NEUROSCIENCE, DOCTOR OF PHILOSOPHY (PH.D.)

Program mission

The program offers an interdepartmental, integrated curriculum for graduate study leading to the Ph.D. in Neuroscience. The program prepares students to teach in the neuroscience disciplines at a university or academic health center and is distinguished by its objective to prepare students to function as independent research investigators.

Program goals

Upon completion of the Ph.D. in Neuroscience degree program, students will have:

1. Demonstrated a mastery of neuroscience and related bioscience knowledge
2. Developed effective oral, written and electronic communication skills
3. Demonstrated the ability to formulate, design, implement and interpret experimental approaches
4. Reached a level of competency to advance to positions as neuroscience researchers and teachers in a broad spectrum of academic, industrial and government employment venues
5. Successfully obtained employment in a neuroscience-related position

Student learning outcomes

1. Students will demonstrate an appropriate level of knowledge of neuroscience and biosciences and exhibit the ability to integrate and comprehensively and critically review the scientific literature with an interdisciplinary perspective.
2. Students will demonstrate an appropriate level of oral and written communication skills with respect to content, organization, logical flow, presentation and appropriate use of language incorporating state-of-the-art technological advances in knowledge dissemination.
3. Students will demonstrate their ability to identify a scientific question, formulate testable hypotheses, design and carry out experiments to test their hypotheses, and interpret their results.
4. The candidate will demonstrate creativity and awareness to make significant contributions to neuroscience research in academic, private or government settings.

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. (https://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. (https://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. (https://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 **doctoral 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:
Ph.D.	Fall	Dec 1 before year of matriculation	TOEFL if international

Special requirements

- Applications for the program must be submitted to the Biomedical Sciences Doctoral Portal – School of Medicine – Ph.D. selected from the drop-down menu of programs on the VCU online application form.

In addition to the general admission requirements of the VCU Graduate School (https://bulletin.vcu.edu/graduate/study/admission-graduate-

study/admission-requirements/), successful applicants will typically have the following credentials:

1. A baccalaureate degree or its equivalent at the time of enrollment, with an undergraduate GPA of 3.5
2. TOEFL scores of 600 (pBT), 250 (cBT) or 100 (iBT) for individuals for whom English is a second language; or 6.5 on the IELTS (To report GRE or TOEFL score, use VCU Code 5570.)
3. Personal statements, which should include: long-term career goals to assess reasons behind the candidate's application; how a Ph.D. in biomedical science helps achieve those goals; the factors motivating a career in research; research experience, including dates, places and duration
4. Three letters of recommendation that speak to the scientific competency and experience of the applicant
5. The equivalent of two semesters of general chemistry, two semesters of organic chemistry and two semesters of upper-level biology courses (e.g. cell biology, molecular biology, biochemistry, genetics, neuroscience, physiology, biophysics, etc.)

Degree requirements

In addition to the general VCU Graduate School graduation requirements (https://bulletin.vcu.edu/academic-regs/grad/graduation-info/), students in the Ph.D. in Neuroscience program will complete a minimum of 69 graduate credit hours. Students will take, typically within the first two years, a set of required core courses and an additional six credits of didactic electives (see course list below). There beyond, students register for dissertation research credits (NEUS 697), research seminar (NEUS 690) and the research presentations course (ANAT 630). Students must maintain a minimum cumulative GPA of 3.0 to remain in good standing with the program. Students should prepare for their comprehensive examination at the end of their second year and have passed the exam no later than the end of fall term in their third year in order to qualify for degree candidacy. Following admission to candidacy, each student must complete a substantial original research project, present their work in a departmental seminar, prepare a written dissertation and defend their work successfully in an oral examination.

Curriculum requirements

Course	Title	Hours
Required core courses		
ANAT 610	Systems Neuroscience	4
ANAT 615	Techniques in Neuroscience and Cell Biology	3
ANAT 620	Scientific Writing and Grantsmanship	2
ANAT 630	Research Presentations (repeat course each semester in the program)	8
BIOC 503	Biochemistry, Cell and Molecular Biology	5
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BIOC 661	Critical Thinking (repeated to earn two credits)	2
IBMS 600	Laboratory Safety	1
IBMS 621	Laboratory Rotation I	2
IBMS 622	Laboratory Rotation II	2
IBMS 623	Laboratory Rotation III	2
NEUS 609	Cellular and Molecular Neuroscience	4
NEUS 690	Neuroscience Research Seminar (repeat course each semester in the program)	8
Required additional course		
OVPR 601	Scientific Integrity	1
or OVPR 602	Responsible Scientific Conduct	
or OVPR 603	Responsible Conduct of Research	
Elective courses		
Select didactic elective courses to total six credits. Suggested electives are listed below.		6
BIOS 543	Graduate Research Methods I	
or STAT 543	Statistical Methods I	
IBMS 635	Cellular Signalling	
NEUS 640	Neurobiology of CNS Diseases	
PHIS 604	Cell Physiology: Cardiovascular and Respiratory	
PHIS 606	Molecular Basis for Disease	
PHIS/PHTX 620	Ion Channels in Membranes	
PHTX 548	Drug Dependence	
PHTX 632	Neurochemical Pharmacology	
PHTX 633	Behavioral Pharmacology	
PHTX 636	Principles of Pharmacology	
Dissertation research		
NEUS 697	Directed Research	14
Total Hours		**69**

The minimum total of graduate credit hours required for this degree is 69.

Students who complete the requirements for this degree will receive a Doctor of Philosophy in Neuroscience.

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.

M.D.-Ph.D. opportunity

The M.D.-Ph.D. program allows students to pursue both the M.D. and Ph.D. degrees using a coordinated program of study and apply a limited number of M.D. requirements toward fulfillment of requirements for the Ph.D. See the dual degree program page (https://bulletin.vcu.edu/graduate/dual-degree-opps/md-neuro-phd/) for additional details.

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Program website: neuroscience.vcu.edu (https://medschool.vcu.edu/education/phd_programs/neuroscience/)