

# ANATOMY AND NEUROBIOLOGY, MASTER OF SCIENCE (M.S.)

## Program mission

The M.S. in Anatomy and Neurobiology program offers a two-year graduate curriculum of formal instructional activities and research training mentored by the members of the faculty leading to the terminal M.S. degree. The program prepares students for technical careers in neurobiological research laboratories in academic, private and government institutions. The program also provides a strong foundation for students who choose to continue onto doctoral training.

This is a research-oriented degree program comprised of graduate course work and supervised research leading to a master's thesis. The M.S. program involves approximately one year of course work and a research thesis performed under the supervision of a faculty adviser.

## Program goals

1. The program is designed to provide students with the skills required to advance to positions as bioscience researchers, trainers and technicians in a broad spectrum of positions. 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.
2. The program relates the above framework to the development of the ability to design, implement and interpret experimental approaches which address the questions identified.
3. 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. The program will prepare students to secure positions in their chosen career goals (medical school, doctoral studies, employment in academic or private laboratories).

## Student learning outcomes

The following are the learning outcomes for the program. Students will be able to

- Define the molecular, cellular and tissue-level organization of the central and peripheral nervous system
- Apply the properties of cells that make up the nervous system, including the propagation of electrical signals used for cellular communication
- Compare and contrast the properties of individual cells to their function in organized neural circuits and systems
- Model and explain how the interaction of cells and neural circuits leads to higher level activities such as cognition and behavior
- Distinguish the fundamental biochemical principles, such as the structure/function of biomolecules, metabolic pathways and the regulation of biological/biochemical processes
- Generate testable scientific hypotheses and develop research plans to test these hypotheses
- Evaluate and critically review primary research literature in seminar discussions
- Engage effectively in independent and collaborative research projects

- Make presentations that convey complex knowledge in an audience-appropriate and venue-appropriate fashion and answer questions effectively
- Write scientific texts such as abstracts, full-length manuscripts and research proposals

## 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 (preferred)	Applications received by Jul 1 given priority consideration	GRE, MCAT or DAT TOEFL if international
	Summer	Applications received by Jan 1 given priority consideration	

## Special requirements

In addition to the general admission requirements of the VCU Graduate School (<http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/>), successful applicants will typically have the following credentials:

1. Baccalaureate degree or its equivalent at the time of enrollment with a minimum overall GPA of 3.2
2. Combined GRE scores of at least 300 for the verbal plus quantitative (1200 based on the previous scale) and 4.0 analytical score
3. Test of English as a Foreign Language examination with a minimum score of 100 (IBT), 250 (CBT) or 600 (PBT), or 6.5 on the IELTS for foreign applicants who do not use English as their native language

Although there are no absolute course requirements for admission, fundamental knowledge of general and organic chemistry and biology are considered necessary to pursue advanced studies, and upper-level courses in molecular and cellular biology are desirable. Previous research experience or demonstration of a serious interest in a research-oriented career is also desirable. A personal statement describing the applicant's research experience and interests, as well as letters of reference from previous supervisors, are necessary and helpful in determining an applicant's suitability for this curriculum. Official transcripts of all graduate and undergraduate records must be mailed from the college or university registrar.

## Degree requirements

In addition to general VCU Graduate School graduation requirements (<http://bulletin.vcu.edu/academic-regs/grad/graduation-info/>), students must complete a minimum of 37 graduate credit hours. A minimum cumulative GPA of 3.0 must be maintained. Students must receive a minimum grade of B for all required courses.

A student who receives a grade of C in a required course shall repeat the course. A second grade of C in a required course shall result in dismissal from the program.

There is no expectation of the time required to complete the master's degree; usually two years of study are necessary to complete the requirements. At the appropriate time in their research, students will

prepare a thesis and schedule a final oral defense of the thesis. The final oral examination (defense of the thesis) will cover the subject of the candidate's dissertation and related basic science course work.

## Course requirements

Course	Title	Hours
<b>Required core courses</b>		
ANAT 610	Systems Neuroscience	4
ANAT 690	Anatomy and Neurobiology Seminar (minimum four semesters)	4
BIOC 503	Biochemistry, Cell and Molecular Biology	5
BIOC 504	Biochemistry, Cell and Molecular Biology	5
IBMS 600	Laboratory Safety	1
NEUS 609	Cellular and Molecular Neuroscience	4
<b>Required additional courses</b>		
OVPR 601	Scientific Integrity	1
or OVPR 602	Responsible Scientific Conduct	
or OVPR 603	Responsible Conduct of Research	
<b>Thesis research</b>		
ANAT 697	Directed Research	13
Total Hours		37

**The minimum total of graduate credit hours required for this degree is 37.**

## Typical plan of study

Many students often end up taking more than the minimum number of hours required for a degree program. The total number of hours may vary depending upon the program, nature of research being conducted by a study or in the enrollment or funding status of the student. Students should refer to their program websites and talk with their graduate program directors or advisers for information about typical plans of study and registration requirements.

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