

MEDICAL LABORATORY SCIENCES, BACHELOR OF SCIENCE (B.S.)

Medical laboratory scientists receive training in the following areas: clinical chemistry, the study of chemical reactions that occur in normal and diseased processes; hematology, the study of the cellular elements of the blood and blood-forming tissues and hemostatic mechanism; urine and body fluids analysis, the study of principles and practices of urinalysis, kidney function, and analyses of cerebrospinal fluid and other body fluids; microbiology, the study of microbiological aspects of infectious disease and the isolation and identification of pathogenic bacteria; immunohematology, the application of theory and principles of blood banking, cell typing, compatibility testing and antibody identification; and immunology, the study of the immune system and the serological and molecular techniques used for diagnosing infectious disease. With the rapid advancement of knowledge in the field of laboratory medicine, there is a growing need for highly skilled and knowledgeable clinical laboratory scientists. Employment is found in hospitals; physicians' offices; research facilities; molecular diagnostics, biotechnology and public health laboratories; industrial quality control; veterinary clinics; and sales and service of health care equipment. In addition to the technical arena, opportunities as managers or consultants exist for graduates of this program.

Upon graduation the student is eligible to take the national examination for Medical Laboratory Scientists given by the Board of Certification of the American Society for Clinical Pathology.

Mission statement

The mission of the undergraduate program is to serve the 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.

Student learning outcomes

1. Demonstrate knowledge

Students will demonstrate knowledge of the basic underlying scientific concepts and proficiency in performing the full range of laboratory tests in the areas of hematology, clinical chemistry, immunohematology (blood banking), microbiology, body fluids, serology/immunology and molecular diagnostics.

2. Environment conducive for student learning

VCU will provide a high quality educational setting for the development of students' professional skills.

3. Success in workplace

The program will provide the community with competent and professional medical laboratory scientists who can function effectively upon entrance into the field.

4. Professional conduct

Students will demonstrate appropriate professional conduct and leadership characteristics to include effective communication skills, ethical conduct and problem-solving abilities.

Academic regulations

The minimum passing grade for all professional courses leading to the Bachelor of Science degree is D. All courses must be completed with a passing grade, with no more than one D, for the student to be eligible for promotion or graduation. Satisfactory completion of the previous semester's course work is a prerequisite to the next semester.

Promotion/graduation is based on recommendations of the faculty. The student is expected to do all of the following:

- Maintain a minimum GPA of 2.0 at VCU
- Maintain a minimum GPA of 2.0 in CLLS course work
- Obtain a passing grade in all CLLS courses, with no more than one course grade of D in CLLS course work
- Complete the clinical education requirements to the satisfaction of the clinical and academic faculty
- Exhibit the attitudes and skills deemed necessary to function as a professional medical laboratory scientist
- Pay all fees

Detailed grading policies including the mechanism for grade appeals are given to each entering student during orientation.

Program admission

See the Department of Medical Laboratory Sciences website for admissions requirements. (<https://mls.chp.vcu.edu/admissions/>)

Special requirements

All students will have fulfilled core and general education requirements and a minimum of 60 transferable semester credits at an accredited college or university including:

- Biology: 12 hours to include general biology; human physiology and anatomy recommended
- Chemistry: 12 hours to include eight hours of general chemistry; remaining four hours can be (in order of preference) quantitative analysis, organic chemistry or qualitative analysis
- English: six to nine hours of composition (VCU: UNIV 111-UNIV 112 and UNIV 200 or their equivalents)
- Mathematics: three hours of college algebra or higher level; additional mathematics or physics recommended
- Humanities/arts: three hours (selected from courses in history, philosophy, political science, religion, foreign languages, literature, art history or art appreciation)
- Social sciences: three hours (selected from courses in anthropology, economics, geography, psychology or sociology)

Applicants should possess the following essential technical abilities and skills for admission consideration:

- Manual dexterity: ability to use hand(s) or prosthetic devices with coordination
- Fine motor: ability to manipulate small objects with fingertips or adaptive devices
- Mobility: ability to maneuver in the laboratory and around instruments and in patient-care settings

- Vision: ability to distinguish red, yellow, blue and green colors; to distinguish clear from cloudy; and to distinguish objects through a microscope
- Hearing: ability to hear with assistive devices (i.e., phone receivers, hearing aid, etc.)
- Speech: ability to verbally communicate in English
- Writing: ability to communicate effectively in written form in English
- Reading: ability to read, understand and follow directions printed in English
- Emotional and physical stability: ability to work accurately and safely under stress, adapt to changing environments and prioritize tasks
- Personal attributes: must demonstrate integrity, responsibility, tolerance and respect

Degree requirements for Medical Laboratory Sciences, Bachelor of Science (B.S.)

Course	Title	Hours
General education		
Select 30 credits of general education courses in consultation with an adviser. ¹		30
Major requirements		
• Major core requirements		
CLLS 301	Hematology	3.5
CLLS 302	Abnormal Hematology	4
CLLS 304	Urine and Body Fluid Analysis	2
CLLS 306	Immunohematology	4.5
CLLS 307	Introduction to Pathogenic Microbiology	3
CLLS 308	Pathogenic Bacteriology	5
CLLS 310	Clinical Immunology	4.5
CLLS 311	Clinical Chemistry and Instrumentation I	5
CLLS 312	Clinical Chemistry and Instrumentation II	5
CLLS 337	Clinical Education	1
CLLS 407	Interpretive Immunohematology	2.5
CLLS 408	Advanced Microbiology	2
CLLS 409	Interpretive Hematology	2
CLLS 410	Advanced Clinical Chemistry and Instrumentation	2
CLLS 411	Principles of Education/Management	3
CLLS 412	Senior Seminar	1
CLLS 483	Biochemistry Practicum	3
CLLS 485	Hematology Practicum	3
CLLS 493	Clinical Microbiology Practicum	3
CLLS 494	Miscellaneous Clinical Practicum	3
CLLS 496	Blood Bank Practicum	3
• Major elective		
CLLS 438	Research Paper (optional)	0-1
Ancillary requirements		
Additional subjects and credits required for admission ¹		39
Biology: general biology, human physiology and anatomy (12 credits)		
Chemistry: general (8 credits)		

Chemistry: quantitative analysis, organic chemistry or qualitative analysis (4 credits)	
English composition (6-9 credits)	
Mathematics (3 credits)	
Humanities/fine arts: history, philosophy, political science, religion, foreign languages, literature, art history or art appreciation (3 credits)	
Social sciences: anthropology, economics, geography, psychology or sociology (3 credits)	
Electives (to reach credits toward admission)	
Total Hours	125

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Some course work completed toward admission will also fulfill general education requirements. Admission to the program requires 60 credits.

The minimum number of credit hours required for this degree is 125.

The minimum number of credits for admission into the program is 60.

Freshman year		
Fall semester		Hours
Credits taken toward admission to program		15
Term Hours:		15
Spring semester		
Credits taken toward admission to program		15
Term Hours:		15
Sophomore year		
Fall semester		
Credits taken toward admission to program		15
Term Hours:		15
Spring semester		
Credits taken toward admission to program		15
Term Hours:		15
Junior year		
Fall semester		
CLLS 301	Hematology	3.5
CLLS 304	Urine and Body Fluid Analysis	2
CLLS 307	Introduction to Pathogenic Microbiology	3
CLLS 310	Clinical Immunology	4.5
CLLS 311	Clinical Chemistry and Instrumentation I	5
Term Hours:		18
Spring semester		
CLLS 302	Abnormal Hematology	4
CLLS 306	Immunohematology	4.5
CLLS 308	Pathogenic Bacteriology	5
CLLS 312	Clinical Chemistry and Instrumentation II	5
Term Hours:		18.5
Summer semester		
CLLS 337	Clinical Education	1
Term Hours:		1
Senior year		
Fall semester		

CLLS 483	Biochemistry Practicum	3
CLLS 485	Hematology Practicum	3
CLLS 493	Clinical Microbiology Practicum	3
CLLS 494	Miscellaneous Clinical Practicum	3
CLLS 496	Blood Bank Practicum	3
Term Hours:		15
Spring semester		
CLLS 407	Interpretive Immunohematology	2.5
CLLS 408	Advanced Microbiology	2
CLLS 409	Interpretive Hematology	2
CLLS 410	Advanced Clinical Chemistry and Instrumentation	2
CLLS 411	Principles of Education/Management	3
CLLS 412	Senior Seminar	1
CLLS 438	Research Paper (elective study)	0-1
Term Hours:		12.5
Total Hours:		125

The minimum total of credit hours required for this degree is 125.

Accelerated B.S. and M.S.

The accelerated B.S. and M.S. program allows qualified students to earn both the B.S. and M.S. in Medical Laboratory Sciences in a minimum of three years after entry into the medical laboratory sciences baccalaureate program by completing approved graduate courses during the final year of the program. Students in the accelerated program may count up to seven hours of graduate courses toward both the B.S. and M.S. degrees. Thus, the two degrees may be earned with a minimum of 152 credits rather than the 159 credits necessary if the two degrees are pursued separately.

Students holding these degrees will have a head start for career advancement in medical laboratory sciences. The M.S. degree provides formal research experience and can lead to expanded job opportunities, greater potential for job advancement and higher salaries.

Entrance to the accelerated program

Interested undergraduate students should consult with their adviser as early as possible to receive specific information about the accelerated program, determine academic eligibility and submit (no later than two semesters prior to graduating with a baccalaureate degree, that is, before the end of the spring semester of their junior year) an Accelerated Program Declaration Form to be approved by the graduate program director. Limited spaces may be available in the accelerated program. Academically qualified students may not receive approval if capacity has been reached.

Minimum qualifications for entrance to this accelerated program include completion of 115.5 undergraduate credit hours, including 60 prerequisite undergraduate credit hours (see admission requirements for the baccalaureate degree program in medical laboratory sciences in the Undergraduate Bulletin for a list of the specific courses) and 52.5 credit hours of undergraduate professional course work in medical laboratory sciences including: CLLS 301, CLLS 302, CLLS 304, CLLS 306, CLLS 307, CLLS 308, CLLS 310, CLLS 311, CLLS 312, CLLS 337, CLLS 483, CLLS 485, CLLS 494 and CLLS 496; a GPA of 3.0 in undergraduate medical laboratory science course work; a satisfactory interview and a positive recommendation from the Department of Medical Laboratory Sciences

faculty. Students who do not meet the minimum GPA requirements may submit GRE scores to receive further consideration.

Once enrolled in the accelerated program, students must meet the standards of performance applicable to graduate students as described in the "Satisfactory academic progress (<http://bulletin.vcu.edu/academic-regs/grad/satisfactory-academic-progress/>)" section of the Graduate Bulletin, including maintaining a 3.0 GPA. Guidance to students admitted to the accelerated program is provided by both the undergraduate adviser and the faculty adviser to the graduate program.

Admission to the graduate program

Entrance to the accelerated program enables the student to take the approved shared courses that will apply to the undergraduate and graduate degrees. However, entry into an accelerated program via an approved Accelerated Program Declaration Form does not constitute application or admission into the graduate program. Admission to the graduate program requires a separate step that occurs through a formal application. In order to continue pursuing the master's degree after the baccalaureate degree is conferred, accelerated students must follow the admission to graduate study requirements outlined in the VCU Bulletin.

Degree requirements

The Bachelor of Science in Medical Laboratory Sciences degree will be awarded upon completion of a minimum of 125 credits and the satisfactory completion of all undergraduate degree requirements as stated in the Undergraduate Bulletin. Upon completion of the B.S. in Medical Laboratory Sciences, students are eligible to take a medical laboratory scientist national certification examination.

A maximum of 10 graduate credits may be taken prior to completion of the baccalaureate degree. Seven graduate credits will substitute for required major course credits for the undergraduate degree. These courses are shared credits with the graduate program, meaning that they will be applied to both undergraduate and graduate degree requirements.

The graduate medical laboratory sciences courses that may be taken as an undergraduate, once a student is admitted to the program, and may be counted toward both B.S. and M.S. degrees are:

Course	Title	Hours
CLLS 628	Advanced Concepts in Microbiology (Substitutes for CLLS 408)	2
CLLS 629	Advanced Concepts in Hematology (Substitutes for CLLS 409)	2
CLLS 630	Advanced Concepts in Clinical Chemistry and Instrumentation (Substitutes for CLLS 410)	2
CLLS 690	Clinical Laboratory Sciences Seminar (Substitutes for CLLS 412)	1

Recommended course sequence/plan of study

What follows is the recommended plan of study for students interested in the accelerated program beginning in the fall of the first year, prior to admission to the accelerated program in the second year.

Course	Title	Hours
First (junior) year		
Fall semester		
CLLS 301	Hematology	3.5

CLLS 304	Urine and Body Fluid Analysis	2	Electives	4
CLLS 307	Introduction to Pathogenic Microbiology	3	Term Hours:	10
CLLS 310	Clinical Immunology	4.5		
CLLS 311	Clinical Chemistry and Instrumentation I	5		
Term Hours:		18		
Spring semester				
CLLS 302	Abnormal Hematology	4		
CLLS 306	Immunochemistry	4.5		
CLLS 308	Pathogenic Bacteriology	5		
CLLS 312	Clinical Chemistry and Instrumentation II	5		
Term Hours:		18.5		
Summer semester				
CLLS 337	Clinical Education	1		
Term Hours:		1		
Second (senior) year				
Fall semester				
CLLS 483	Biochemistry Practicum	3		
CLLS 485	Hematology Practicum	3		
CLLS 493	Clinical Microbiology Practicum	3		
CLLS 494	Miscellaneous Clinical Practicum	3		
CLLS 496	Blood Bank Practicum	3		
Term Hours:		15		
Spring semester				
CLLS 407	Interpretive Immunochemistry	2.5		
CLLS 411	Principles of Education/Management	3		
CLLS 628	Advanced Concepts in Microbiology	2		
CLLS 629	Advanced Concepts in Hematology	2		
CLLS 630	Advanced Concepts in Clinical Chemistry and Instrumentation	2		
CLLS 661	Research Methodology in Medical Laboratory Sciences	3		
CLLS 690	Clinical Laboratory Sciences Seminar	1		
Term Hours:		15.5		
Third year				
Fall semester				
ALHP 594	Health Education Practicum	2		
BIOS 543	Graduate Research Methods I	3		
CLLS 690	Clinical Laboratory Sciences Seminar	1		
CLLS 790	Research in Clinical Laboratory Sciences	1		
HADM 602	Health System Organization, Financing and Performance	3		
Electives		4		
Term Hours:		14		
Spring semester				
ALHP 594	Health Education Practicum	2		
CLLS 690	Clinical Laboratory Sciences Seminar	1		
CLLS 790	Research in Clinical Laboratory Sciences	3		