MEDICAL LABORATORY SCIENCES, MASTER OF SCIENCE (M.S.), CATEGORICAL CONCENTRATION

Program goals
The Department of Medical Laboratory Sciences provides students with advanced theoretical and technical education and prepares them to assume roles as laboratory supervisors, educators and researchers. VCU will provide students with a superior, yet flexible, course of advanced study in medical laboratory sciences.

Student learning outcomes
1. Categorical M.S. students will demonstrate knowledge and proficiency of laboratory tests.
2. Students will demonstrate the ability to research and evaluate laboratory issues within medical laboratory sciences, formulate a research question, design a research protocol and complete a research project.
3. Students will demonstrate appropriate professional conduct and leadership characteristics to include effective communication skills, ethical conduct and problem-solving abilities.

VCU Graduate Bulletin, VCU Graduate School and general academic policies and regulations for all graduate students in all graduate programs
The VCU Graduate Bulletin website documents the official admission and academic rules and regulations that govern graduate education for all graduate programs at the university. These policies are established by the graduate faculty of the university through their elected representatives to the University Graduate Council.

It is the responsibility of all graduate students, both on- and off-campus, to be familiar with the VCU Graduate Bulletin as well as the Graduate School website and academic regulations in individual school and department publications and on program websites. However, in all cases, the official policies and procedures of the University Graduate Council, as published on the VCU Graduate Bulletin and Graduate School websites, take precedence over individual program policies and guidelines.

Visit the academic regulations section for additional information on academic regulations for graduate students.

Degree candidacy requirements
A graduate student admitted to a program or concentration requiring a final research project, work of art, thesis or dissertation, must qualify for continuing master’s or doctoral status according to the degree candidacy requirements of the student’s graduate program. Admission to degree candidacy, if applicable, is a formal statement by the graduate student’s faculty regarding the student’s academic achievements and the student’s readiness to proceed to the final research phase of the degree program.

Graduate students and program directors should refer to the following degree candidacy policy as published in the VCU Graduate Bulletin for complete information and instructions.

Visit the academic regulations section for additional information on degree candidacy requirements.

Graduation requirements
As graduate students approach the end of their academic programs and the final semester of matriculation, they must make formal application to graduate. No degrees will be conferred until the application to graduate has been finalized.

Graduate students and program directors should refer to the following graduation requirements as published in the Graduate Bulletin for a complete list of instructions and a graduation checklist.

Visit the academic regulations section for additional information on graduation requirements.

Other information
All students will be given a handbook on policies and regulations at orientation.

Apply online today. (https://www.vcu.edu/admissions/apply/graduate/)

Admission requirements

<table>
<thead>
<tr>
<th>Degree:</th>
<th>Semester(s) of entry:</th>
<th>Deadline dates:</th>
<th>Test requirements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S.</td>
<td>Fall</td>
<td>Jun 1</td>
<td>Satisfactory scores on the GRE; minimum TOEFL of 600 (paper), 250 (computer) or 100 (IBT); or minimum IELTS score of 7.0 for international students whose native language is not exclusively English</td>
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<td></td>
<td>Spring</td>
<td>Nov 1</td>
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</tbody>
</table>

Special requirements
• Applicants must possess the essential technical abilities and skills described below.

In addition to the general admission requirements of the VCU Graduate School (http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/), the general entrance requirements for the Master of Science in Clinical Laboratory Sciences for the categorical concentration are:

1. Baccalaureate degree from an accredited college or university with a major in biology or chemistry (Other majors may be approved with 12 credits of biology and 12 credits of chemistry completed.)
Degree requirements

The categorical concentration of the Master of Science program provides specialized study, including a clinical practicum, in one of the following areas: clinical chemistry, hematology, microbiology or immunohematology.

In addition to the general VCU Graduate School graduation requirements (http://bulletin.vcu.edu/academic-regs/grad/graduation-info/), students in the categorical concentration are required to complete:

2. Minimum undergraduate GPA of 3.0 on a 4.0 scale for at least the last two years of undergraduate work
3. Three letters of recommendation from recent instructors or professional references from the applicant’s intended field of study addressing the applicant’s academic and professional abilities and preparation for graduate study
4. Satisfactory interview
5. Essential functions in clinical laboratory sciences
   The VCU Department of Medical Laboratory Sciences is responsible for providing education without regard to disability while assuring that academic and technical standards are met.
   a. Academic standards are met by successfully completing the curriculum for the M.S. in Clinical Laboratory Sciences degree.
   b. Technical standards represent the essential nonacademic requirements that a student must demonstrate to successfully participate in the M.S. in Clinical Laboratory Sciences degree program. The technical standards for each category identified below are consistent with the expectations of Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990 and the ADA Amendments Act of 2008. Applicants must possess the following essential technical abilities and skills for admission consideration:
      i. Manual dexterity: Ability to use hand(s) or prosthetic devices with coordination
      ii. Fine motor: Ability to manipulate small objects with fingertips or adaptive devices
      iii. Mobility: Ability to maneuver in the laboratory and around instruments and in patient-care settings
      iv. Vision: Ability to distinguish red, yellow, green and blue colors; to distinguish clear from cloudy; and to distinguish objects through a microscope
      v. Hearing: Ability to hear with assistive devices (i.e., phone receivers, hearing aid, etc.)
      vi. Speech: Ability to verbally communicate in English
      vii. Writing: Ability to verbally communicate in English
      viii. Reading: Ability to read, understand and follow directions printed in English
      ix. Emotional and physical stability: Ability to work accurately and safely under stress, adapt to changing environments and prioritize tasks
      x. Personal attributes: Must demonstrate integrity, responsibility, tolerance and respect

Curriculum requirements

Undergraduate course work

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLLS 311</td>
<td>Clinical Chemistry and Instrumentation I</td>
<td></td>
</tr>
<tr>
<td>CLLS 312</td>
<td>Clinical Chemistry and Instrumentation II</td>
<td></td>
</tr>
<tr>
<td>CLLS 301</td>
<td>Hematology</td>
<td></td>
</tr>
<tr>
<td>CLLS 302</td>
<td>Abnormal Hematology</td>
<td></td>
</tr>
<tr>
<td>CLLS 304</td>
<td>Urine and Body Fluid Analysis</td>
<td></td>
</tr>
<tr>
<td>CLLS 306</td>
<td>Immunohematology</td>
<td></td>
</tr>
<tr>
<td>CLLS 310</td>
<td>Clinical Immunology (other immunology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>courses may be approved)</td>
<td></td>
</tr>
</tbody>
</table>

1. A minimum of 34 graduate credit hours to include 20 credits from core courses and 14 credits from discipline-specific science courses while completing undergraduate courses specific to their specializations
2. A six-week clinical practicum in their specialty area

In addition to the basic science requirement, each student may choose an area of secondary emphasis in biomedical research, education, management or business.
1. In lieu of 12 of the 14 credit hours of discipline-specific course, students with a secondary emphasis in education, management or business may elect to focus on courses in those areas.
2. No more than 12 credit hours in the area of the secondary emphasis may be applied toward the required curriculum minimum of 34 credits.

Upon completion of the curriculum, students are eligible to take a national certification examination in the area in which they performed their concentrated study.

Full-time candidates require a minimum of two academic years to complete the program. Part-time students must complete all work requirements within six years. An interruption in registration in excess of one semester requires prior approval of the department.

In addition to these requirements, the department faculty will review continuation in the program if:

1. A student fails to achieves a minimum GPA of 3.0
2. A student receives a D or F in a course
3. A student receives a grade of C on more than one CLLS graduate course (CLLS and non-CLLS credits)
4. A student receives a grade of U (unsatisfactory) on required graduate course work.
5. A student receives a grade less than a B in undergraduate course
6. A student fails to demonstrate appropriate professional responsibility
Microbiology specialty

CLLS 307 Introduction to Pathogenic Microbiology

CLLS 308 Pathogenic Bacteriology

Total Hours 8-10

Specific courses will depend on the individual student's choice of specialty. Other courses may be approved.

Total undergraduate credit hours required 8-10

Graduate curriculum

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ALHP 594</td>
<td>Health Education Practicum</td>
<td>4</td>
</tr>
<tr>
<td>BIOS 543</td>
<td>Graduate Research Methods I</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 543</td>
<td>Statistical Methods I</td>
<td></td>
</tr>
<tr>
<td>CLLS 661</td>
<td>Research Methodology in Medical Laboratory Sciences</td>
<td>3</td>
</tr>
<tr>
<td>CLLS 690</td>
<td>Clinical Laboratory Sciences Seminar</td>
<td>3</td>
</tr>
<tr>
<td>CLLS 790</td>
<td>Research in Clinical Laboratory Sciences</td>
<td>4</td>
</tr>
<tr>
<td>HADM 602</td>
<td>Health System Organization, Financing and Performance</td>
<td>3</td>
</tr>
</tbody>
</table>

Discipline-specific courses (14 credits)

Select 14 credit hours from the following specialties: ¹

All specialties (required)

CLLS 500 Concepts and Techniques in Clinical Laboratory Science 3
CLLS 580 Principles of Education/Management 3
CLLS 595 Clinical Practicum 3

Clinical chemistry specialty

Clinical chemistry required

CLLS 630 Advanced Concepts in Clinical Chemistry and Instrumentation

Clinical chemistry recommended

CHEM 633 Mass Spectrometry
CLLS 611 Analytical Techniques for Clinical Mass Spectrometry
CLLS 612 Mass Spectrometry Systems for Clinical Analyses
CLLS 613 Mass Spectrometry Assay Development for In Vitro Diagnostics
FRSC 644 Analytical Considerations in Forensic Toxicology

Immunohematology required

CLLS 627 Advanced Concepts in Immunology and Immunohematology

Immunohematology recommended

CLLS 601 Theoretical Blood Banking
HGEN 501 Introduction to Human Genetics

Microbiology specialty

Microbiology required

CLLS 628 Advanced Concepts in Microbiology

Microbiology recommended

CLLS 608 Laboratory Diagnosis of Infectious Diseases
MICR 515 Principles of Molecular Microbiology
MICR 616 Mechanisms of Viral and Parasite Pathogenesis
MICR 618 Molecular Mechanisms of Microbial Pathogenesis

Electives for all specialties

Select from the following (other courses may be approved):

BIOC 503 Biochemistry, Cell and Molecular Biology
BIOC 504 Biochemistry, Cell and Molecular Biology
BIOL/BNFO 540 Fundamentals of Molecular Genetics
CLLS 602 Molecular Diagnostics in Clinical Laboratory Sciences
HGEN 502 Advanced Human Genetics
MICR 505 Immunobiology
PATH 601 General Pathology (Dentistry)

Electives in business, education, management, marketing, health administration (secondary emphasis) ²

ACCT 507 Fundamentals of Accounting
ADLT 601 Adult Learning and Development
FIRE 520 Financial Concepts of Management
GRAD 601 The Academic Profession
GRAD 602 Teaching and Learning in Higher Education
HADM 624 Health Economics
HADM 638 Administration of Long-term Care Facilities and Programs
INFO 661 Information Systems for Managers
MGMT 656 Best Practices in Leadership
MKTG 671 Marketing Management

¹ Specific courses will depend on the individual student's choice of specialty. The basic science requirement may be distributed among approved courses listed in the VCU Graduate Bulletin. Other courses may be approved.

² In lieu of 12 of the 14 credits in discipline-specific courses, students with a secondary emphasis in education, management or business may elect to focus on courses in those areas. No more than 12 graduate credit
Medical Laboratory Sciences, Master of Science (M.S.), categorical concentration

hours in the area of secondary emphasis may be applied to the required curriculum minimum of 34 credits.

The minimum number of graduate credit hours required for this degree is 34.

The department offers opportunities for qualified undergraduate students to earn both an undergraduate and graduate degree in a minimum of five years by completing approved graduate courses during the senior year of their undergraduate program. See the individual program page for concentrations in the Undergraduate Bulletin for details.

- B.S. in Biology and M.S. in Medical Laboratory Sciences, categorical concentration
- B.S. in Science with a concentration in professional science and M.S. in Medical Laboratory Sciences, categorical concentration (http://bulletin.vcu.edu/undergraduate/college-humanities-sciences/interdisciplinarydegreeprograminscience/science-bs-concentration-professional-science/)

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Program website: cls.chp.vcu.edu (https://cls.chp.vcu.edu/)