NEUROSCIENCE, MASTER OF SCIENCE

Neuroscience, Master of Science

The Master's degree in Neuroscience is a full-time in-person program consisting of nine months of intensive coursework followed by 12 months of laboratory research in one of the world-class neuroscience laboratories at Johns Hopkins University. Both the coursework and the research opportunities will encompass the gamut of contemporary neuroscience including molecular/cellular approaches, development, circuit function and neurobiology of disease, as well as systems, cognitive and computational neuroscience.

Graduates of the program will be well-prepared for research-oriented jobs in pharma, biotechnology, academia, government, or for application to programs conferring advanced degrees such as M.D., Ph.D., D.V.M., or Pharm.D.

Program Requirements

The MS in Neuroscience is a 21 month-long program. The first 9 months consist of a full load of graduate-level coursework. The following 12 months consist of a research experience in a single Neuroscience Program laboratory.

Code	Title	Credits
Academic Year 1: FALL		
ME.440.811	Neuroscience Cognition I	4.5
ME.440.801	Readings in Neuroscience (Journal Club)	1
or ME.440.810	Readings In Systems Neuroscience	
ME.440.819	Rigor, Reproducibility, and Responsibility in Science	2
ME.440.820	Circuits and Brain Disorders	2
ME.440.802	Current Topics in Neuroscience (Research Seminar)	1
Academic Year 1: SPRING		
ME.440.812	Neuroscience Cognition II	4.5
ME.440.801	Readings in Neuroscience (Journal Club)	1
or ME.440.810	Readings In Systems Neuroscience	
AS.200.659	Quantitative Methods for Brain Sciences	3
or ME.440.825	Quantitative Neurogenomics	
PH.140.615	Statistics for Laboratory Scientists I	4
OR		
Neuroscience Elective (if previous stats course taken and approved by program director) [1]		
Neuroscience Elective [1]		
ME.440.802	Current Topics in Neuroscience (Research Seminar)	1
Academic Year 1: SUMMER		
ME.440.800	Neuroscience Research	1 - 18
Academic Year 2: FALL		
ME.440.802	Current Topics in Neuroscience (Research Seminar)	1
ME.440.800	Neuroscience Research	1 - 18
Academic Year 2: SPRING		
ME.440.802	Current Topics in Neuroscience (Research Seminar)	1
ME.440.800	Neuroscience Research	1 - 18

[1] For a list of Neuroscience Electives please see https://neuroscience.jhu.edu/graduate/curriculum (https://neuroscience.jhu.edu/graduate/curriculum/)

Learning Outcomes

1. Basic knowledge of neuroscience principles

All graduates should be able to:

- Explain how neurons use passive and active membrane properties to receive, process, and transmit signals to post-synaptic cells.
- Explain how neurons are connected in circuits and refined by experience.
- Demonstrate a fundamental understanding of the cellular and molecular specializations that support nervous system function.
- Demonstrate sufficient understanding of neuroanatomy to describe neural circuits and how they contribute to nervous system function.
- Explain how the nervous system develops.
- Identify and discuss common disorders of the nervous system, their biological basis, & current therapies.
- Grasp the fundamental approaches used by theoretical neuroscience to understand how the brain solves computational problems.
- Demonstrate familiarity with common methodologies used in experimental neuroscience.
- Explain biochemical and cell biological processes important for brain function.

2. Critical thinking

All graduates should be able to:

- Analyze primary literature and identify strengths and shortcomings of the methods employed.
- Construct testable hypotheses and design experiments to challenge these hypotheses.

3. Quantitative analysis

All graduates should be able to:

- Appropriately process and apply analytical techniques and statistical tests to their data.
- Create figures that effectively communicate results.
- Critically evaluate and interpret quantitative data.
- Identify and use computational tools in their research.

4. Effective written/oral communication skills

All graduates should be able to:

- Organize their oral and written scientific communications to effectively transmit: 1. significance of topic, 2. relevant background material to place the topic in context, and 3. knowledge gap to be addressed.

5. Self-motivated learning/scientific inquiry

All graduates should:

- Independently explore and assimilate existing literature in their field of interest.
- Be able to identify and engage expert guidance when needed.

6. Discipline-specific research skills

All graduates should be able to:

- Develop hypothesis driven research questions founded on own their current studies.
- Conduct discipline-specific experimental techniques with appropriate controls and analysis.
- Troubleshoot and solve emergent problems.

7. Citizenship

All graduates should demonstrate:

- A fundamental understanding of research ethics.
- The ability to work collaboratively with others.