Medical Laboratory Science

Program Director: Rachel Hulse
Clinical Associate Professor: Susan Galindo
Clinical Professor: Kathleen Spiegel (Emerita)

Master of Science in Medical Laboratory Science

Medical laboratory scientists are vital healthcare detectives, uncovering and providing key medical information from laboratory analyses that assist physicians in patient diagnosis and treatment, as well as in disease monitoring or prevention.

Laboratory testing encompasses such disciplines as clinical chemistry, hematology, immunology, transfusion medicine, microbiology, and molecular biology.

The Medical Laboratory Science program is located in the Division of Health Sciences, Kasiska School of Health Professions, with campuses in Pocatello, Meridian, and Idaho Falls.

The Master of Science in Medical Laboratory Science degree is designed for either the practicing medical laboratory scientist (certified lab professional) or those students who wish to become certified and then go into leadership positions in administration, education, or specialize in a certain area of pathology/laboratory medicine. Graduates are ideally suited for positions involving teaching, laboratory management, and research. Full-time and part-time options are available, and many courses are available online. A curriculum of course work and research project is designed and personalized for each student, depending on his/her area of interest and experience.

The Master of Science program in Clinical Laboratory Science requires an original research project that culminates in a thesis, a minimum of 32 credits earned in graduate courses (including research and thesis), and expertise in core conceptual areas of Medical Laboratory Science (scientific, administrative, or educational).

Admission Requirements

Applicants must have a minimum 3.0 GPA for upper division credits taken at the undergraduate level. Graduate School Admission GPA is calculated based on the last 60± semester undergraduate credits (90± quarter credits). The student must apply to and meet all criteria for admission to the Graduate School.

In addition, admission into the M.S. program will require the student to meet one of the two following conditions:

1. Professionals already certified as Medical Laboratory Scientist (BOC) and completion of a B.S. or B.A. degree in a related science from an accredited university or college. Note: Certification as Medical Laboratory Scientist categorical does not wholly satisfy this requirement, OR
2. Professional entry-level M.S. completing certification requirements while pursuing the M.S. degree. Completion of a B.S. or B.A. degree from an accredited institution and completion of the following requirements during the M.S. program of study:
   a. At least 16 semester hours of chemistry to include inorganic chemistry and some combination or organic, biochemistry and analytical chemistry;
   b. At least 16 semester hours of biology, to include at least one semester in microbiology, cell biology, genetics, immunology, anatomy and physiology and human pathophysiology.
   c. Successful completion of the ISU Medical Laboratory Science professional program, accredited by NAACLS (National Accrediting Agency for Clinical Laboratory Science). Successful completion qualifies the applicant to take the national credentialing examinations offered by Board of Certification (BOC) and this should be attempted within one year of finishing the MLS professional block and prior to completion of the MLS research thesis.

Core Curriculum Areas

The three core curriculum areas for Medical Laboratory Science that all students can include in their programs of study are:

1. Scientific subject core area including pathology, hematology, transfusion medicine (immunohematology), clinical chemistry, genetics, microbiology, or molecular biology.
2. Management core area including information management, statistics, Quality Assurance Programs (i.e. Westgard, 6 Sigma Lean), predictive value theory, personnel, financial, organizational, or regulatory concepts.
3. Educational core area including educational design and adult learning for professionals within and outside the medical laboratory setting.

Students are expected to have significant exposure to these core areas by the time they complete their degree requirements. Students coming in with MLS credentials have already demonstrated mastery of the core scientific subject area and those who do not have these credentials will be expected to demonstrate mastery by an examination administered by the program before they finish their M.S. studies.

Students may opt to gain expertise through a variety of mechanisms including independent readings, formal course work, seminars, or special projects. For those students who are not already credentialed, the 6 credits of the MLS Practicum are at the undergraduate level. This does not count toward the 32 graduate credit requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS 4490</td>
<td>General Site Practicum</td>
<td>2</td>
</tr>
<tr>
<td>MLS 4491</td>
<td>Microbiology Practicum</td>
<td>2</td>
</tr>
<tr>
<td>MLS 4492</td>
<td>Hematology and Urinalysis Practicum</td>
<td>2</td>
</tr>
<tr>
<td>MLS 4493</td>
<td>Transfusion Blood Bank Practicum</td>
<td>1</td>
</tr>
<tr>
<td>MLS 4494</td>
<td>Chemistry and Automation Practicum</td>
<td>1</td>
</tr>
<tr>
<td>BOC MLS certification 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select 4 of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS 6640</td>
<td>Advanced Topics in Hematology</td>
<td>12</td>
</tr>
<tr>
<td>MLS 6641</td>
<td>Advanced Topics in Immunology and Transfusion Medicine</td>
<td></td>
</tr>
<tr>
<td>MLS 6642</td>
<td>Advanced Topics in Medical Chemistry</td>
<td></td>
</tr>
<tr>
<td>MLS 6643</td>
<td>Advanced Topics in Medical Laboratory Education</td>
<td></td>
</tr>
<tr>
<td>MLS 6644</td>
<td>Advanced Topics in Medical Microbiology</td>
<td></td>
</tr>
<tr>
<td>MLS 6651</td>
<td>Graduate Seminar</td>
<td>9</td>
</tr>
</tbody>
</table>

6000 level electives

1 does not count for graduate credit
The remaining credits are to be taken from graduate-level courses (a minimum of 16 at the 6600 level) in one or more of the core areas with the approval of the applicant’s committee and MLS Program Director.

Three graduate level courses (6 to 9 credits) approved by the graduate student’s committee may be taken from outside the department (to be taken at Boise State University, Idaho State University, or another approved university) and may include adult education, management, and/or medical informatics.

The capstone project may be in a core scientific subject, management, education, or a combination thereof.

Courses

**MLS 5512 Urinalysis and Body Fluids: 1 semester hour.**
Fundamental principles of urine and body fluid analysis with correlation of laboratory methods and practice. Graduate students will prepare, conduct, and evaluate case study sessions. PREREQ: Acceptance into the Medical Laboratory Science program. Professional fee.

**MLS 5514 Hematology and Hemostasis: 3 semester hours.**
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. Professional fee.

**MLS 5516 Medical Microbiology I: 3 semester hours.**
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: BIOL 2235 or BIOL 2221 or equivalent and acceptance into the Medical Laboratory Science program. Professional fee.

**MLS 5518 Medical Chemistry and Instrumentation: 3 semester hours.**
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. Professional fee.

**MLS 5520 Medical Immunology: 2 semester hours.**
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. Professional fee.

**MLS 5522 Basic Concepts in Transfusion Medicine: 2 semester hours.**
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. Professional fee.

**MLS 5524 Medical Laboratory Fundamentals: 1 semester hour.**
Theory and application of basic techniques and instruments used in all areas of medical laboratories. Graduate students will evaluate laboratory methods and write standard operating procedures. PREREQ: Acceptance into the Medical Laboratory Science program. Professional fee. Lab fee.

**MLS 5531 Medical Microbiology II: 3 semester hours.**
Advanced topics in medical microbiology, including application of laboratory techniques to the identification and evaluation of medically important pathogens, and correlations with disease states. Graduate students will prepare, conduct, and evaluate case study sessions. PREREQ: MLS 5516 and acceptance into the Medical Laboratory Science program. Professional fee.

**MLS 5533 MLS Management and Education: 2 semester hours.**
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. Professional fee.

**MLS 5535 Molecular Diagnostics: 3 semester hours.**
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. Professional fee.

**MLS 5537 Critical Analysis of Lab Information: 3 semester hours.**
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. Professional fee.

**MLS 5539 Advanced Concepts in Transfusion Medicine: 2 semester hours.**
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. PREREQ: MLS 5522 and acceptance into the Medical Laboratory Science program. Professional fee.

**MLS 5541 MLS Graduate Research: 1-3 semester hours.**
Individual theory and application of related topics associated with the medical laboratory. PREREQ: Acceptance into the Medical Laboratory Science program. Professional fee.

**MLS 5555 MLS Student Laboratory Practices: 2 semester hours.**
Directed practice in the advanced tests and techniques in common use in the medical laboratory (including molecular biology, microbiology, hematology, chemistry, blood bank). Graduate students will be responsible for higher complexity testing and advanced problem solving exercises. PREREQ: Acceptance into the Medical Laboratory Science program. Professional fee. Lab fee.

**MLS 6640 Advanced Topics in Hematology: 1-4 semester hours.**
Current research and practice in hematology and hemostasis including molecular approaches to medical diagnosis and treatment. May be repeated for a maximum of 4 credits.

**MLS 6641 Advanced Topics in Immunology and Transfusion Medicine: 1-4 semester hours.**
Current research and practice in immunology and transfusion medicine including molecular approach to diagnosis and treatment. May be repeated for a maximum of 4 credits.

**MLS 6642 Advanced Topics in Medical Chemistry: 1-4 semester hours.**
Current research and practice in medical chemistry including innovative instrumentation and molecular diagnostics. May be repeated for a maximum of 4 credits.

**MLS 6643 Advanced Topics in Medical Laboratory Education: 1-4 semester hours.**
Curriculum design and evaluation in the Medical Laboratory setting. May be repeated for a maximum of 4 credits.

**MLS 6644 Advanced Topics in Medical Microbiology: 1-4 semester hours.**
Current research in microbiology and molecular diagnostics including the molecular basis of important infectious diseases, microbial pathogenesis, and host-pathogen interactions. May be repeated for a maximum of 4 credits.
**MLS 6647 MLS Capstone: 1-6 semester hours.**
Completion of a Medical Laboratory Science project. Practical application of a knowledge/skill in laboratory practice, management, or education. May be repeated for a total of 6 credits. Graded S/U. Prerequisite: Acceptance into the Medical Laboratory Science program. Professional fee.

**MLS 6648 MLS Graduate Problems: 1-9 semester hours.**
Thesis-related research. May be repeated. Graded S/U. PREREQ: Graduate standing and permission of instructor.

**MLS 6650 Thesis: 1-9 semester hours.**
Thesis-related research. May be repeated. Graded S/U. PREREQ: Graduate standing and permission of instructor.

**MLS 6651 Graduate Seminar: 2 semester hours.**
An online elective graduate course for students admitted into the Medical Laboratory Science program.

**MLS 6699 Experimental Course: 1-6 semester hours.**
This is an experimental course. The course title and number of credits are noted by course section and announced in the class schedule by the scheduling department. Experimental courses may be offered no more than three times. May be repeated.