

## MEDICAL LABORATORY SCIENCE

<http://www.uvm.edu/cnhs> (<http://www.uvm.edu/cnhs/>)

### OVERVIEW

The Master of Science in Medical Laboratory Science (MMLS) program is designed to provide students with the knowledge and skills required for leadership opportunities in management, education, research and advanced clinical practice in the medical laboratory science profession.

Individuals may enter the program via two tracks, depending on their background:

- Track 1 is for individuals with a bachelor's degree who are not certified in medical laboratory science but desire a career in the clinical laboratory sciences. Upon completion of the program, these students will be eligible to take the national certification exam in medical laboratory science offered by the American Society of Clinical Pathology (ASCP).
- Track 2 is for medical laboratory science-certified graduates who seek advanced training and expertise in evidence-based practice, scientific research, health care management and leadership. Track 2 also includes an accelerated master's option for current UVM Medical Laboratory Science students.

Both Track 1 and Track 2 involve a research-based capstone project that will engage students in hands-on research methodology, experimental practice, and scientific communication. The capstone project provides students with the opportunity to develop important skills in evidence-based practice and clinically-related research.

Program faculty conduct research that aims to understand the molecular mechanisms of human disease, with particular emphasis on immune cell activation, gene expression and molecular signal transduction. Our faculty offer advanced practice courses in molecular methods, clinical laboratory correlations, emerging diagnostic technologies, healthcare leadership and management, quality, evidence based practice, research design and methods; and research experiences to prepare graduates of both tracks to become future leaders in the profession.

Students in Track 1 will complete a semester-long clinical practicum at one of our clinical affiliate hospitals as part of the core NAACLS-accredited program.

### Degrees

- Medical Laboratory Science AMP (<http://catalogue.uvm.edu/graduate/medicallaboratoryscience/medicallaboratoryscienceamp/>)
- Medical Laboratory Science M.S. (<http://catalogue.uvm.edu/graduate/medicallaboratoryscience/medicallaboratorysciencems/>)

## FACULTY

**Amiel, Eyal;** Assistant Professor, Department of Biomedical and Health Sciences; PHD, Dartmouth College

**Deming, Paula;** Associate Professor, Department of Biomedical and Health Sciences; PHD, University of North Carolina at Chapel Hill

**Frietze, Seth;** Assistant Professor, Department of Biomedical and Health Sciences; PHD, Harvard University

**Fung, Mark K.;** Professor, Department of Pathology and Laboratory Medicine; MD, PHD, University of Alabama School of Medicine

**Krementsov, Dimitry N.;** Assistant Professor, Department of Biomedical and Health Sciences, PHD; University of Vermont

**Moreau, Katrina;** Clinical Assistant Professor, Department of Biomedical and Health Sciences; M.A.T., MLS, Tufts University

**Scheiber, Melissa;** Clinical Assistant Professor, Department of Biomedical and Health Sciences, PHD: Medical University of South Carolina

### Biomedical and Health Sciences Courses

#### **BHSC 242. Immunology. 3 Credits.**

Deals with cells, organs, development, interactions and the functioning (infectious process, immunodeficiency, hypersensitivity reactions, transplantation and tumor immunology) of the innate and the adaptive immune system. Prerequisites: One semester of biochemistry, one semester of organic chemistry.

#### **BHSC 244. Immunology Lab. 1 Credit.**

Laboratory experience dealing with cellular and humoral immunity, B cells and T cells, autoimmunity, immunodeficiency. Laboratory covers immunological techniques and applications. Prerequisites: One semester of biochemistry, one semester of organic chemistry. Co-requisites: BHSC 242 or MMG 223.

#### **BHSC 281. Applied Molecular Biology. 3 Credits.**

Introduces students to the nucleic acid and protein-based molecular diagnostics technology through class presentation, reading, and discussions. Focuses on diagnostic applications for understanding molecular mechanisms of disease. Prerequisite: CHEM 042 or CHEM 141.

#### **BHSC 282. Applied Molecular Biology Lab. 1 Credit.**

Laboratory experiences include practical concepts of molecular applications. Introduces basic methods used in DNA and Protein technology including plasmid isolation, polymerase chain reaction, restriction enzyme use, and related assays. Prerequisite: CHEM 042 or CHEM 141. Co-requisite: BHSC 281.

#### **BHSC 390. Internship. 1-18 Credits.**

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

#### **BHSC 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**BHSC 396. Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**BHSC 397. Teaching Assistantship. 1-3 Credits.**

Student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

**BHSC 398. Graduate Research. 1-18 Credits.**

Student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**Medical Laboratory Science Courses****MLS 221. Clinical Chemistry I. 3 or 4 Credits.**

Lectures and laboratory experiences introduce basic principles in clinical quantitative analysis and laboratory instrumentation; test results are correlated with clinical case studies. Prerequisites: ANPS 019 and ANPS 020; CHEM 031 and 032; CHEM 042 or CHEM 141.

**MLS 222. Clinical Chemistry II. 3 Credits.**

Advanced instruction in body chemistry and pathophysiology of disease with emphasis on diagnostic lab techniques in chemistry. Prerequisites: MLS 221, PATH 101.

**MLS 231. Hematology. 3-4 Credits.**

Advanced theory and analysis of blood cell physiology and related pathology. Concepts of hemostasis and clinical assessment methods. Prerequisites: One semester of organic chemistry, one semester of biochemistry.

**MLS 255. Clinical Microbiology II. 3 Credits.**

Comprehensive study of non-bacterial pathogenic microorganisms and their disease states in humans. Includes medical mycology, parasitology and virology. Prerequisites: MMG 065 or MMG 101.

**MLS 262. Immunohematology. 4 Credits.**

Advanced theory and experience related to human blood groups and transfusion practice. Prerequisite: MLRS 242 or MMG 223.

**MLS 301. Clinical Practicum. 12 Credits.**

Clinical Practicum involves a semester long directed clinical practice in Hematology, Chemistry, Microbiology, Immunohematology, and Molecular Biology at assigned clinical affiliate sites. Prerequisites: MLRS 281, MLRS 282, MLS 255; MLRS 242 or MMG 223; MLRS 244, MLS 221, MMG 222, MLS 222, MLS 231, MLS 262.

**MLS 302. Certification Review. 1 Credit.**

Certification review of the Medical Laboratory Science Body of Knowledge. It is designed to provide a challenging self directed assessment of practical and theoretical knowledge and will prepare students to successfully pass the ASCP certification exam in MLS. Prerequisites: MLRS 281, MLRS 282, MLS 255; MLRS 242 or MMG 223; MLRS 244, MLS 221, MMG 222, MLS 222, MLS 231, MLS 262. Pre/Co-requisite: MLS 301.

**MLS 310. Advanced Immunobiology. 3 Credits.**

Advanced survey of key current topics in immunology. Focus on understanding the key concepts and experimental approaches in the major areas in immunology, with an emphasis on applications to human disease. Prerequisites: Graduate student standing; Cell Biology and Biochemistry recommended.

**MLS 371. Clinical Correlations. 3 Credits.**

Advanced, graduate-level education in medical laboratory testing. The appropriate utilization of laboratory tests for screening, diagnosis, monitoring and determining prognosis of various human diseases will be discussed.

**MLS 372. Emerging Diag. Technologies. 3 Credits.**

Provides advanced, graduate-level education in medical laboratory testing. Using the scientific literature, students will review and discuss historical and emerging medical laboratory strategies that relate to human health and disease and the clinical environment.

**MLS 389. Research and Design I. 3 Credits.**

Guides students to identify a research capstone project and will include instruction in literature evaluation, review of experimental design and evaluation, and a foundational understanding of evidence based practice.

**MLS 390. Research and Design II. 3 Credits.**

Provides students with a foundation in how to read the primary literature, understanding the major sections of a primary literature reports, and instruction on writing their own reports to facilitate their success for their capstone project. Prerequisite: MLS 389.

**MLS 391. Research Capstone. 3 Credits.**

Students will complete a capstone project under the guidance of his/her research mentor. Findings will be communicated both through a formal oral presentation and a written research paper that will be submitted for publication. Prerequisites: MLS 389, MLS 390.

**MLS 392. Independent Study. 1-18 Credits.**

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

**MLS 396. Advanced Special Topics. 1-18 Credits.**

See Schedule of Courses for specific titles.

**MLS 397. Clinical Leadership & Mgt. 3 Credits.**

Focuses on the fundamentals of clinical leadership and management, with particular emphasis on organizational design, problem solving, communication and change theories. Strategies for human resource management, project management, quality improvement, increasing productivity, and ensuring financial viability are covered.