

# 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. (<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 **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	Applications received prior to Jan 1 given priority consideration	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 (<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 an undergraduate GPA of 3.5
2. TOEFL score of 600 (pBT), 250 (cBT) or 100 (iBT; or 6.5 on the IELTS for individuals for whom English is a second language
3. Personal statements, including:
  - a. Long-term career goals to assess reasons behind application
  - b. How a Ph.D. in biomedical science helps achieve those goals
  - c. Initial motivating factors for a career in research
  - d. Research experience, including dates, places and duration
4. 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 or biophysics)

## Degree requirements

In addition to the general VCU Graduate School graduation requirements (<http://bulletin.vcu.edu/academic-regs/grad/graduation-info/>), students in the Ph.D. program must complete a minimum of 69 graduate credit hours.

Students must maintain a minimum cumulative GPA of 3.0 and 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.

## Comprehensive examinations

The comprehensive examination occurs in two parts, usually commencing after the second year for Ph.D. students, or the first graduate year for M.D.-Ph.D. students. Part 1 consists of a mini-review, written by the student and defended before their graduate advisory committee. Part 2 consists of an oral defense of an NIH-style grant proposal prepared by the student, in consultation with their adviser, based on their research plan. Part 2 is also defended before their graduate advisory committee. Students are strongly encouraged to submit their proposals for extramural funding (e.g., NIH predoctoral fellowships) where appropriate. Both phases of the comprehensive exam must be completed by the end of the fall semester of the third year for Ph.D. students, or the second graduate year for M.D.-Ph.D. students.

Successful completion of the oral candidacy exam advances the student to candidacy for the doctoral degree. The oral candidacy exam must be completed prior to the beginning of the third year. Beginning with the spring semester the third year in the graduate program, students will devote their full time to conducting research in their advisers' laboratories. Students also register for neuroscience research seminar and journal club each semester.

At the appropriate time in their research, students will prepare a dissertation and schedule a final oral defense of the thesis. The final oral examination (defense of the dissertation) will be limited to the subject of the candidate's dissertation and related basic science.

It is anticipated that students will complete the program in four to five years. All requirements for the Ph.D. degree must be completed

within eight years from the date of matriculation in the degree program. Extensions may be approved in extenuating circumstances.

## Curriculum requirements

Course	Title	Hours
<b>Required core courses</b>		
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 to earn at least 8 credits)	8
BIOC 503	Biochemistry, Cell and Molecular Biology	5
BIOC 504	Biochemistry, Cell and Molecular Biology	5
BIOC 661	Critical Thinking	1
IBMS 600	Laboratory Safety	1
IBMS 620	Laboratory/Clinical Rotations (repeat course to earn 6 credits)	6
NEUS 609	Cellular and Molecular Neuroscience	4
NEUS 690	Neuroscience Research Seminar (repeat course to earn 8 credits)	8
<b>Required additional course</b>		
OVPR 601 or OVPR 602 or OVPR 603	Scientific Integrity Responsible Scientific Conduct Responsible Conduct of Research	1
<b>Elective courses</b>		
Select two elective courses from the list below (or others as approved by the graduate program director)		6
ANAT 608	Functional and Clinical Neuroanatomy	
ANAT 617	Developmental Neurobiology	
BIOC 605	Molecular Biology	
BIOS 543 or STAT 543	Graduate Research Methods I Statistical Methods I	
IBMS 635	Cellular Signalling	
NEUS 619	Synaptic Organization of the Brain	
PHIS 604	Cell Physiology: Cardiovascular and Respiratory	
PHIS 606	Molecular Basis for Disease	
PHIS 619	Mitochondrial Pathophysiology and Human Diseases	
PHIS/PHTX 620	Ion Channels in Membranes	
PHIS 631	Electrophysiology and Photonic Methods	
PHTX 548	Drug Dependence	
PHTX 632	Neurochemical Pharmacology	
PHTX 636	Principles of Pharmacology	
<b>Dissertation research</b>		
NEUS 697	Directed Research	15
Total Hours		69

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

## 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 (<http://bulletin.vcu.edu/graduate/dual-degree-ops/md-neuro-phd/>) for additional details.

### Contact

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**Program website:** [neuroscience.vcu.edu \(https://medschool.vcu.edu/education/phd\\_programs/neuroscience/\)](https://medschool.vcu.edu/education/phd_programs/neuroscience/)