
Medical Laboratory Science

Faculty and Fields of Interest

Medical Laboratory Science Major BS degree

In medical laboratory science, both the clinical laboratory science option and the cytotechnology option, provide students with the concepts, professional attitudes, scientific theory and skills essential for practicing clinical laboratorians. Medical laboratory science leads students to understand the health care delivery system and the role of the clinical laboratory scientist and cytotechnologist in that system, to function as professionals, and to gain the skills and attitudes needed to enter their practice. All graduates are eligible for national certification and licensure.

Students use state-of-the-art equipment and laboratory methods in the new, modern-design laboratory facility. The medical laboratory science faculty are professional laboratory scientists and leaders in local, regional, and national professional and scientific organizations who influence the practice of the profession by serving on committees and as consultants.

Dorothy A. Bergeron immunohematology, health education, professional issues

Brenda Bouchard coagulation, serology, science education

Lynne Brodeur medical laboratory science

Eileen Carreiro-Lewandowski clinical chemistry, biochemistry, laboratory regulation

Thom Goodwin medical laboratory science

James T. Griffith (chairperson) microbiology, antimicrobial agents, health legislation

Susan J. Leclair hematology, health planning

Frank J. Scarano molecular epidemiology, clinical microbiology

Entrance to Medical Laboratory Science

In addition to the general course requirements for admission, the Department of Medical Laboratory Science more specifically requires 3 units of Natural Science and 3 units of College Preparatory Mathematics which must include 2 units of algebra.

Admission of Transfer Students and Certified Clinical Laboratory Technicians

Credits earned at another institution will be evaluated for transferability and equivalency to existing UMass Dartmouth courses. All required Medical Laboratory Science courses must be taken at the University of Massachusetts at Dartmouth, unless approved by the department.

Health Policies

Students admitted to medical laboratory science programs are expected to have a complete physical examination and the appropriate immunizations as outlined by the department.

Medical Laboratory Science Major

Clinical Laboratory Science Option

The option in clinical laboratory science is an integrated program, accredited by the National Accrediting Agency for Clinical Laboratory Sciences, 8410 West Bryn Mawr Avenue, Suite 670, Chicago, IL 60631-3415. The program officials are David K. Rubin, MD (Medical Advisor), and Dorothy A. Bergeron, MS (Program Director). Academic and technical competence are developed in the major areas of clinical laboratory practice: hematology, clinical chemistry, clinical microbiology and immunohematology. The clinical laboratory theory and methods integrated throughout the four-year curriculum culminate with a clinical practicum in an affiliated hospital during the second semester of the senior year. Laboratory instrumentation, use of computers in laboratories, and quality assurance are emphasized throughout.

Careers are available in hospital, independent, public health, industrial, pharmaceutical, and private laboratories as scientists and researchers, and some clinical laboratory scientist work as educators, administrators, and consultants. By presenting a diverse background in science, analytical skills, and problem-solving, medical laboratory science prepares students for post-graduate studies in the sciences (including chemistry, microbiology, pathology), administration (including human resource management, health service administration, and business administration) and professional schools (including medical, osteopathy, and physician assistant).

After completion of this program, the graduate will be able to demonstrate entry level competencies in the following areas of professional practice:

- collect and process biological specimens for analysis;
- perform analytical tests on body fluids, cells, and other samples;
- make critical judgments by integrating and relating data generated by the various clinical laboratory departments;
- evaluate quality control results and institute corrective procedures;
- perform preventive and corrective maintenance on equipment and instruments or refer to appropriate source for repair;
- evaluate new techniques and procedures in terms of usefulness and practicality within the context of a given laboratory's resources;
- demonstrate concern for the patient and cooperate with laboratory personnel and

- other health care professionals;
- communicate effectively and in a professional manner with patients, laboratory personnel, other health care professionals, and the public;
- assume responsibility for continuing professional development and competence;
- assume leadership to effect positive change in the profession;
- apply principles of safety, management and supervision, education methodologies, and current information systems.

Entrance to the Upper Division of the Option in Clinical Laboratory Science

The Committee on Advanced Standing meets each year to evaluate the academic and professional progress of sophomore students who have completed sophomore-level requirements. After reviewing the records, the committee recommends to the department faculty those students to be admitted to the upper division of the option in clinical laboratory science. Conditional acceptance with academic qualifications is possible in unusual circumstances.

Admission to the upper division of the option in clinical laboratory science requires:

- 1.** completion of all prerequisites in the first two years as outlined in the requirements;
- 2.** a minimum cumulative science grade point average of 2.0 in all **completed** courses required by the major;
- 3.** evidence that the student is making progress toward satisfying degree requirements and certification requirements;
- 4.** evidence that the student is able to meet the following non-academic criteria (technical standards)
 - Observation. The student must be able to participate actively in laboratory exercises and clinical experiences.
 - Communication. The student must be able to communicate with fellow students, faculty, staff and members of a health care team.
 - Motor. The student must have sufficient motor skills to perform basic diagnostic tests.
 - Intellectual/Conceptual, Integrate and Quantitative Abilities. The student must be able to problem solve and comprehend spatial relationships of structures.

Clinical Practicum

The faculty assigns the students to the clinical practicum at the following affiliates: Charlton Memorial Hospital (Fall River, MA), Massachusetts General Hospital (Boston, MA), Morton Hospital and Medical Center (Taunton, MA), New England Medical Center (Boston, MA), Roger Williams Medical Center (Providence, RI), St. Anne's Hospital (Fall River, MA), St. Luke's Hospital (New Bedford, MA), and South Shore Hospital (South Weymouth, MA). Students may be assigned to a rotation at enrichment sites: Rhode Island Blood Center (Providence, RI) and State Laboratory Institute, Massachusetts Department of Public Health (Jamaica Plain, MA).

See requirements on next page.

Medical Laboratory Science Major
Cytotechnology Option

Requirements

		Semester Credits			
		First	Second		
First Year					
MLS 115	Fundamentals of Medical Laboratory Science	1		Cytotechnology, a specialty in the clinical laboratory, evaluates cells microscopically to detect morphologic changes related to benign and malignant disease. The first three years are spent on campus building a foundation in biology, chemistry, math, and medical laboratory science, followed by a one year clinical practicum in an accredited hospital program. A strong sense of responsibility, ability to concentrate, and an interest in natural science are necessary qualities for a cytotechnologist. Career opportunities are excellent. Cytotechnologists are employed as laboratory managers, educators, medical sales representatives, technical representatives, and scientists in private and hospital-based laboratories, state, federal or industrial laboratories, research laboratories and veterinary laboratories. Graduate study possibilities include pathology, anatomy, or genetics.	
MLS 116	Fundamentals of Medical Lab Sci Techniques	1			
MLS 121	Human Genetics		3		
MLS 122	Human Genetics Laboratory		1		
CHM 151, 152	Principles of Modern Chemistry I, II	3	3		
CHM 161, 162	Introductory Applied Chemistry I, II	1	1		
MTH 104	Fundamentals of Statistics		3		
ENL 101, 102	Critical Writing and Reading I, II	3	3		
	General Education/Distribution Requirements	6	3		
		15	17		
Second Year					
MLS 221	Pathophysiology		3	Students interested in this option are encouraged to discuss cytotechnology with the department chairperson as early as possible to select the most appropriate courses. Application for this option should be made during the spring semester of the sophomore year and no later than the fall semester of the junior year. Generally, students apply for admission to the accredited hospital program in the spring semester of the junior year. <i>See requirements on next page.</i>	
MLS 222	Pathophysiology Laboratory		1		
MLS 241	Clinical Chemistry Applied to Diagnostic Techniques		3		
MLS 242	Clinical Chemistry Applied to Diagnostic Techniques Laboratory		1		
BIO 111	Introduction to Human Physiology	4			
CHM 251	Organic Chemistry I	3			
CHM 263	Bio-Organic Chemistry Laboratory	1			
	General Education/Distribution Requirements	6	9		
		14	17		
Integrated Program					
Third Year					
MLS 301	Principles of Microbiology	4		Students majoring in the Cytotechnology option will meet their departmentally-controlled General Education requirements as follows:	
MLS 303	Principles of Microbiology Laboratory	1			
MLS 313	Medical Microbiology		3		
MLS 314	Medical Microbiology Laboratory		1		
MLS 325	Clinical Immunobiology	3			
MLS 326	Clinical Immunobiology Laboratory	1			
MLS 331	Fundamentals of Clinical Hematology		2		
MLS 332	Fundamentals of Clinical Hematology Lab		1		
MLS 341	Clinical Instrumental Analysis		2		
MLS 342	Clinical Instrumental Analysis Laboratory		1		
PHL 317	Ethics and Health Care Professionals		3		
	Free Electives	3			
		12	13		
Fourth Year					
MLS 401, 411	Clinical Microbiology I, II	5	4		
MLS 421, 422	Immuno-hematology I, II	2	2		
MLS 443, 444	Clinical Biochemistry I, II	5	4		
MLS 431, 432	Hematology I, II	3	3		
MLS 429	Clinical Serology	2			
MLS 450	Senior Seminar		2		
		17	15		
	Total Credits		120		

Note: The department has renumbered many courses; previous numbers are shown at the end of each course description in this catalogue.

General Education Departmental Requirements

Students majoring in the Clinical Laboratory Science option will meet their departmentally-controlled General Education requirements as follows:

- Area E: Satisfied by PHL 317
- Area I, Tier 2: Satisfied by MLS 242, 341, 342, 443, and 450
- Area W, Tier 2: Satisfied by ENL 266
- Area O: Satisfied by MLS 326 and 450

General Education Departmental Requirements

Students majoring in the Cytotechnology option will meet their departmentally-controlled General Education requirements as follows:

- Area E: Satisfied by PHL 317
- Area I, Tier 2: Satisfied within hospital placement, as arranged between MLS Department Chairperson and placement supervisor
- Area W, Tier 2: Satisfied by ENL 266
- Area O: Satisfied by MLS 307 and 450

Requirements

1. A minimum of 20 semester hours of approved courses in biological and laboratory science.
2. A minimum of 8 semester hours of chemistry.
3. All requirements of the university and the College of Arts and Sciences for a B.S. degree.
4. Free electives to bring the total to 90 credits, preceding the fourth year.
5. Successful completion of an accredited hospital cytotechnology program.

Each hospital cytotechnology program determines the number of credits in a specific course based on the nature of the laboratory and the range of case presentations.

A minimum of thirty credits from the courses listed below are granted at the completion of the hospital cytotechnology program.

MLS 461	Introduction to Cytotechnology
MLS 462	Special Topics in Cytotechnology
MLS 463	Cytopathology
MLS 464	Medical Cytology
MLS 465	Cytotechnology Seminar
MLS 466	Applied Cytotechnology
MLS 467	Cytology Practicum
MLS 468	Cytology Practicum II

All students must be recommended by the department chairperson to the approved hospital program. The university cannot guarantee placement in an approved hospital program.

Clinical fees are established by the hospital program. Students are required to pay this fee in addition to the usual university fees.

Medical Laboratory Science Courses

MLS 105 three credits **S**
Contemporary Topics in Human Ecology I
Medical-social problems as they relate to modern society. Contemporary topics such as over-the-counter drugs, factors affecting I.Q., basic human physiology, the disease state, diabetes, and eugenics.

MLS 106 three credits **S**
Contemporary Topics in Human Ecology II
Continuation of MLS 105. Medical-social problems as they relate to modern society. Contemporary topics such as sexuality, inheritance, stress, and aging are discussed.

MLS 115 one credit
Fundamentals of Medical Laboratory Science
Specialty areas, professional issues, career mobility and an introduction to the university and its facilities presented in lectures, field trips and laboratory experiences. Student Resource Center facilities will be utilized during class time.

MLS 116 one credit
Fundamentals of Medical Laboratory Science Techniques
An orientation to clinical laboratory techniques.

MLS 121 three credits
Human Genetics
An intensive survey of genetic mechanisms emphasizing the effect on human inheritance and disease.

MLS 122 one credit
Human Genetics Laboratory
Corequisite: MLS 315
Laboratory correlated with MLS 315.

MLS 221 three credits
Pathophysiology
Prerequisite: BIO 111 or perm. of instructor
The selection, generation, and translation of basic information for the diagnosis, prognosis and management of clinical samples. Health screen vs. diagnostic and prognostic profiles will be discussed.

MLS 222 one credit
Pathophysiology Laboratory
Corequisites: MLS 112, 221
Prerequisite: MLS 112 or perm. of instructor
Laboratory correlated with MLS 221.

MLS 241 three credits
Clinical Chemistry Applied in Diagnostic Techniques

Gen Ed note: Medical Laboratory Science courses satisfy the Natural Science and Technology requirement. Those marked **S** are appropriate for non-science/engineering majors.

Prerequisites: CHM 152, 162; or perm. of instructor.
Medically relevant carbohydrates, proteins, lipids, hormones, nonprotein nitrogenous substances, and enzymes will be discussed.

MLS 242 one credit
Clinical Chemistry Applied in Diagnostic Techniques Laboratory
Corequisite: MLS 241
Laboratory correlated with MLS 241.

MLS 298 one to six credits
Experiential Learning
Prerequisites: At least sophomore standing; perm. of the instructor, department chairperson, and college dean
Work experience at an elective level supervised for academic credit by a faculty member in an appropriate academic field. Conditions and hours to be arranged. Graded CR/NC. For specific procedures and regulations, see section of catalogue on Other Learning Experiences.

MLS 301 four credits
Principles of Microbiology
Prerequisite: MLS 241 or perm. of instructor
This course presents the basic concepts of physiology, genetics, morphology, ecology, systematics and control of microorganisms.

MLS 303 one credit
Principles of Microbiology Laboratory
Corequisite: MLS 301
Laboratory correlated with MLS 301.

MLS 313 three credits
Medical Microbiology
Prerequisite: MLS 301
The theoretical basis for an in-depth understanding of organisms of medical importance. Stress shall be placed on bacterial physiology as it relates to disease. Quality control, statistical methods, and current literature shall be analyzed.

MLS 314 one credit
Medical Microbiology Laboratory
Corequisite: MLS 311
Prerequisite: MLS 302 or perm. of instructor
Laboratory correlated with MLS 311.

MLS 325 three credits
Clinical Immunobiology
The emerging concepts of immunobiology. Topics will include immunogens, immunoglobulins, autoimmunity, infection and immunity, immunohematology, and tumor biology.

MLS 326 one credit

College of Arts and Sciences

Clinical Immunobiology Laboratory

Corequisite: MLS 325
Laboratory correlated with MLS 325.

MLS 331 two credits

Fundamentals of Clinical Hematology

Prerequisites: MLS 121, 122, 221, 222; or perm. of instructor
Introduction to the pathophysiology of anemias, leukocyte dyscrasias and disorders. Topics may include bone marrow activity, cell energetics, testing protocols and examples of various modalities of therapy.

MLS 332 one credit

Fundamentals of Clinical Hematology Laboratory

Corequisite: MLS 331
Prerequisites: MLS 121, 122, 221, 222; or perm. of instructor
Introduction to the morphology and biochemical testing of cells involved in anemias, leukocyte dyscrasias and other disorders. Topics may include bone marrow morphology, peripheral blood morphology and cytochemical testing protocols.

MLS 341 two credits

Clinical Instrumental Analysis

Prerequisite: MLS 241 or perm. of instructor
Study of chemical and analytical techniques used in clinical laboratory analysis. Topics include photometric, electrochemical, and immunochemical separation used in research, forensic, and medical applications.

MLS 342 one credit

Clinical Instrumental Analysis Laboratory

Corequisite: MLS 341
Prerequisite: MLS 242
Laboratory course correlated with MLS 341.

MLS 351 one to three credits

Medical Laboratory Science Seminar I

Prerequisite: Junior or senior standing or perm. of instructor
Selected topics shall be presented, determined by current interests and developments in clinical laboratory science.

MLS 352 one to three credits

Medical Laboratory Science Seminar II

Prerequisites: Junior or senior standing and perm. of chairperson
Selected topics shall be presented by both faculty and students. Topics shall be submitted from affiliated hospitals.

MLS 381 three credits

Health Care Legislation

Major, recent, and pending health care

legislation and its impact on the provider will be discussed. Possible topics include: Medicare, Medicaid, health manpower, accreditation, licensure, professional standards review, health systems agencies, and national health insurance.

Senior Courses: Option in Clinical Laboratory Science

The following courses are presented on campus and at affiliated hospitals for an academic year that may exceed the regular academic year. This year will consist of 40 hours per week on campus and/or in affiliated hospital(s). Lecture and laboratory hours shall comply with the standards set by the National Accrediting Agency for Clinical Laboratory Sciences. These are open only to medical laboratory science students or by perm. of the Department:

MLS 401 five credits

Clinical Microbiology I

Prerequisites: MLS 311, 314
The principles or practice of diagnostic microbiology such as specimen collection and handling, quality control, and laboratory safety. Clinical correlation, immunology and hospital surveillance will be included.

MLS 411 four credits

Clinical Microbiology II

Prerequisite: MLS 401
Continuation of MLS 401.

MLS 421 two credits

Immuno-hematology I

The principles of blood banking, including the preparation and storage of blood and its components, donor evaluation, transfusion, required record keeping, and processing of frozen blood. Clinical correlation, quality control and laboratory safety will be included.

MLS 422 two credits

Immuno-hematology II

Prerequisite: MLS 421
Continuation of MLS 421.

MLS 428 two credits

Clinical Microscopy and Serology

Prerequisites: MLS 305, 307
The applied principles of the clinical evaluation of the physical and chemical constituents and formed elements of kidney filtrate. Quality control, laboratory safety and clinical correlation shall be covered.

MLS 431 three credits

Hematology I

Prerequisites: MLS 331, 322
Subjects include the analysis and clinical correlation of quantitative and qualitative variations in blood. Blood cell and other formed element morphology, the dynamics of coagulation, processing and evaluation of human bone marrow, quality control and laboratory safety will be studied.

MLS 432 three credits

Hematology II

Prerequisite: MLS 431
Continuation of MLS 431.

MLS 443 five credits

Clinical Biochemistry I

Prerequisites: MLS 341, 342
Principles of the physical and chemical analysis of medically significant organic and inorganic substances found in human body fluids and tissues. Laboratory instrumentation and electronics, metabolic screening, specimen collection, clinical correlation, quality control and laboratory safety will be emphasized.

MLS 444 four credits

Clinical Biochemistry II

Prerequisite: MLS 443
Continuation of MLS 443.

MLS 450 two credits

Senior Seminar

Prerequisites: MLS 411, 421, 444, and 432; or perm. of the instructor.
Intensive, integrated study of selected topics in clinical laboratory science including management.

Senior Courses: Option in Cytotechnology

MLS 461 one to three credits

Introduction to Cytotechnology

Prerequisite: Perm. of chairperson
A review of cell structure, principles of microscopy, and staining techniques. Anatomy and physiology of the female reproductive system and study of the non-malignant cytology of the female genital tract will be covered.

MLS 462 one to three credits

Special Topics in Cytotechnology

Prerequisite: Perm. of chairperson
Special projects in cytology, cytopathology or cytotechnology are investigated or reviewed and reported by the student. Written or oral presentation is required.

MLS 463 one to four credits

Cytopathology

Prerequisite: Perm. of chairperson
Cytopathology and clinical aspects of cervical dysplasia, carcinoma-in-situ and invasive squamous cell carcinoma. Consideration of endometrial and endocervical carcinoma, other genital tract cancers and radiation effect.

MLS 464 one to four credits

Medical Cytology

Prerequisite: Perm. of chairperson
Benign and malignant cytology of the respiratory and gastrointestinal tracts will be correlated with anatomy and physiology. Benign, atypical, and malignant exfoliative cells from the urinary tracts, serous effusion, cerebrospinal fluid and breast secretions will be studied.

MLS 465 one to two credits

Cytotechnology Seminar

Prerequisite: Perm. of chairperson
Presentation, discussion and interpretation of benign, suspicious, and hormonal conditions. The cytological diagnostic criteria of malignant tumors from various body sites and their histopathological correlation will be studied.

MLS 466 one to three credits

Applied Cytotechnology

Prerequisite: Perm. of chairperson
The microscopic evaluation and screening of cytological smears from various body sites. Effects of radiation and of chemotherapy; diagnosis of suspicious and hormonal conditions; cytological observations in pregnancy. Cell research techniques. Epidemiology and current concepts related to cytotechnology.

MLS 467 one to eight credits

Cytology Practicum I

Prerequisite: Perm. of chairperson
The microscopic evaluation and screening of benign cytological smears and smears from cervical dysplasia; carcinoma-in-situ, and invasive malignant tumors of the female genital tract.

MLS 468 one to eight credits

Cytology Practicum II

Prerequisite: Perm. of chairperson
The microscopic evaluation and screening of cytological smears from the respiratory tract, gastrointestinal tract, urinary tract and from body fluids. Continuing evaluation of cytological smears from the gynecological tract.

Senior courses for either option

MLS 495 one to four credits

Independent Study

Prerequisites: Upper-division standing; perm. of instructor, department chairperson, and college dean

The student selects a topic for in-depth study. Readings and reports are supervised by a member of the faculty.

MLS 196, 296, 396, 496 three credits

Directed Study

Prerequisites: Perm. of the instructor, department chairperson, and college dean
Study under the supervision of a faculty member in an area covered in a regular course not currently being offered. Conditions and hours to be arranged.

MLS 497 two credits

Research Project

4 hours per credit hour per week.
Prerequisite: Perm. of instructor
The student initiates a proposal on a selected research topic. The research is done under the supervision of the appropriate faculty member. A completed paper is required.

MLS 498 one to four credits

Research Project

Continuation of MLS 497.

Graduate Courses

MLS 510 three credits

Bioethics

Issues and cases in bioethics, across the range of medical practice, individual rights, and social implications.

MLS 522 three credits

Evidence and Courtroom Proceedings

The use of DNA evidence in the court. The implications of relevancy, competency, impeachment, hearsay, and expert testimony will be discussed. Constitutional issues of privacy, informed consent, and mandated registries will be weighed. Special considerations will be presented, from issues of paternity and the sanctity of marriage to the practical issues of specimen collection, quality, and processing.

MLS 525 three credits

Pathophysiology

Investigations of the aberrations of normal physiology, with the processes that bring about these disruptions. The course covers the ways in which the disruptions manifest themselves as symptoms, signs, physical findings, and laboratory findings, including advanced topics in the selection, generation, and translation of information for the diagnosis, prognosis, and management of clinical samples.