

NEUROSCIENCE

<http://biomed.med.miami.edu/graduate-programs/neuroscience>

Overview

The Neuroscience Program was formed in 1989 by a committee of neuroscientists led by the Provost and organized as a university-wide program. A representative steering committee was established, and Dr. Richard Rotundo was appointed as the first chair. In 1992, the Neuroscience Program became an independent, PhD-granting entity. Neuroscience research is a major focus at the University of Miami and the Neuroscience Graduate Program (NGP) is currently composed of 30 graduate students and 78 faculty members with diverse research interests, but also with some areas of commonality. Areas of concentration include neurotrauma such as stroke, spinal cord injury and traumatic brain injury, mechanisms of addiction, neurodegenerative diseases such as multiple sclerosis and Alzheimer's disease, and sensory transduction of the somatosensory, visual, auditory, olfactory and gustatory systems. The Neuroscience Graduate Program faculty are from 19 different departments and distributed across three University of Miami campuses: Miller School of Medicine (MSOM) campus, Rosenstiel School of Marine and Atmospheric Science (RSMAS) campus and the Coral Gables (CG) campus. This comprehensive, diverse group of faculty, students and scientists that make up the Neuroscience Graduate Program is a cornerstone of research and graduate education in biomedical sciences at the University of Miami.

Contact Information

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Admission Requirements

Admission to the Neuroscience Program is through the common umbrella of Programs in the Biomedical Sciences (PIBS), for all biomedical PhD programs.

For more information, please visit this website (<http://biomed.med.miami.edu/graduate-programs/programs-in-biomedical-sciences-pibs/>).

Curriculum Requirements

Graduate training is the major goal of the program, with emphasis on cellular, molecular, and genetic approaches to Neuroscience. A single core curriculum provides the didactic scaffold of the program. This curriculum consists of courses in Developmental Neuroscience, Membrane Biophysics, Introductory Neuroscience, Neural Systems, and Neuroanatomy. The core courses are supplemented with a variety of Special Topics Short Courses. Students also attend research seminars and a scientific journal club. The Neuroscience Steering Committee guides the students, overseeing their coursework, until they have passed their qualifying exams. From then on, their progress is supervised by individually tailored dissertation committees.

Code	Title	Credit Hours
Biomedical Science Core		
PIB 700	Journal Club	1
PIB 701	Introduction to Biomedical Sciences	5
PIB 702	Scientific Reasoning	3
PIB 705	Biostatistics for the Biosciences	3
PIB 731	Laboratory Research	1-6
PIB 780	Research Ethics	1
PIB 782	Professional Development: Skills for Success I	1
PIB 783	Professional Development: Skills for Success II	1
PIB 785	PIBS Bioinformatics Workshop	1
PIB 830	Doctoral Dissertation	1
Neuroscience Required Courses		
NEU 700	Seminars in Neuroscience	1
NEU 721	Principles of Membrane Physiology and Biophysics I	2
NEU 722	Principles of Membrane Physiology and Biophysics II	2

NEU 731	Advanced Topics in Neuroscience	1
NEU 761	Neuroscience 1B (Developmental Neuroscience)	2
NEU 762	NEU II - Systems Neuroscience	4
NEU 763	Developmental Neuroscience	2
NEU 797	Neuroanatomy	3
Research Credits		24
NEU 830	Doctoral Dissertation	
NEU 840	Doctoral Dissertation- Post Candidacy	
NEU 850	Research in Residence	
Total Credit Hours		59-64

¹ Neuroscience students must take 1 seminar credit each fall and spring semester.

Sample Plan of Study

Please note that the following is only a sample curriculum plan. Current students must discuss their plan with their program director to make adjustments as needed. It is the student's responsibility to contact the program to verify the information.

Year One		Credit Hours
Fall		
PIB 700	Journal Club	1
PIB 701	Introduction to Biomedical Sciences	5
PIB 702	Scientific Reasoning	3
PIB 731	Laboratory Research	1
PIB 780	Research Ethics	1
PIB 782	Professional Development: Skills for Success I	1
Credit Hours		12
Spring		
PIB 700	Journal Club	1
PIB 705	Biostatistics for the Biosciences	3
PIB 731	Laboratory Research	1
PIB 783	Professional Development: Skills for Success II	1
NEU 721	Principles of Membrane Physiology and Biophysics I	2
NEU 722	Principles of Membrane Physiology and Biophysics II	2
NEU 761	Neuroscience 1B (Developmental Neuroscience)	2
NEU 763	Developmental Neuroscience	2
Credit Hours		14
Summer		
PIB 830	Doctoral Dissertation	1
Credit Hours		1
Year Two		
Fall		
NEU 700	Seminars in Neuroscience	1
NEU 762	NEU II - Systems Neuroscience	4
NEU 797	Neuroanatomy	3
NEU 830	Doctoral Dissertation	3
Credit Hours		11
Spring		
NEU 700	Seminars in Neuroscience	1
NEU 830	Doctoral Dissertation	3
Credit Hours		4

Summer			
NEU 830	Doctoral Dissertation		1
Credit Hours			1
Year Three			
Fall			
NEU 700	Seminars in Neuroscience		1
NEU 731	Advanced Topics in Neuroscience		1
NEU 840	Doctoral Dissertation- Post Candidacy		3
Credit Hours			5
Spring			
NEU 700	Seminars in Neuroscience		1
NEU 840	Doctoral Dissertation- Post Candidacy		3
Credit Hours			4
Summer			
NEU 840	Doctoral Dissertation- Post Candidacy		1
Credit Hours			1
Year Four			
Fall			
NEU 700	Seminars in Neuroscience		1
NEU 840	Doctoral Dissertation- Post Candidacy		2
Credit Hours			3
Spring			
NEU 700	Seminars in Neuroscience		1
NEU 840	Doctoral Dissertation- Post Candidacy		2
Credit Hours			3
Summer			
NEU 840	Doctoral Dissertation- Post Candidacy		1
Credit Hours			1
Year Five			
Fall			
NEU 700	Seminars in Neuroscience		1
NEU 840	Doctoral Dissertation- Post Candidacy		2
Credit Hours			3
Spring			
NEU 700	Seminars in Neuroscience		1
NEU 840	Doctoral Dissertation- Post Candidacy		2
Credit Hours			3
Summer			
NEU 850	Research in Residence		1
Credit Hours			1
Total Credit Hours			67

Mission

The Neuroscience Graduate Program offers training leading to a Ph.D. in Neuroscience. The program's mission is to provide students with 1) an understanding of the central concepts in neuroscience and basic biomedical science and 2) the ability to formulate, carry out, and communicate original research in neuroscience.

Goals

- Ensure that students obtain fundamental knowledge of the central concepts in neuroscience and basic biomedical science
- Ensure the students obtain the ability to formulate, carry out, and communicate original research in neuroscience
- Equip students with an understanding of rigorous experimental design, statistical methodology, and quantitative literacy in neuroscience
- Provide rigorous training for writing and orally presenting neuroscience

- Develop student's ability to write a successful grant application
- Nurture a student's ability to teach others neuroscience and to collaborate to achieve common research goals
- Promote publishing of original research performed with high ethical and rigorous standards that make a substantial contribution to neuroscience
- Provide students with access to career development advising and knowledge of the career opportunities in neuroscience
- Prepare students effectively for their chosen career route
- Increase diversity of the neuroscience workforce
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- Ensure the students obtain the ability to formulate, carry out, and communicate original research in neuroscience
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- Provide rigorous training for writing and orally presenting neuroscience
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- Increase diversity of the neuroscience workforce

Student Learning Outcomes

- Students should demonstrate overall knowledge and understanding of the core concepts in neuroscience, including the essential skills necessary for conducting research in the field of neuroscience.
- Students should demonstrate critical thinking skills, the capability to develop hypotheses, and the ability to evaluate their hypotheses, paying attention to responsible conduct of research as appropriate.
- Students should demonstrate the ability to write effective scientific reports and to present scientific results orally.
- Students should, in honing research capabilities throughout their graduate careers, publish original research in peer-reviewed journals.
- Students should submit for extramural fellowships, the receipt of which will prove valuable to the student, the program, and the university.
- Students should be encouraged to formulate, carry out, and defend dissertation research in a timely manner, keeping the program's mean time from matriculation to defense low so that the student can take the next step in his or her career.

NEU 721. Principles of Membrane Physiology and Biophysics I Chemical and physical structure of membranes, model systems, permeability and transport, membrane potential, ionic channels, excitability in nerve and muscle, ionophores, active transport, and membrane receptors. (2 credits)

NEU 722. Principles of Membrane Physiology and Biophysics II Osmosis and cell volume, permeability and compartmentation, cable properties, Hodgkin-Huxley formalism, Na, K, and Ca ion channels, regulation of cellular Na, Ca activities, single-channel analysis, chemical synapses, membrane receptors, cell junctions, excitation and E-C coupling in muscle. Prerequisite: NEU 721. (2 credits)

NEU 760. Neuroscience IA – Molecular and Cellular Neuroscience This course is an advanced introduction to modern neurobiology, focusing on the cellular and molecular biology of neurons, glia, synapses, and neurotransmitters. (2 credits)

NEU 761. Neuroscience IB - Developmental Neuroscience This course will explore nervous system development from early neural induction and neurogenesis to the construction of neural circuits. Basic mechanisms of neurulation and CNS patterning, neural progenitor migration, neural crest and ectodermal placodes, programmed cell death, construction of neural circuits, axon guidance, synaptogenesis and several emerging techniques in neurobiology will be covered. (2 credits)

NEU 762. Systems Neuroscience Sensory, motor and integrative neuroscience at the level of functional systems. The course concentrates on the experimental basis for our understanding of nervous system function using didactic lectures and student discussions of research literature. Students are expected to have a working knowledge of synaptic transmission, excitable cell membranes, and ion channels from previous coursework in NEU 721/722 and NEU 761. [Prerequisites: NEU 721/22 and NEU 761, or in exceptional cases, permission of instructors]. (4 credits)

NEU 797. Neuroanatomy Functional neuroanatomy for neuroscience research. Emphasis is on gross anatomy, identification of pathways and circuits, and a description of the physiological functions of neuroanatomical systems. Each lecture will contain some clinical examples and/or case histories, and a laboratory segment for study of human and sheep brains. Brain models and online tools including 3-dimensional rotations are included. (3 credits)

NEU 731. Advanced Topics in Neuroscience A seminar course with guided readings and discussions based on research literature. The course is taught by faculty in areas related to their research topics. The course may include writing assignments or homework exercises. All NEU program students are required to pass this course at least once before requesting sufficiency. Not available every semester. Announcements for this course are sent by email to all NEU students. (1 credit)

NEU 700. Seminars in Neuroscience Required each Fall and Spring for all NEU students, emphasizes student research presentations (30 min each for 2nd year students; 60 min each for 3rd year on). Attendance at neuroscience related seminars is also required. (1 credit)

NEU 830. Doctoral Dissertation – Pre Candidacy Dissertation Research before requesting Admission to Candidacy (i.e. before Qualifying Exam). No more than 6 (six) of these credits may be taken prior to completion of the Qualifying Exam. (variable credits)

NEU 840. Doctoral Dissertation – Post Candidacy Dissertation Research after Admission to Candidacy. (variable credits)

NEU 850. Research in Residence – Defense Semester Dissertation Research after the student has defended their dissertation but is preparing dissertation for final submission to Graduate School, or has accumulated the permissible total in doctoral research credits.