Neuroscience: Systems, Behavior and Plasticity, M.S.

COLLEGE OF LIBERAL ARTS (http://www.cla.temple.edu)

About the Program

Neuroscience is the study of the nervous system, including the brain, spinal cord, networks of nerve cells called neurons, and how these cells interact to generate behavior. This is a rapidly evolving field with applications ranging from health disciplines to economics and public policy. The philosophical goal of the M.S. program in Neuroscience: Systems, Behavior and Plasticity is to provide advanced training in neuroscience and professional development via coursework and a faculty-mentored research experience to students who have completed an undergraduate major in Neuroscience or a closely related scientific area and who wish to extend their studies before moving on to other post-graduate training or professional employment. Students in this program achieve the following objectives:

• Build a core knowledge in specific areas of neuroscience, including behavioral, cellular, molecular, and systems.
• Develop a general professional competence in oral and written expression as well as in the critical analysis of research articles.
• Learn to understand, create, and undertake hypothesis-based approaches to research.
• Train in a variety of techniques and approaches to studying the nervous system.
• Develop a keen sense of analytical thinking and logic in the evaluation of their own work and that of others.
• Become effective teachers and communicators of neuroscience.
• Gain independence in thinking, teaching, laboratory work, and communicating.

Time Limit for Degree Completion: 2 years

Campus Location: Main

Full-Time/Part-Time Status: The degree program is expected to be completed on a full-time basis.

Job Prospects: Because the brain is involved in every important human endeavor, understanding the brain and its functions opens career paths in multiple fields, including education, engineering, law, medicine, psychology, and public policy. Master’s-level education in neuroscience provides students with a wide range of career options, including:

• Biostatistician
• Clinical data manager
• Counselor
• Environmental health safety officer
• Medical or science writer
• Public health administrator
• Public policy strategist
• Regulatory affairs specialist
• Research associate at academic research institutes or in private industry
• Research and teaching administrator
• Teacher/lecturer

The United States Bureau of Labor Statistics identifies the breadth of employment opportunities in neuroscience along with the salary ranges for different careers options based on different types of employers in its Occupational Outlook Handbook (http://www.bls.gov/ooh).

Non-Matriculated Student Policy:

Financing Opportunities:

Admission Requirements and Deadlines

Application Deadline:

Fall: March 1

APPLY ONLINE to this graduate program.

Letters of Reference:
Number Required: 3

*From Whom:* Letters of recommendation should be obtained from college/university faculty who are familiar with the applicant's academic abilities.

**Bachelor's Degree in Discipline/Related Discipline:** All applicants must hold a baccalaureate degree (B.A. or B.S.) in one of the following disciplines:

- Bioengineering
- Biology
- Chemistry
- Human Movement Science
- Kinesiology
- Mathematics
- Neuroscience
- Physics
- Psychology
- Public Health

Other relevant disciplines, combined with or including coursework in Biology, Chemistry, Mathematics/Statistics, Neuroscience, Physics, and/or Psychology, may be accepted after individual evaluation of the applicant's qualifications.

A minimum GPA of 3.2 in undergraduate work is required for consideration of the application to the program.

**Statement of Goals:** Approximately 500 to 1,000 words outline your specific interest in Temple's program, your academic achievements, and your future career goals.

**Standardized Test Scores:**
TOEFL (international students only): 88 iBT or 575 PBT minimum

## Program Requirements

**General Program Requirements:**

**Number of Credits Required Beyond the Baccalaureate:** 30

**Required Courses:**

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>NSCI 5001</td>
<td>Systems and Behavioral Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>NSCI 5002</td>
<td>Neurochemistry</td>
<td>3</td>
</tr>
<tr>
<td>NSCI 5016</td>
<td>Professional Development in Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>NSCI 9381</td>
<td>Readings in Neuroscience</td>
<td>3</td>
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<tr>
<td>PSY 5003</td>
<td>Advanced Statistics</td>
<td>3</td>
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<tr>
<td>PSY 8712</td>
<td>Core Course in Behavioral Neuroscience</td>
<td>3</td>
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**Electives**

Students may select any elective relevant to their area of interest or specialization with approval from the Program Director.

**Capstone Course**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSCI 9991</td>
<td>Directed Research</td>
<td>6</td>
</tr>
</tbody>
</table>

**Total Credit Hours:** 30

1 Students may select any elective relevant to their area of interest or specialization with approval from the Program Director.

**Culminating Events:**

**Master's Project:**

Students are required to work on a master's project over both terms in their second year of the program. The purpose of the project is not only to train students in specific neuroscientific techniques, but also how to develop a scientific and analytical approach toward a problem, formulate clear research questions, conduct experiments, and analyze/interpret data. Depending on their career goals, students may opt to engage either in a laboratory-based research project or in a non-laboratory project.

Students who are motivated to join a doctoral program or are interested in a research position gain by working independently on a neuroscientific investigation under the supervision of a faculty member who maintains an active neuroscience research program. On the other hand, students who are not intending to engage in bench-level research upon graduation and are interested in non-research jobs, such as counseling, research administration,
public policy, and teaching, may choose to engage in a non-laboratory project of a similar scope. This may include activities such as conducting a literature review on a topic and presenting it to an audience, drafting a scope of work for a grant funding agency, or preparing a consulting proposal for a prospective client.

Contacts

Program Web Address:
https://www.cla.temple.edu/neuroscience/graduate/

Department Information:
College of Liberal Arts Neuroscience Program
638 Weiss Hall
1701 N. 13th Street
Philadelphia, PA 19122-6085
neuro@temple.edu
215-204-3441

Submission Address for Application Materials:
http://www.interfolio.com/

Department Contacts:
Program Director:
Vinay Parikh
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215-204-1572

Associate Director, Master's Program in Neuroscience:
Debra Bangasser
debra.bangasser@temple.edu
215-204-1015

Courses

NSCI 5001. Systems and Behavioral Neuroscience. 3 Credit Hours.
The goals of this class are to expose Master's degree students to topics in systems and behavioral neuroscience. In addition, students will also be introduced to methods and techniques used for the analysis of neural and behavioral data. Through intensive instruction of systems underpinning sensory, motor, and integrative functions, as well as motivation, students will gain a thorough understanding of brain function/behavior and its neuronal correlates.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

NSCI 5002. Neurochemistry. 3 Credit Hours.
This course explores the major areas of cellular and molecular neurobiology, including cellular and subcellular components of the nervous system, neuronal excitability and molecular properties of ion channels, biochemistry of synaptic transmission, intracellular signaling, neurochemistry of learning and memory, cell injury and inflammation and psychiatric/neurodegenerative disorders. Material includes lectures, presentations and discussion of primary literature and journal articles that cover recent advances in the field. Additionally, students will get the opportunity to gain hands-on experience with some of the research methodologies used to study neurochemical processes.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.
NSCI 5016. Professional Development in Neuroscience. 3 Credit Hours.
This course will help prepare you for the remainder of your master's degree by providing the required laboratory and animal training, laboratory technique training, research and presentation skills training, and discussion of ethical issues in the field. The first module of this course will cover all the necessary laboratory and animal training and the second module will expose students to contemporary neuroscience techniques. The third module will provide training in research and presentation skills including how to design a research study, write a research paper and presenting your results. In the fourth module, we will discuss the ethical issues in neuroscience and consider the future challenges that may arise from the evolving study of the genetic and neurobiological determinants of behavior.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

NSCI 8007. Neuroendocrinology. 3 Credit Hours.
This course will provide an in-depth exploration of the interactions between the endocrine system and the nervous system. The role of hormones in modulating behaviors and mental processes will be covered with the following topics: sex determination and differentiation, reproduction, parental behavior, social behavior, homeostasis, biological rhythms, stress, learning and memory, and affect. Multidisciplinary approaches to understand neuroendocrine function and dysfunction from the molecular to systems level will be covered.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

NSCI 8008. Neuropsychopathology. 3 Credit Hours.
This course will provide an in-depth exploration of neuropsychopathology. Students will learn about recent advances in the understanding of the neurobiology mechanisms that underlie psychiatric disease, neurodegenerative, and neurological disorders. How available and experimental treatments for these disorders work also will be covered.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

NSCI 8009. Neuroscience Drug Discovery. 3 Credit Hours.
This course will consist of a series of didactic sessions and seminar-style discussions on topics that cover major aspects of the drug discovery process including lead/target identification, validation, preclinical pharmacology, toxicity and clinical trials. The course will also address unique challenges of research translation from preclinical to early and late phases of clinical development. Additionally, the technical and clinical aspects of biomarker validation needed to be applied to the different aspects of drug development process will be discussed.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

NSCI 9381. Readings in Neuroscience. 1 Credit Hour.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.

NSCI 9991. Directed Research. 1 to 6 Credit Hour.
This course is intended to meet the needs of students who desire to carry on an individual investigation while working towards the Master's degree in Neuroscience.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.