements (including immunizations) outlined on the MLS website in the MLS Student Handbook. The admissions packet is available from the department office staff. See the BACHELOR’S DEGREE (p. 1) section for the Admissions requirements and processes.

Initial academic work provides students with a strong liberal arts general education and background in fundamental sciences. As the program proceeds, students receive theory and laboratory experience in all areas of medical laboratory science. The students’ clinical education encompasses practical rotations through the various clinical specialty areas of affiliated medical laboratories and is under the joint supervision of faculty at the University of Illinois Springfield and practicing professionals in affiliated hospital laboratories. These practicum courses integrate the theory and practice of prerequisite campus courses with the professional practice and sophisticated instrumentation at the medical laboratories. Enhancement experiences are available in areas of interest to the student. A list of the current affiliated medical laboratories can be found on the MLS website. All facilities where students rotate are accredited. The program concludes with courses such as Health Care Management and a capstone Clinical Correlations course.

All students are required to have a criminal background check and drug screen completed prior to participating in clinical rotations. A background check that is not “clear” precludes rotations at some hospitals and prevents employment at most healthcare facilities.

Honors in Medical Laboratory Science (Department Honors)

MLS majors with a cumulative GPA equal to or greater than 3.25 in the MLS Program and one semester in residency at UIS may elect to participate in the MLS honors option. In addition to the MLS Program requirements, honors students must:

1. maintain a minimum cumulative GPA of 3.25,
2. earn a minimum grade of B- for each course in the MLS Program,
3. successfully complete three credits of CLS 400 Applied Research or CLS 499 Tutorial, and
4. present their findings in a formal paper and public presentation.

Students must apply for participation in the honors program to the MLS Program Director and obtain approval of a faculty research advisor prior to their final semester. This is not connected with the CAP Honors Program. Details can be found in the MLS Student Handbook.
Advising

All students are encouraged to meet with the MLS Program Director or a MLS advisor before initial registration and periodically thereafter in order to plan their courses of study to ensure that all requirements are met in the minimum amount of time. There is no advance placement and no credits for experiential learning.

Students are advised to be familiar with the current MLS Student Handbook and ask a MLS advisor for help if they do not understand the MLS policies and procedures.

The transfer option provides for the continuing education of students who have completed the first two years (60 semester hours) of lower-division work (preferably with the A.A. or A.S. degree). The MLS program has two + two articulation agreements with several community colleges; however, transfer students from other two-year and four-year institutions are also encouraged to apply. See the MLS Program Director regarding questions about transfer of credits.

Students should consult with college advisors for specific guidance regarding completion of general education requirements. In MLS, the clinical practicum courses (MLS 421, MLS 422, MLS 423, MLS 424) fulfill the requirement for the ECCE Engagement Experience (six hours).

For best outcomes in the Program and on the national certification exam, part-time status is not recommended. Because the MLS Program proceeds in cohorts, off-sequence students will need to reapply for the cohort with which they will do the full-time clinical practicum courses.

MLS Course Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CHE 322</td>
<td>Laboratory Techniques</td>
<td>1</td>
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<tr>
<td>CHE 418</td>
<td>Bioanalytical Chemistry</td>
<td>3</td>
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<tr>
<td>CHE 433</td>
<td>Physiological Chemistry</td>
<td>4</td>
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<tr>
<td>MLS 321</td>
<td>Seminar in Medical Laboratory Science</td>
<td>2</td>
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<tr>
<td>MLS 347</td>
<td>Medical Bacteriology</td>
<td>4</td>
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<tr>
<td>MLS 401</td>
<td>General Chemistry I</td>
<td>2</td>
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<tr>
<td>MLS 402</td>
<td>Introduction to Hematology</td>
<td>2</td>
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<tr>
<td>MLS 403</td>
<td>Introduction to Immunohematology</td>
<td>2</td>
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<tr>
<td>MLS 404</td>
<td>Introduction to Hemostasis</td>
<td>1</td>
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<tr>
<td>MLS 405</td>
<td>Introduction to Urinalysis</td>
<td>2</td>
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<tr>
<td>MLS 411</td>
<td>Health Care Management</td>
<td>3</td>
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<tr>
<td>MLS 421</td>
<td>ECCE: Clinical Chemistry Practicum</td>
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<tr>
<td>MLS 422</td>
<td>ECCE: Clinical Hematology Practicum</td>
<td>4</td>
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<tr>
<td>MLS 423</td>
<td>ECCE: Clinical Microbiology Practicum</td>
<td>4</td>
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<tr>
<td>MLS 424</td>
<td>ECCE: Clinical Immunohematology Practicum</td>
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<td>MLS 431</td>
<td>Special Topics Practicum</td>
<td>1</td>
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<tr>
<td>MLS 447</td>
<td>Medical Mycology, Parasitology and Virology</td>
<td>4</td>
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<tr>
<td>MLS 448</td>
<td>Introduction to Immunology</td>
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<tr>
<td>MLS 449</td>
<td>Introductory Immunology Lab</td>
<td>1</td>
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<tr>
<td>MLS 451</td>
<td>Advanced Concepts in Immunohematology</td>
<td>2</td>
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<tr>
<td>MLS 452</td>
<td>Advanced Concepts in Hematology</td>
<td>2</td>
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<tr>
<td>MLS 454</td>
<td>Advanced Concepts in Clinical Chemistry</td>
<td>2</td>
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<tr>
<td>MLS 456</td>
<td>Clinical Correlations</td>
<td>2</td>
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Total Hours 59

Grading Policy

Since the curriculum includes laboratory work done under professional supervision, the degree candidate not only must satisfy the customary expectations of academic work but also must meet the high-quality standards demanded of a professional medical laboratory scientist. Students must maintain a minimum cumulative GPA of 2.0 at UIS. Medical Laboratory Science students are required to maintain a grade of C- or better in all required courses.

Courses

MLS 115. Solving Medical Mysteries. 3 Hours.

This course is intended to answer commonly asked questions about human health and disease. An overview will briefly describe healthy human biology and function which will be contrasted with the abnormal functioning seen in major diseases. Actual clinical lab results will be presented in case stories that offer a glimpse into "what is going on inside" the diseased patient. Armed with this type of information, students can become more active and effective consumers within the healthcare system. Course Information: This course fulfills a general education requirement at UIS in the area of Life Science without a Lab.

MLS 131. Introduction to Forensic Science. 3 Hours.

Introduces the scientific basis of forensics investigations. Discusses basic procedures for investigation of crime scenes through deductive reasoning, case history/problem-solving approach. Topics include fingerprints, soil/imprints, toxicology, ballistics, blood/body fluid analysis, DNA fingerprints, and PCR technology. Course Information: Same as CHE 131. This course fulfills a general education requirement at UIS in the area of Physical Science without a Lab.

MLS 132. Introduction to Forensic Science Laboratory. 1 Hour.

This laboratory will illustrate many of the basic scientific procedures and analyses used in forensic science laboratories. Exercises will include fingerprinting, hair/fiber analysis, soil/glass analysis, PCR and DNA profiling, toxicology, blood spatter analysis, and field tests for blood, semen, and drugs. This optional laboratory to be taken with MLS 131. Course Information: Same as CHE 132. This course, with MLS 131, fulfills a general education requirement at UIS in the area of Physical Science with a Lab.

MLS 201. Introduction to Medical Laboratory Science. 1 Hour.

An introduction to health care in general and the medical laboratory profession in particular. Students will create a plan for pursing a health career. Students will also learn how to be better consumers of medical laboratories.

MLS 225. Nutrition. 3 Hours.

Provides a foundation in the basic principles of human nutrition in maintaining and promoting health. Application of basic biological concepts such as cell function and heredity, as well as personal and societal applications of nutrition will enable students to make informed decisions. Course Information: This course fulfills a general education requirement at UIS in the area of Life Science without a Lab.

MLS 311. Laboratory Operations. 2 Hours.

This is an introductory course for basic laboratory operations necessary for Medical Laboratory Science (MLS). This is a lecture/laboratory course that will focus on lab skills as well as general laboratory knowledge. Emphasis will be placed on laboratory skills such as pipetting and phlebotomy. Students will learn to use math skills to solve problems in laboratory science, to include the design and analysis of QC charts.
MLS 321. Seminar in Medical Laboratory Science. 2 Hours.
A writing-intensive course which serves as an introduction to the medical laboratory science program. Professionalism, ethics, and adult learning are discussed. Introduction to research and critique of scientific literature are included. Instruction and experience in blood collection techniques are included.

MLS 325. Evidence-Based Research Concepts. 3 Hours.
This course will focus on outlining the foundation of evidence-based practice in health sciences. The students will gain a basic understanding of principles in evidence-based practice and how to incorporate those principles into clinical practice. Course Information: Same as EXR 325.

MLS 341. Physiologic Processes. 3 Hours.
This course teaches the normal physiology, as well as selected diseases, of the human body at a level required for clinical medicine. Concepts are taught using a combination of lectures and exercises with case studies.

MLS 347. Medical Bacteriology. 4 Hours.
Concise overview of pathogenic bacteriology. Includes discussion of techniques for culturing and identifying bacteria and an introduction to epidemiology. Required of medical laboratory science students. Offered fall semester. Course Information: Same as BIO 347.

Prerequisites: BIO 345 and BIO 346.

MLS 400. Applied Research. 1-4 Hours.
Directed research in procedure development or in-depth investigation of a specific area in medical laboratory science. Topic approved and hours assigned by instructor. Written report required. Course Information: May be repeated to a maximum of 4 hours.

MLS 401. Clinical Chemistry I. 2 Hours.
Lecture/laboratory course focusing on clinical significance and methodology of carbohydrates, proteins, lipids, enzymes, electrolytes, blood gases, acid-base balance, liver function, kidney function, and endocrinology. Emphasis on quality control as it applies to selected clinical chemistry procedures. Course Information: Emphasis is on operation and problem-solving in a modern transfusion service. Course Information: Prerequisites: CHE 433 or equivalent.

MLS 402. Introduction to Hematology. 2 Hours.
Lecture/laboratory course that emphasizes basic hematologic principles. Manual and automated procedures are performed. Emphasis on morphology and clinical applications. Course Information: Prerequisites: MLS 448 or equivalent.

MLS 403. Introduction to Immunohematology. 2 Hours.
Lecture/laboratory course emphasizing immunohematologic concepts and properties underlying scientific principles of blood banking. Includes theory and practical applications of blood-group systems, antibody identification and compatibility testing, hemolytic disease of the newborn, autoimmune hemolytic anemia, and donor procurement and processing. Course Information: Prerequisites: MLS 448 or equivalent.

MLS 404. Introduction to Hemostasis. 1 Hour.
Lecture/laboratory course that emphasizes components in the blood related to hemostatic mechanisms. Includes principles of procedures involved and their relationship to diagnosis and treatment of disease. Course Information: Prerequisites: BIO 141 or equivalent.

MLS 405. Introduction to Urinalysis. 2 Hours.
Lecture/laboratory course emphasizing qualitative, quantitative, and microscopic examination of urine. Includes special analytical procedures and their relationship to diagnosing and monitoring disease and health. Course Information: Prerequisites: BIO 141 or equivalent and CHE 141 or equivalent.

MLS 411. Health Care Management. 3 Hours.
Explores the health care community and groups affected by health care delivery in the United States. Emphasis is on management, including personnel issues, financial issues, regulatory issues, and educational principles using the example of the medical laboratory. This course is open to non-MLS majors.

MLS 421. ECCE: Clinical Immunohematology Practicum. 1-5 Hours.
Experience in clinical hematology, includes advanced instrumentation using automated hematology and coagulation analyzers. Includes microscopic examination of blood smears. Laboratory data is interpreted in light of various disease states and disorders. Course Information: Prerequisites: Senior in Medical Laboratory Science program. This course fulfills an Engaged Citizenship Common Experience requirement at UIS in the area of Engagement Experience.

 MLS 422. ECCE: Clinical Hematology Practicum. 1-4 Hours.
Experience in clinical hematology, includes advanced instrumentation using automated hematology and coagulation analyzers. Includes microscopic examination of blood smears. Laboratory data is interpreted in light of various disease states and disorders. Course Information: Prerequisites: Senior in Medical Laboratory Science program. This course fulfills an Engaged Citizenship Common Experience requirement at UIS in the area of Engagement Experience.

MLS 423. ECCE: Clinical Microbiology Practicum. 1-4 Hours.
Isolation and identification of clinically important microorganisms from a variety of body sites. Includes antibiotic susceptibility testing. Course Information: Prerequisites: Senior in Medical Laboratory Science program. This course fulfills an Engaged Citizenship Common Experience requirement at UIS in the area of Engagement Experience.

MLS 424. ECCE: Clinical Immunohematology Practicum. 1-3 Hours.
Blood typing, antibody screening and identification, compatibility testing, and other immunohematologic procedures are included. Emphasis is on operation and problem-solving in a modern transfusion service. Course Information: Prerequisites: Senior in Medical Laboratory Science program. This course fulfills an Engaged Citizenship Common Experience requirement at UIS in the area of Engagement Experience.

MLS 431. Special Topics Practicum. 1-6 Hours.
Directed research and observational experience opportunities in alternative medical laboratory science practice arenas. Topics and sites must be approved by the instructor. Written report required. Course Information: Prerequisites: Senior in Medical Laboratory Science program. May be repeated to a maximum of 6 hours if topics vary.

MLS 447. Medical Mycology, Parasitology and Virology. 4 Hours.
Overview of medically significant fungi, parasites, and viruses. Emphasis will be placed on pathogenesis, modes of transmission, and identification. Laboratory techniques used in isolation, cultivation, and identification will be used. Also included will be discussions of epidemiology and host response regarding these microorganisms. Course Information: Prerequisites: BIO 141 or equivalent.
MLS 448. Introduction to Immunology. 3 Hours.
Immunologic principles, concepts, and techniques will be discussed, including components of the immune system, cellular and humoral immune response, and antigen-antibody reactions. Human diseases related to compromised immunity will be introduced. Course Information: Same as BIO 448. Prerequisites: BIO 141 or equivalent.

MLS 449. Introductory Immunology Lab. 1 Hour.
Basic immunology and serology procedures with emphasis on medical laboratory diagnostic procedures. Course Information: Same as BIO 449. Prerequisites: BIO 141 or equivalent, MLS 448 or concurrent.

Lecture/laboratory focusing on problem-solving and special techniques used in antibody identification and compatibility testing. Also includes a discussion of donor requirements, blood component preparation and therapy, and quality assurance in the blood bank/transfusion service. Course Information: Prerequisites: MLS 403.

MLS 452. Advanced Concepts in Hematology. 2 Hours.
Lecture/laboratory focusing on advanced principles of hematologic testing leading to improved interpretative skills in hematology. Emphasis on correlation of data with disease states and disorders. Case studies and discussion used to illustrate the pathophysiology of hematological dysfunction. Course Information: Prerequisites: MLS 402.

MLS 454. Advanced Concepts in Clinical Chemistry. 2 Hours.
Lecture/laboratory focusing on clinical significance and methodology of trace elements, vitamins, therapeutic drug monitoring, and toxicology. Newer testing methods used to identify diseases/disorders will be discussed. Emphasizes instrument selection and method validation process. Course Information: Prerequisites: MLS 401.

MLS 456. Clinical Correlations. 2 Hours.
Use of problem-based case studies to analyze clinical situations and correlate laboratory data. Course Information: Prerequisites: Senior in Medical Laboratory Science Program.

MLS 471. Emerging Diseases. 3,4 Hours.
Examines the global emergence of previously unknown or re-emergent infectious diseases. Historical and current diseases will be discussed by integrating the perspectives of medical science and public health in contexts of social systems, economics, politics, and geography. Challenges and remedies in an interdependent but unequal world will be discussed. Course Information: Same as MPH 471.

MLS 480. Topics in Medical Laboratory Science. 1-4 Hours.
Selected topics of interest in current Medical Laboratory Science. Topic(s) for a semester will be stated in the class schedule. Course may include laboratory. Course Information: Prerequisites: Dependent on topic. May be repeated if topics vary.

MLS 499. Tutorial. 1-4 Hours.
Intended to supplement, not supplant, regular course offerings. Students interested in a tutorial must secure the consent of the faculty member concerned before registration and submit any required documentation to him or her. Course Information: May be repeated to a maximum of 4 hours if topics vary.