Medical Laboratory Science
Bachelor of Science Degree Courses
Core Courses

MLS 4410 - Phlebotomy Practicum

Introduction to the theory and procedures for the practice of phlebotomy and simple laboratory testing. Part of the Medical Laboratory Science Core Curriculum, also suited for other health care providers. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4410 Course Outcomes

Participants in this course will gain knowledge and skill in:

1. collecting, transporting, handling and processing blood specimens for analysis;
2. recognizing the importance of specimen collection in the overall patient care system;
3. relating the anatomy and physiology of body systems and anatomic terminology to the major areas of the clinical laboratory, and to general pathologic conditions associated with body systems;
4. identifying and selecting equipment, supplies and additives used in blood collection;
5. recognizing factors that affect specimen collection procedures and test results, and taking appropriate actions within predetermined limits, when applicable;
6. recognizing and adhering to infection control and safety policies and procedures;
7. monitoring quality control within predetermined limits;
8. recognizing the various components of the health care delivery system;
9. recognizing the responsibilities of other laboratory and health care personnel and interacting with them with respect for their jobs and patient care;
10. demonstrating professional conduct, stress management, interpersonal and communication skills with patients, peers and other health care personnel and with the public;

MLS 4412 – Urinalysis and Body Fluids

Fundamental principles of urine and body fluid analysis with correlation of laboratory methods and practice. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4412 Course Outcomes

Participants in this course will gain knowledge and skill in:

· List the six components of the chain of infection and the laboratory safety precautions that break the chain.

· State the purpose of the Standard Precautions policy and describe its guidelines.

· State the requirements mandated by the Occupational Exposure to Blood Borne Pathogens Compliance Directive

· Describe the types of personal protective equipment that laboratory personnel wear, including when, how, and why each article is used.

· Correctly perform hand hygiene procedures following CDC guidelines.
· Describe the acceptable methods for handling and disposing of biological waste and sharp objects in the urinalysis laboratory.
· Discuss the components and purpose of chemical hygiene plans and material safety data sheets.
· State and interpret the components of the National Fire Protection Association hazardous material labelling system.
· Describe precautions that laboratory personnel should take with regard to radioactive, electrical, and fire hazards.
· Explain the RACE and PASS actions to be taken when a fire is discovered.
· Recognize standard hazard warning symbols.
· Define the preexamination, examination, and postexamination components of quality assessment.
· Distinguish between the components of internal quality control, external quality control, electronic quality control, and proficiency testing.

MLS 4414 - Hematology and Hemostasis

Theoretical and applied aspects of medical hematology and hemostasis with emphasis on recognition and correlation of abnormal laboratory observations with pathological conditions. Graduate students will prepare, conduct, and evaluate case study sessions. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4414 Course Outcomes

1. Apply principles of safety, quality assurance and quality control in Hematology.
2. Evaluate specimen acceptability.
3. Compare and contrast hematology values under normal and abnormal conditions.
4. Perform and explain principles and procedures of tests to include sources of error and clinical significance of results.
5. Evaluate normal and abnormal cell morphology with associated diseases.

MLS 4416 - Medical Microbiology

Study and identification of medically important bacteria, viruses, fungi, chlamydiae, rickettsiae, and parasites as applicable to laboratory and infection control settings. Graduate students will prepare, conduct, and evaluate case study sessions. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4416 Course Outcomes

Participants in this course will gain knowledge and skill in:

Understand basic principles of clinical microbiology.

- Know the basic growth media varieties and why/when they are used.
- Know rudimentary culture workups based on source.
- Understand the methods utilized to identify organisms.
- Understand the different staining techniques and when they are used.
- Distinguish microscopic morphologies.
- Understanding antimicrobials and their mechanisms of action.
- Understand basic features of mycobacterium and the stains/smears associated.
- Understand fundamentals of clinical mycology.

- Classification and characteristics of viruses.
- Categories of parasites including classification and examination.
- Understand how to approach working cultures in a clinical microbiology department.
- Understand the material to pass the BOC.

MLS 4418 – Medical Chemistry and Instrumentation

Theoretical and applied aspects of medical chemistry with emphasis on test development, validation, and use in diagnosis and management of pathological conditions. Graduate students will prepare, conduct and evaluate case study sessions. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4418 Course Outcomes

Know the basic principles of clinical chemistry in lab safety, automation, and analytical techniques.

- Categorize clinical correlations based on data from analytical procedures.
- Assess the function of human organ systems based upon laboratory data and patient presentation.

MLS 4420 – Medical Immunology

Practical aspects of immunology with emphasis on pathological conditions and laboratory practice. Graduate students will prepare, conduct, and evaluate case study sessions. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4420 Course Outcomes

Participants in this course will:

1. Gain understanding of basic aspects of the structure and functions of the immune system.
2. Describe the applied aspects of immunology such as defense mechanism, allergy and auto immunity.
3. Understand the cellular and molecular interaction of the immune responses.
4. Discuss the fundamental mechanisms underlying protective immune responses, and discuss the recent advances and emerging themes in immunology research.
5. Describe the fundamental mechanisms underlying immunologic disease and associate these mechanisms with strategies for therapeutic modulation of the immune system.
6. Appreciate the basic immunological principles underlying biotherapeutics, recognize the commonality among diverse organ-specific disease states and infer the mechanisms of therapeutic effect.
7. Analyze the medical literature reporting immunologic advances pertinent to their patients, cite the rationale for use of new immunodiagnostic and immunotherapeutic modalities in their patients, and serve as thought leaders within their medical communities.
8. Understand pre-analytic, analytic, and post-analytic importance and implications on clinical laboratory testing, particularly in regards to immunologic assays.

MLS 4422 – Basic Concepts Transfusion Medicine

Practical aspects and theoretical considerations of major blood groups with respect to transfusion therapy. Oral and written project presentation required for graduate credit. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4422 Course Outcomes

- Apply advanced blood bank and blood transfusion knowledge to make appropriate and effective on-the-job professional decisions.
- Perform and interpret commonly utilized procedures in the blood bank laboratory.
- Recognize normal and abnormal test results and correlate these data with appropriate pathologic conditions to accurately advise health care providers.
- Adapt immunohematology laboratory techniques and procedures when errors and discrepancies in results are obtained to effect resolution in a professional and timely manner.

MLS 4424- Medical **Laboratory Fundamentals**
Theory and application of basic techniques and instruments used in all areas of medical laboratories. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4424 Course Outcomes

Research, evaluate, implement, and monitor methods of collection, transport and handling of various specimen types for molecular analysis. Perform molecular-based laboratory tests, analyze and verify results, and resolve common problems in all the major areas of the clinical laboratory.

MLS 4431 - Medical Microbiology II
Advanced topics in medical microbiology including application of laboratory techniques to the identification and evaluation of medically important pathogens and correlations with disease states.

MLS 4431 Course Outcomes

Participants in this course will gain knowledge and skill in:

Understand basic principles of clinical microbiology.

- Know the basic growth media varieties and why/when they are used.
- Know rudimentary culture workups based on source.
- Understand the methods utilized to identify organisms.
- Understand the different staining techniques and when they are used.
- Distinguish microscopic morphologies.
- Understanding antimicrobials and their mechanisms of action.
- Understand basic features of mycobacterium and the stains/smears associated.
- Understand fundamentals of clinical mycology.
- Classification and characteristics of viruses.
- Categories of parasites including classification and examination.
- Understand how to approach working cultures in a clinical microbiology department.
- Understand the material to pass the BOC.

MLS 4433 – MLS Management and Education

Advanced principles of current personnel, financial, regulatory issues, laboratory information systems, management, and education. Student presentations will be required. Students taking the course for graduate credit will prepare, conduct, and evaluate a project. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4433 Course Outcomes

Go through the following checklist and have an understanding how each component is utilized in the laboratory:

- CAP Checklist
- Inspections
- Leadership Test / Styles
- Time Management
- Conflict Resolution
- QA / Regulations
- Communication Skills
- Professionalism
- Conducting Meetings
- Healthcare Theories
- Budget
- New Test Validation / Instrument Validation
- Procedure Writing
- Competency
- Training
- Recruitment- Resume Writing, Interviewing
- Leadership Skills
- Team Management
- Problem Solving
- Decision Making
- Stress Management

MLS 4435 – Molecular Diagnostics

A comprehensive overview of the fundamental principles of medical molecular diagnostics and use of molecular techniques in the diagnosis of disease. Topics include: Nucleic acid structure and function, genetics, DNA chemistry, introduction to nucleic acid isolation, identification and amplification techniques. Graduate students will prepare, conduct, and evaluate case study sessions. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4435 Course Outcomes

Participants in this course will be able to:

1. Apply knowledge of cellular structure and function, especially DNA and RNA, to molecular diagnostic procedures.
2. Gain a thorough working knowledge of nucleic acid extraction, resolution and detection.
3. Gain a solid foundation in the most commonly utilized molecular diagnostic testing protocols.
4. Apply the knowledge of molecular testing to the most commonly performed applications in the clinical laboratory such as: nucleic acid extraction, resolution and detection, nucleic acid amplification and analyzing DNA sequencing.
5. Defines basic terminology and describes concepts in molecular diagnostics that provide the foundation for implementing and adapting new techniques and assays.
6. Identify appropriate specimen collection and handling measures for molecular diagnostics. Analyze the medical literature reporting molecular advances pertinent to their patients, cite the rationale for use of new molecular modalities in their patients, and serve as thought leaders within their medical communities.

MLS 4437 - Critical Analysis of Lab Information

Evaluation of clinical laboratory values with emphasis on advanced methods, specialized statistics, algorithm building, and clinical correlations. Graduate students will prepare, conduct, and evaluate case study sessions. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4437 Course Outcomes

Participants in this course will be able to:

7. Apply knowledge of previous coursework in hematology, immunohematology, microbiology, hemostasis, immunology, molecular, chemistry, urinalysis and body fluids to accurately diagnose and suggest further testing for patients.
8. Participate in a local MLS professional meeting.
9. Actively and intelligently participate in expert guest lecture discussions.
10. Analyze the medical literature reporting MLS advancements pertinent to the profession, and design a thoughtful case study or presentation to share with other MLS professionals

MLS 4439 - Advanced Concepts in Transfusion Medicine

Advanced topics in Immunohematology. Application of laboratory techniques to the identification and evaluation of antibodies and antigens. Emphasis on transfusion therapy. Graduate students will prepare, conduct, and evaluate case study sessions.

MLS 4439 Course Outcomes

- account for background, principle and carrying-out of basic and commonly occurring laboratory methodology within transfusion medicine
- describe the genetics and AB0-systemets structure of the blood group systems
- explain the Rh-system and D the importance of the antigenets within transfusion medicine
- account for the formation of antibodies within the different blood group systems
- account for blood component production
- show certain knowledge of current research in the area and the connection between research and clinical application

- follow the laws and regulations that govern transfusion medicine and blodverksamhet
- be able to give example of quality assurance methods in transfusion medicine

MLS 4441- MLS Research

Individual theory and application of related topics associated with the medical laboratory. PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4441 Course Outcomes

Participants in this course will gain knowledge and skill in:
Be able to access valid resources

- Outline steps in the information research process
- Create a focused research topic
- Recognize key terms and develop a search strategy
- Online database searches utilizing keywords, subjects, and advanced options
- Understand the different types of research studies (e.g. quantitative, qualitative)
- Correctly use APA citation style
- Assess the value of web-based resources
- Understand plagiarism
- Correctly write an abstract from a valid research article

MLS 4455 - MLS Student Laboratory Practices

Directed practice in the advanced tests and techniques in common use in the medical laboratory (including molecular biology, microbiology, hematology, chemistry, blood bank). PREREQ: Acceptance into the Medical Laboratory Science Program.

MLS 4455 Course Outcomes

Research, evaluate, implement, and monitor methods of collection, transport and handling of various specimen types for molecular analysis. Perform molecular-based laboratory tests, analyze and verify results, and resolve common problems in all the major areas of the clinical laboratory.

MLS 4490 – 4494 Practicum Experiences

Structured medical laboratory experiences as determined by Medical Laboratory Science faculty.

MLS 4455 Course Outcomes

Specimen Collection/Processing:
1. Describe the proper specimen collection, handling, and processing procedures for each test.
2. Describe how to identify improperly collected specimens, and the appropriate actions to take.
General Testing:
3. Discuss the principle of each test performed in the department.
4. Perform dilutions of specimens and describe how to calculate results.
5. For manual, semi-automated, and automated test procedures that are performed in the department, complete the following:
   a. Accurately prepare reagents.
   b. Perform the test procedure.
   c. Observe and/or perform the calibration procedure.

d. State the principle of the reaction.
e. Perform daily maintenance of the analyzer used.
f. Perform quality control for the test procedure and discuss appropriate actions to take if quality control is out of range.
g. Recognize, evaluate, and interpret normal and abnormal results, and take actions for panic values.
h. Recognize possible sources of error.
i. Troubleshooting of testing and results.

6. Perform the following tests:
    a. Osmolarity
    b. Direct/indirect bilirubin
    c. Therapeudic drug monitoring
    d. Lithium
    e. Qualitative and quantitative HCG Quality Control and Quality Assurance:
7. Perform and record quality control and quality assurance for the department.
8. Describe appropriate actions to take if quality control is out of range.
9. Discuss how patient results are verified and/or reported in the department.
10. Discuss how STAT testing is handled in the department and perform STAT testing.
11. Discuss the importance of quality control and quality assurance procedures in the department.