

# MICROBIOLOGY AND IMMUNOLOGY, MASTER OF SCIENCE (M.S.)

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## Program goals

The graduate programs of the Department of Microbiology and Immunology in the School of Medicine include degrees offered at the master's and doctoral levels. These educational programs have as their mission the preparation of individuals for a variety of career objectives in microbiology and immunology. The programs incorporate formal instructional activities and, as appropriate, research training, mentored by the members of the faculty. The M.S. program is distinguished by inclusion of the preparation of the individual to function as a laboratory technician/manager or research associate.

1. The program is designed to provide students with the skills required to advance to positions as bioscience researchers and trainers in a broad spectrum of positions.
2. The structure of the program provides a framework for the progressive development of a mastery of the current state of the subject matter of bioscience, an ability to synthesize this information and apply this foundation to the identification of key areas of investigation/experimentation in bioscience.
3. The program relates the above framework to the development of the ability to design, implement and interpret experimental approaches which address the questions identified.
4. In addition, the program will develop skills in the various means of communicating both the core of bioscience knowledge and the expression of experimental design, results and interpretation to a variety of potential audiences.

## Student learning outcomes

1. Problem-solving skills: Degree candidates will demonstrate an appropriate level of skill in the identification and selection of meaningful problems to be addressed in bioscience research, including the ability to defend said identifications and to design and develop appropriate methods to solve said problems as measured by rubric.
2. General knowledge of sciences: Degree candidates will demonstrate an appropriate level of knowledge of the current elements of the biosciences as related to disciplinary specialization and a more detailed understanding of the individual area of scholarship, including an appropriate familiarity with the research literature and the ability to evaluate and critique publications as measured by rubric.
3. Communication skills: Degree candidates will demonstrate that an appropriate level of oral, written and visual communication skills have been acquired as measured by rubric.
4. Experimental design: Degree candidates will demonstrate the achievement of an appropriate level of competence in the ability to appraise, modify and/or create, and implement experimental protocols and to design and develop experiments as measured by rubric.

## 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 (<http://www.graduate.vcu.edu/>) 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.** (<http://bulletin.vcu.edu/academic-regs/>)

## 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.** (<http://bulletin.vcu.edu/academic-regs/grad/candidacy/>)

## 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.** (<http://bulletin.vcu.edu/academic-regs/grad/graduation-info/>)

## Other information

### School of Medicine graduate program policies

The School of Medicine provides policies applicable to all programs administratively housed in the school. Information on **master's programs** is available elsewhere in this chapter of the Graduate Bulletin.

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

## Admission requirements

Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
M.S.	Fall or summer (spring start available to applicants admitted for fall/summer with program permission)	Applications received prior to Jan 1 given priority consideration	TOEFL if international

## Special requirements

- International applicants should display English language proficiency by achieving a minimum TOEFL score of 100 (iBT).

In addition to the general admission requirements of the VCU Graduate School (<http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/>), applicants must meet the following minimum requirements.

- Applicants must have earned or expect a baccalaureate or equivalent degree and must have demonstrated a superior knowledge of biology, chemistry, physics and mathematics.
- Laboratory experience is strongly recommended.
- Letters of recommendation and a letter summarizing the applicant's goals are required.
- Foreign applicants who do not use English as their native language must take the Test of English as a Foreign Language examination.

Complete application portfolio reviews will begin in January and will continue through May 1. International students requiring temporary U.S. visas should apply by April 1 for fall matriculation.

## Basic science, research-intensive, non-thesis curriculum for medical students

Individuals who are participants in medical training (the Doctor of Medicine program) at VCU may be eligible for enrollment in a research-intensive, non-thesis graduate curriculum. This basic science option builds on the core of disciplinary material embedded in the first two years of training in the medical school curriculum. Additional exposure is provided to specialized areas in basic science disciplines in concert with an intensive research experience leading to the preparation of a report in the form of a manuscript suitable for publication. The program is designed to be completed within 12 to 15 months. Subject matter related to the core material and/or suitable elective courses taken in the didactic phase of medical training correspond to a minimum of the equivalent of 24 graduate credit hours. The equivalent of 12 credit hours may be applied to the M.S. degree program in which the student is enrolled in accordance with Graduate School policy. Medical students interested in the basic science option should contact the M.S. graduate program director for additional information.

## Degree requirements

The Department of Microbiology and Immunology has an outstanding faculty with diverse research interests that include cell and molecular biology, molecular genetics, molecular pathogenesis, bacteriology, immunology, immunotoxicology, virology, parasitology, mycology and oncology. The goal of the graduate program is to prepare students to become creative problem-solvers and leaders in scientific research. The Master of Science degree is offered, as well as a Ph.D. and an M.D.-Ph.D. degree for medical students interested in academic or research careers.

The research experience is complemented with excellent course offerings, seminar programs, teaching opportunities, presentations at scientific meetings and writing scientific papers. Graduate students acquire a wide range of research experience in the first year through exposure to a variety of research laboratories and investigators. The student chooses a research adviser and then carries out an original, guided research project under the direction of the adviser. The project falls under the review of a graduate advisory committee and a written thesis is defended in a final oral examination.

M.S. students select their permanent advisers after three rotations completed during the first year of study. Research projects will be based on ongoing research in laboratories of the selected permanent adviser. The GAC is developed by the student and adviser. The M.S. student and the GAC will formulate a suitable curriculum of study based on the student's area of research interest.

In addition to the general VCU Graduate School graduation requirements (<http://bulletin.vcu.edu/academic-regs/grad/graduation-info/>), students in the M.S. degree program must complete all course requirements below. Additional hours may be completed for the M.S. degree. A cumulative GPA of 3.0 (with no more than six credit hours of a C grade) is required to maintain satisfactory academic progress.

An M.S. student performs a public presentation or defense of their thesis to their GAC, but the defense is open to all faculty members, students and staff. The GAC examines the student's fundamental knowledge of their research project and the disciplines encompassed by the student's thesis research.

## Course requirements

Course	Title	Hours
<b>Required core courses</b>		
MICR 505	Immunobiology	3
MICR 515	Principles of Molecular Microbiology	3
MICR 607	Techniques in Molecular Biology and Genetics	2
MICR 608	Introduction to Microbiology and Immunology Research I	4
MICR 609	Introduction to Microbiology and Immunology Research II	4
MICR 690	Microbiology Research Seminar (taken each fall and spring semester; minimum four credits)	4
IBMS 600	Laboratory Safety	1
OVRP 601	Scientific Integrity	1
<b>Elective courses</b>		
Select at least five credits from the following:		5

BNFO 653	Advanced Molecular Genetics: Bioinformatics	
MICR 605	Prokaryotic Molecular Genetics	
MICR 616	Mechanisms of Viral and Parasite Pathogenesis	
MICR 618	Molecular Mechanisms of Microbial Pathogenesis	
MICR 684	Molecular Biology of Cancer	
MICR 686	Advanced Immunobiology	
Take one of the following journal club courses for one semester every year.		2
MICR 692	Current Topics in Molecular Pathogenesis	
or MICR 694	Current Topics in Immunology	
<b>Thesis research</b>		
MICR 697	Directed Research in Microbiology	12
<b>Total Hours</b>		<b>41</b>

**The minimum number of graduate credit hours required for this degree is 41.**

Students who complete the requirements for this degree will receive a Master of Science in Microbiology and Immunology.

**Contact for prospective students**

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**Contact for current students**

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**Program website:** [vcu.edu/micro](http://www.vcu.edu/micro/) (<http://www.vcu.edu/micro/>)