# BIOLOGY, MASTER OF SCIENCE (M.S.)

## Program goals

The Department of Biology prepares graduate students to:

1. Acquire training in a chosen subdiscipline of biology
2. Learn research techniques used in the subdiscipline
3. Develop presentation skills
4. Develop publication skills

## Student learning outcomes

Upon completion of the M.S. in Biology, students will:

1. Demonstrate a broad knowledge of the principles of biology
2. Develop the quantitative and critical thinking skills needed to successfully perform research in the discipline
3. Demonstrate effective written and oral communication of biological concepts and research
4. Demonstrate appropriate expertise of the most recent research advances of a biology subdiscipline

## 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

Details on the M.S. degree in biology can be found in the Guidelines for Graduate Studies in Biology (http://biology.vcu.edu/media/biology/pdf/MS_GuidelinesRevised2015.pdf).

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

## Admission requirements

| Degree: | Semester(s) of entry: | Deadline dates: | Test requirements: |
|---|---|---|---|
| M.S. | Fall | Jan 15 | |
| | Spring and summer | By special permission of graduate director | |

In addition to the general admission requirements of the VCU Graduate School (http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/), the following requirements represent the minimum acceptable standards for admission:

1. Bachelor's degree in biological or related science or equivalent
2. Appropriate college-level background in mathematics, chemistry and physics
3. Three letters of recommendation pertaining to the applicant's potential ability as a graduate student in biology
4. Student's written statement concerning career and research interests
5. Transcripts of all previous college work

## Degree requirements

In addition to general VCU Graduate School graduation requirements (http://bulletin.vcu.edu/academic-regs/grad/graduation-info/), students are required to complete course work in core and elective courses and to conduct significant research.

1. Credit hour requirements: Master of Science degree candidates are required to take a minimum of 30 graduate credit hours with a minimum of 15 credit hours at the 600 level. A maximum of six credit

hours from graduate course work taken at other institutions may be transferred if they meet approval of the department.

2. Grade requirements: Receipt of a grade of C or lower in two courses constitutes automatic dismissal from the graduate program in biology. Courses with a grade of C or lower cannot be applied to satisfying the degree requirements.

3. Thesis or non-thesis option: Each student must select either the thesis or the non-thesis option. Students selecting the thesis option must take at least six and no more than nine credit hours of BIOL 698. The M. S. thesis option requires the successful defense of a written thesis based on laboratory or field research. Students selecting the non-thesis option must take three credit hours of BIOL 692 and complete and defend an independent research project under the guidance of a faculty mentor.

4. Other requirements: All M.S. thesis option students are required to write a thesis proposal and a formal thesis following a prescribed format. In order to initiate thesis research, the thesis proposal must be approved by the student's graduate committee and the chair of the department, and the student must be approved for degree candidacy. Each student will be required to pass a final examination, which will be primarily a defense of the M.S. thesis. Students may specialize within many areas, such as molecular and cellular biology, genetics, aquatic and terrestrial ecology, systematics, physiology, neurobiology and developmental biology. Students also may develop an interdisciplinary focus to their degree programs, for example, within areas such as bioinformatics, cancer biology, forensic science and environmental science.

# Curriculum requirements

## Thesis option

| Course | Title | Hours |
|---|---|---|
| **Core courses** | | |
| BIOL 604 | Research Integrity | 1 |
| BIOL 607 | Science Communication: Fundamentals | 2 |
| BIOL 608 | Science Communication: Research Proposals | 2 |
| BIOL 631 | Biology Integration: From Molecules to Organisms | 3 |
| BIOL 632 | Biology Integration: From Organisms to Landscapes | 3 |
| BIOL 690 | Biology Seminar (one-credit course repeated for two credits) | 2 |
| BIOL 693 | Current Topics in Biology (one-credit course repeated for two credits) | 2 |
| **Statistical and quantitative skills course** | | |
| BIOL 606 | Quantitative Ecology | 3 |
| or BIOS 543 | Graduate Research Methods I | |
| or STAT 543 | Statistical Methods I | |
| **Research** | | |
| BIOL 698 | Thesis | 6 |
| **Electives** | | |
| Select from the list of recommended electives below. | | 6 |
| **Total Hours** | | **30** |

**The minimum number of graduate credit hours required for this degree is 30.**

## Non-thesis option

| Course | Title | Hours |
|---|---|---|
| **Core courses** | | |
| BIOL 604 | Research Integrity | 1 |
| BIOL 607 | Science Communication: Fundamentals | 2 |
| BIOL 608 | Science Communication: Research Proposals | 2 |
| BIOL 631 | Biology Integration: From Molecules to Organisms | 3 |
| BIOL 632 | Biology Integration: From Organisms to Landscapes | 3 |
| BIOL 690 | Biology Seminar (one-credit course repeated for two credits) | 2 |
| BIOL 693 | Current Topics in Biology (one-credit course repeated for two credits) | 2 |
| **Statistical and quantitative skills course** | | |
| BIOL 606 | Quantitative Ecology | 3 |
| or BIOS 543 | Graduate Research Methods I | |
| or STAT 543 | Statistical Methods I | |
| **Research** | | |
| BIOL 692 | Independent Study | 3 |
| **Electives** | | |
| Select from the list of recommended electives below. | | 9 |
| **Total Hours** | | **30** |

**The minimum number of graduate credit hours required for this degree is 30.**

## Recommended electives

Choose from the following list in consultation with adviser.

| Course | Title | Hours |
|---|---|---|
| BIOL 516 | Population Genetics | 3 |
| BIOL 519 | Forest Ecology | 4 |
| BIOL 524 | Endocrinology | 3 |
| BIOL 535 | Wetlands Ecology | 4 |
| BIOL 540 | Fundamentals of Molecular Genetics | 3 |
| BIOL 565 | Advances in Cell Signaling | 3 |
| BIOL 580 | Eukaryotic Biotechnology | 3 |
| BIOL 601 | Integrated Bioinformatics | 4 |
| BIOL 603 | Fundamentals of Scientific Leadership | 3 |
| BIOL 605 | Diversity and Inclusion in Science | 1 |
| BIOL 606 | Quantitative Ecology | 3 |
| BIOL 610 | Conservation Applications | 3 |
| BIOL 618 | Ecosystems Ecology | 3 |
| BIOL 620 | Biogeochemistry | 3 |
| BIOL 626 | Physiological Ecology | 4 |
| BIOL/ENVS/URSP 654 | Environmental Remote Sensing | 3 |
| BIOL 660 | Developmental Biology | 3 |
| BIOL 676 | Plant and Animal Cell Biology | 3 |
| BIOL 690 | Biology Seminar | 1 |

| | | |
|---|---|---|
| BIOL 691 | Special Topics in Biology | 1-4 |
| BIOL 693 | Current Topics in Biology | 1 |
| BIOL 698 | Thesis | 1-3 |
| Any 500- or 600-level courses in ANAT, BIOL, BIOC, BIOS, BNFO, CLSE, EGRB, ENVS, HEMS, HGEN, LFSC, MEDC, MICR, NEUS, PCEU, PHTX, PHIS or STAT | | |
| Any 600-level course in CHEM, EDUS, GRAD, MATH, PHYS, PSYC or URSP | | |

## Accelerated opportunities

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 program page in the Undergraduate Bulletin (http://bulletin.vcu.edu/undergraduate/college-humanities-sciences/biology/biology-bs/) for details.

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**Program website:** biology.vcu.edu/graduate-program/ms-program-in-biology (http://biology.vcu.edu/graduate-program/ms-program-in-biology/)