

# DEPARTMENT OF MEDICAL LABORATORY SCIENCES

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The Department of Medical Laboratory Sciences supports the philosophy and mission of the university and the College of Health Professions, and provides an environment that nurtures excellence in education, research and service. The programs offered by the department are dedicated to enhancing and promoting medical laboratory science. The department fosters fair and equitable educational experiences for students of all ages and diverse backgrounds. Strong affiliations with clinical educators and the integration of innovative technology in the academic setting facilitate both the education and research goals of the department.

The department provides students with superior studies in medical laboratory science, including both theoretical and applied clinical education, and develops problem-solving expertise, leadership capabilities and communication skills. By providing advanced theoretical and technical education, the graduate program serves to maintain and update the competency of laboratory professionals and to prepare students to assume roles as laboratory supervisors, university educators and researchers. A mature, responsible approach to the acquisition of knowledge is cultivated in order to establish continuing intellectual growth and an enthusiasm for the profession.

The department meets the growing health care needs of the community by providing highly competent and professional medical laboratory scientists who will be able to function effectively upon entrance into the field and be prepared to explore future scientific and technological advances in laboratory science. And the department promotes continued professional development and personal growth for the faculty and staff to fulfill and balance the individual's abilities and aspirations with the departmental, college and institutional mission and needs. Members of the department conduct themselves in a forthright, ethical manner and practice the highest standard of quality performance.

The objectives of the Department of Medical Laboratory Sciences are:

- To provide an educational program that prepares students to accurately perform and evaluate analytical tests on body fluids, cells and products
- To foster the development of professional conduct, interpersonal communication skills and ethical principles
- To develop and promote strategies for lifelong learning and to encourage continued professional growth through research, continued education and active participation in professional societies

## History

Clinical and medical laboratory scientists have been trained on the MCV Campus since 1927. However, the Department (formerly school) of Medical Technology was not formally established until 1952, at which time the curriculum included six months of didactic experience with lectures and laboratory sessions held in the department, followed by a six-month rotation through the clinical laboratories. The school offered a certificate and/or bachelor's degree program; the certificate program was discontinued during the 1961-62 school year.

In 1974 the curriculum was expanded to the current two-plus-two year program in which students complete 60 semester hours of prerequisites followed by two years of professional course work. The graduate program in medical laboratory sciences was started in 1967 to provide advanced education for certified medical technologists/clinical laboratory scientists. In 1985 the program was modified to allow candidates holding a degree in another area of science to obtain graduate education in medical laboratory sciences.

In 1994, the department name was changed to the Department of Clinical Laboratory Sciences. In 2003, an accelerated track was initiated to integrate the undergraduate and graduate programs, which requires completion of two years of prerequisites and three years of full-time professional course work, and leads to the simultaneous awarding of both the bachelor's and master's degrees.

To aggressively address the critical shortage of clinical laboratory scientists and meet the growing staffing needs of rural Virginia, in 2014 the department began its delivery of the Bachelor of Science using facilities at the Southwest Virginia Higher Education Center in Abingdon, Virginia. Students receive their curriculum of study via two-way synchronous distance education and clinical training rotations in southwest Virginia and eastern Tennessee.

In 2020, the department was approved for a name change and became the Department of Medical Laboratory Sciences.

## Facilities

The Department of Medical Laboratory Sciences is located at the College of Health Professions building at 900 East Leigh Street on the MCV Campus. Faculty and clerical offices are located in this facility, as well as student classrooms, general teaching laboratory, study areas and a student lounge. Classrooms and a general teaching laboratory are also present at the Southwest Virginia Higher Education Center at One Partnership Circle, Abingdon, Virginia.

- Medical Laboratory Sciences, Master of Science (M.S.)
- Medical Laboratory Sciences, Master of Science (M.S.), advanced master's concentration (<http://bulletin.vcu.edu/graduate/school-allied-health-professions/medical-laboratory-sciences/medical-laboratory-sciences-ms-advanced-masters-concentration/>)
- Medical Laboratory Sciences, Master of Science (M.S.), categorical concentration (<http://bulletin.vcu.edu/graduate/school-allied-health-professions/medical-laboratory-sciences/medical-laboratory-sciences-ms-categorical-concentration/>)

### **CLLS 500. Concepts and Techniques in Clinical Laboratory Science. 3 Hours.**

Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: Permission of instructor. Restricted to candidates in the categorical master's program. Presents the basic theoretical concepts, laboratory techniques and skills employed in the areas of clinical chemistry, hematology, immunohematology and microbiology.

**CLLS 501. Instrumental Methods of Analysis I. 2-4 Hours.**

Semester course; 2 lecture and 4 laboratory hours. 2-4 credits.  
Prerequisite: Permission of instructor. A study of modern research and clinical laboratory instrumentation and procedures. Principles, theory and comparison of laboratory instruments are discussed along with the factors affecting their operation. Laboratory exercises are designed to demonstrate the practical applications of the instruments in the research and clinical laboratory. Areas covered include basic electronics, principles of photometry, spectrophotometry, fluorometry, flame emission photometry, atomic absorption spectrophotometry and computerized instrumentation.

**CLLS 502. Instrumental Methods of Analysis II. 2-4 Hours.**

Semester course; 2 lecture and 4 laboratory hours. 2-4 credits.  
Prerequisite: Permission of instructor. A study of modern research and clinical laboratory instrumentation and procedures. Principles, theory and comparison of laboratory instruments are discussed along with the factors affecting their operation. Laboratory exercises are designed to demonstrate the practical applications of the instruments in research and clinical laboratory. Areas covered include electrophoresis, chromatography, particle counters, radio-isotope counters and clinical laboratory automation.

**CLLS 580. Principles of Education/Management. 1-3 Hours.**

Semester course; 2 lecture and 2 practicum hours. 1-3 credits.  
Introduces fundamental educational theories and practice, principles of management and employee relations and health-care issues from a global perspective with an emphasis on multicultural diversity. Stresses the application in the clinical laboratory. Requires a practicum in education and in management following the completion of the didactic portion.

**CLLS 595. Clinical Practicum. 1-4 Hours.**

Semester course; 80-320 clock hours. 1-4 credits. Prerequisite: At least one of the following: CLLS 301-302, 306 and 310, 307-308, 311-312, or by permission of instructor. Individual participation in a hospital laboratory in a selected specialty area: clinical chemistry, hematology, microbiology or immunohematology. Students gain practical experience in the performance of procedures and use of instruments by working with the clinical staff. After gaining competence, the students are expected to properly perform and sign out routine laboratory work under supervision. Based on adviser's recommendation and student's past experience, the course may be taken for less than four credits. Graded as pass/fail.

**CLLS 601. Theoretical Blood Banking. 3 Hours.**

Semester course; 3 lecture hours (delivered online). 3 credits. Enrollment requires permission of the instructor. A comprehensive study of the blood groups in man, including biochemistry, genetics and clinical significance. Topics relating to problems with antibodies to the blood group antigens are discussed.

**CLLS 602. Molecular Diagnostics in Clinical Laboratory Sciences. 3 Hours.**

Semester course; 3 lecture hours. 3 credits. Restricted to students in the M.S. in Clinical Laboratory Sciences' advanced master's track or permission of instructor. Provides the basic principles and techniques of molecular diagnostics and information for establishing a molecular diagnostics laboratory. Examines the utilization of molecular techniques in the clinical laboratory for patient diagnosis and therapy. Emphasizes the use of these techniques in the areas of immunology, microbiology, hematology/oncology, and inherited genetic disorders.

**CLLS 605. Advanced Hematology. 2-4 Hours.**

Semester course; 2 lecture and 2 laboratory hours. 2-4 credits.  
Prerequisite: Permission of instructor. Discusses advanced laboratory techniques used to analyze blood dyscrasias and hemostatic disorders. Students also may perform related laboratory tests.

**CLLS 608. Laboratory Diagnosis of Infectious Diseases. 3 Hours.**

Semester course; 3 lecture hours. 3 credits. Prerequisite: permission of instructor. Applies an organ system approach to the laboratory diagnosis of infectious diseases. Emphasizes diagnostic methods to verify infections because of pathogenic micro-organisms and includes related diagnostic microbiology laboratory issues. Utilizes a distance learning format.

**CLLS 610. Interpretative Clinical Hematology. 2 Hours.**

Semester course; 2 lecture hours. 2 credits. Prerequisite: Permission of instructor. Principles of hematopoiesis and related pathological and pathophysiological correlation of hematological disorders are discussed.

**CLLS 611. Analytical Techniques for Clinical Mass Spectrometry. 2 Hours.**

6-week summer session; 12 lecture and 36 laboratory contact hours. 2 credits. Enrollment restricted to student admitted to the M.S. in Clinical Laboratory Sciences program or by permission of the instructor. Focuses on the proper utilization of chemicals and equipment required for the calibration, quality control and operation of clinically relevant mass spectrometry systems. Emphasizes calculations and demonstration of proficiency with quantitative techniques.

**CLLS 612. Mass Spectrometry Systems for Clinical Analyses. 4 Hours.**

Semester course; 3 lecture and 2 laboratory hours. 4 credits. Prerequisite: CLLS 611 or permission of the instructor. Focuses on the principles of chemical and instrumental analysis relevant to the detection and quantitation of clinically relevant analytes using mass spectrometry systems. Emphasizes the clinical laboratory applications of different types of mass spectrometry systems, preanalytical sample preparation, and integration of chromatography and mass spectrometry.

**CLLS 613. Mass Spectrometry Assay Development for In Vitro Diagnostics. 3 Hours.**

Semester course; 2 lecture and 2 laboratory hours. 3 credits.  
Prerequisites: CLLS 611 and CLLS 612 or permission of the instructor. Focuses on the principles of assay development and evaluation of methods for the measurement of clinically relevant analytes using chromatography-mass spectrometry systems. Emphasizes "best practices" as found in CLSI, SOFT and FDA guidance documents.

**CLLS 627. Advanced Concepts in Immunology and Immunohematology. 3 Hours.**

Semester course; 3 lecture hours. 3 credits. Prerequisites: CLLS 306, 310 and 496. Presents advanced topics in clinical immunology and immunohematology. Focuses on the integration of advanced concepts in the evaluation of laboratory data and solving clinical and methodological problems related to autoimmune diseases, ABO discrepancies, compatibility testing, hemolytic disease of the fetus and newborn and transfusion reactions.

**CLLS 628. Advanced Concepts in Microbiology. 2 Hours.**

Semester course; 2 lecture hours. 2 credits. Prerequisites: CLLS 307 and 308; and CLLS 496 or 595. Advances study of pathogenic microbiology principles. Includes application of laboratory data and techniques to solve clinical microbiology problems.

**CLLS 629. Advanced Concepts in Hematology. 2 Hours.**

Semester course; 2 lecture hours. 2 credits. Prerequisites: CLLS 302, and CLLS 485 or 595. Focuses on developing and expanding the knowledge acquired in the prerequisite courses in hematology and hemostasis. Incorporates case study evaluations, challenging current hematology topics in the literature and the integration of assessing laboratory data and clinical problems. Emphasizes the development of skills in critical thinking and analyzing clinical data.

**CLLS 630. Advanced Concepts in Clinical Chemistry and Instrumentation. 2 Hours.**

Semester course; 2 lecture hours. 2 credits. Prerequisites: CLLS 311 and 312; and CLLS 483 or 595. Focuses on advanced concepts in clinical chemistry, including endocrinology, measurement of vitamins and tumor markers, method evaluation and laboratory and hospital information systems. Integrates the basic knowledge and skills acquired in the undergraduate sequence of courses with advanced concepts in clinical chemistry/instrumentation to analyze the more complex clinical and analytical problems presented by the aforementioned topics. Includes the design and conduct of library research and laboratory experiments, and data analysis to generate recommendations that are practical and applicable in a real clinical chemistry service.

**CLLS 690. Clinical Laboratory Sciences Seminar. 1 Hour.**

Semester course; 1 lecture hour. 1 credit. Presentation and discussion of current research and topics of interest by the departmental faculty, graduate students and visiting lecturers.

**CLLS 691. Special Topics in Clinical Laboratory Sciences. 1-4 Hours.**

Semester course; 1-4 credits. This course provides for lectures, tutorial studies and/or library assignments in specialized areas not available in formal courses or research training.

**CLLS 694. Molecular Diagnostic Practicum I. 8 Hours.**

Semester course; 640 clock hours. 8 credits. Prerequisite: permission of instructor. Provides direct observation and practice in a molecular diagnostics laboratory with emphasis on nucleic acid extraction and molecular amplification techniques. Develops proficiency at performing, analyzing and reporting test results. Graded as pass/fail.

**CLLS 695. Molecular Diagnostic Practicum II. 4 Hours.**

Semester course; 320 clock hours. 4 credits. Prerequisite: permission of instructor. Provides direct observation and practice in molecular diagnostics laboratory. Focuses on molecular hybridization and human identity analyses. Develops proficiency at all stages of nucleic acid analyses including performing, analyzing and reporting test results. Introduces practice issues involved in management of a molecular diagnostics laboratory. Graded as pass/fail.

**CLLS 696. Advanced Blood Bank Practicum. 2 Hours.**

6 laboratory hours. 2 credits. Prerequisite: permission of instructor. A laboratory course with practical experiences in resolving complex blood group serological problems and discussion of these problems. Donor phlebotomy, processing of donor units, component preparation and instruction of undergraduate clinical laboratory sciences students also are performed.

**CLLS 761. Research Methodology in Clinical Laboratory Sciences. 3 Hours.**

Semester course; 3 lecture hours. 3 credits. Focuses on the principles of scientific research as applicable to problems encountered in the clinical laboratory sciences. Also focuses on developing a draft research proposal that would be the foundation for a project that would satisfy the research requirement for the master's degree in clinical laboratory sciences.

**CLLS 790. Research in Clinical Laboratory Sciences. 1-15 Hours.**

Semester course; 1-15 credits. Research leading to the M.S. degree.