

# NEUROSCIENCE (NEUR)

## 100 Level Courses

**NEUR 101:** *Introduction to Neuroscience*. 3 credits.

This course is for students interested in the science of the brain from its evolutionary origins to its role in health and behavior. We examine systems that make up the brain from neurons to circuits. We explore trends in neuroscience experimentation including neuroimaging, computational neuroscience and neuropharmacology. May not be taken for major or minor credit after 300-level PSYC or NEUR courses. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Mason Core:** Natural Science Overview (<http://catalog.gmu.edu/mason-core/>)

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

## 300 Level Courses

**NEUR 327:** *Cellular Neuroscience*. 3 credits.

Basic concepts of cellular and molecular level neuroscience, including neuronal functions, cellular anatomy and membrane functions, electrical properties of neurons, and cellular basis of plasticity. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Registration Restrictions:**

**Required Prerequisites:** (CHEM 211<sup>C</sup> or 211<sup>XS</sup>) and (CHEM 213<sup>C</sup> or 213<sup>XS</sup>) and (BIOL 213<sup>C</sup> or 213<sup>XS</sup>).

<sup>C</sup> Requires minimum grade of C.

<sup>XS</sup> Requires minimum grade of XS.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 328:** *Cellular Neuroscience Lab*. 1 credit.

Introduction to basic neurophysiology to optionally accompany NEUR 327 Cellular, Molecular and Pharmacological Neuroscience. This highly integrative course will allow students to learn and apply principles from across cellular neuroscience. Students will learn practical laboratory skills required for neurophysiological experiments. Students will non-invasively record and analyze biopotentials created by their own bodies. Students will learn computational analysis of central pattern generators through a gamified program. Students will use anesthetized animals to record and analyze biopotentials through intracellular and extracellular recordings. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Registration Restrictions:**

**Required Prerequisites:** (NEUR 327<sup>\*C</sup> or 327<sup>XS</sup>).

\* May be taken concurrently.

<sup>C</sup> Requires minimum grade of C.

<sup>XS</sup> Requires minimum grade of XS.

**Schedule Type:** Laboratory

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 335:** *Developmental and Systems Neuroscience*. 3 credits.

In-depth survey of genetic and embryological development of the brain and introduction to systems neuroscience, including sections on patterning gene expression, generation and migration of neurons, axonal and dendritic outgrowth, and basic neuroanatomy. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Recommended Prerequisite:** PSYC 373 (may also be enrolled concurrently), PSYC 376.

**Schedule Type:** Laboratory, Lecture

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

## 400 Level Courses

**NEUR 405:** *RS: Laboratory Methods in Behavioral Neuroscience*. 3 credits.

Introduction to experimental methods used in behavioral neuroscience research. Laboratory work includes surgical, histological and behavioral techniques. Proper use and handling of animals, ethical issues, evaluation of neuroscience literature, experimental design and data analysis are addressed. This requires working with laboratory rodents. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Specialized Designation:** Research/Scholarship Intensive

**Recommended Prerequisite:** PSYC 300, BIOL 312 or equivalent. PSYC 372 or PSYC 376 or permission of instructor.

**Schedule Type:** Laboratory

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 406:** *Zebrafish Neurodevelopment Laboratory*. 3 credits.

Introduction to experimental methods used in neurodevelopment research, using zebrafish as a model system. Includes zebrafish embryo manipulation, microscopy, and histology, with a focus on vertebrate nervous system development and disease. Experimental design, research methods, data analysis and ethical issues are addressed. Scholarly research projects are incorporated. Notes: This requires working with live zebrafish embryos. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Specialized Designation:** Research/Scholarship Intensive

**Recommended Prerequisite:** PSYC 300, BIOL 312 or equivalent. BIOL 213, NEUR 327 and NEUR 335.

**Schedule Type:** Laboratory

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 407: *Lab Investigations Using Voltage Clamp Electrophysiology*.** 3 credits.

Introduction to neurophysiology using two electrode voltage clamp. Basic and advanced concepts of neurophysiology such as membrane potentials and neuronal channel and receptor function are covered. Includes theory of bioelectrical amplifiers, properties of biological membranes, and principles of physiological software and hardware. Students will learn skills such as making physiological solutions, using micromanipulators, basic molecular biology techniques, and obtaining and handling oocytes from the African clawed toad *Xenopus Laevis* depending on the students' chosen projects. Students will read primary literature, design, and execute scholarly research projects. Notes: This course requires working with live amphibians. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to two attempts.

**Specialized Designation:** Mason Impact.

**Recommended Prerequisite:** PHYS 245

**Registration Restrictions:**

**Required Prerequisites:** NEUR 327<sup>C</sup> or 327<sup>XS</sup>.

<sup>C</sup> Requires minimum grade of C.

<sup>XS</sup> Requires minimum grade of XS.

**Schedule Type:** Laboratory

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 410: *Current Topics in Neuroscience*.** 3 credits.

Overview of current topics in neuroscience, focusing on research at Mason. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Specialized Designation:** Topic Varies, Writing Intensive in Major

**Recommended Prerequisite:** PSYC 375, 376, ENGH 302. NSCI 327 recommended.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 411: *Seminar in Neuroscience*.** 3 credits.

Advanced seminar on a selected topic in neuroscience. Includes in depth reading and discussion of current research in human and nonhuman animals, with an emphasis on critical evaluation. Notes: Course may be repeated if selected topic is different. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May be repeated within the degree for a maximum 6 credits.

**Specialized Designation:** Writing Intensive in Major

**Registration Restrictions:**

**Required Prerequisites:** (ENGH 302<sup>C</sup>, 302<sup>XS</sup>, HNRS 110<sup>C</sup> or 302<sup>C</sup> and (NEUR 327<sup>C</sup>, 327<sup>XS</sup>, 335<sup>C</sup> or 335<sup>XS</sup>)).

<sup>C</sup> Requires minimum grade of C.

<sup>XS</sup> Requires minimum grade of XS.

**Schedule Type:** Seminar

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 422: *Glutamatergic Systems*.** 3 credits.

A survey of molecular and clinical neuroscience from the perspective of glutamatergic systems. This course will use the reading of primary scientific literature to guide students to learn a variety of neural systems, methods in neuroscience, and levels of analysis. Students will develop critical thinking skills through communicating and critiquing papers. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to two attempts.

**Registration Restrictions:**

**Required Prerequisites:** (NEUR 327<sup>C</sup> or 327<sup>XS</sup>).

<sup>C</sup> Requires minimum grade of C.

<sup>XS</sup> Requires minimum grade of XS.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 424: *Sleep and Circadian Rhythms*.** 3 credits.

This course introduces the fields of circadian rhythms with emphasis on sleep including the underlying molecular and genetic machinery, neuroanatomy, and neurophysiology. The impact of sleep and lack thereof will be explored on diseases and modern society. Considerable time will be spent reading and analyzing the primary literature in human and animal models. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Mason Core:** Synthesis (<http://catalog.gmu.edu/mason-core/>)

**Recommended Prerequisite:** NEUR 335

**Registration Restrictions:**

**Required Prerequisites:** ((BIOL 213<sup>C</sup> or 213<sup>XS</sup>) and (PSYC 376<sup>C</sup> or 376<sup>XS</sup>)).

<sup>C</sup> Requires minimum grade of C.

<sup>XS</sup> Requires minimum grade of XS.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 440: *Independent Study in Neuroscience*.** 1-3 credits.

Independent research based a laboratory or field investigation under the guidance of a faculty member, assisting with research on faculty projects, or reviewing the literature on a specific research topic. Notes: A maximum of 6 hours of independent study may be applied towards the major. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May be repeated within the degree for a maximum 6 credits.

**Recommended Prerequisite:** NEUR 327, 30 hours of course work with a grade point average of 3.0, or permission of instructor.

**Schedule Type:** Independent Study

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 450:** *Honors Thesis Proposal*. 2-3 credits.

Work on proposal for thesis based a laboratory or field investigation under the guidance of a faculty member. Notes: A total of 6 hours must be taken in NEUR 450 and 451. A minimum of 2 hours and a maximum of 3 hours may be taken in NEUR 450. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Recommended Prerequisite:** NEUR 327; 335; 410 or 411, may be taken as co-requisites. PSYC 300 or equivalent statistics course. Permission of NAC undergraduate committee and thesis director.

**Schedule Type:** Independent Study

**Grading:**

This course is graded on the Satisfactory/No Credit scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 451:** *Honors Thesis*. 3-4 credits.

Thesis based a laboratory or field investigation under the guidance of a faculty member. Notes: A total of 6 hours must be taken in NEUR 450 and 451. A minimum of 3 hours and a maximum of 4 hours may be taken in NEUR 451. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Recommended Prerequisite:** NEUR 450.

**Schedule Type:** Independent Study

**Grading:**

This course is graded on the Satisfactory/No Credit scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 461:** *Special Topics in Neuroscience*. 1-3 credits.

Selected topics reflecting in specialized areas of neuroscience. Notes: May be repeated for credit when topic is different. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May be repeated within the term for a maximum 12 credits.

**Specialized Designation:** Topic Varies

**Recommended Prerequisite:** PSYC 372, 375, or equivalent or permission of instructor.

**Schedule Type:** Lec/Sem #1, Lec/Sem #2, Lec/Sem #3, Lec/Sem #4, Lec/Sem #5, Lec/Sem #6, Lec/Sem #7, Lec/Sem #8, Lec/Sem #9, Lecture, Sem/Lec #10, Sem/Lec #11, Sem/Lec #12, Sem/Lec #13, Sem/Lec #14, Sem/Lec #15, Sem/Lec #16, Sem/Lec #17, Sem/Lec #18

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 473:** *Current Neuroscience Research in Germany*. 3 credits.

This course is part of the "Neuroscience and Technology in Germany" summer study abroad program. Students will visit active research settings, interact with professional scientists, learn about innovative and current research, and tour historically and culturally significant sites. This course emphasizes scientific communication and evaluation of scientific findings in an international research setting. Students will also explore the cultural contexts for discovery by comparing the scientific culture between Europe and North America. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>).

[catalog.gmu.edu/colleges-schools/science/neuroscience-program/](http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/)). Limited to two attempts.

**Mason Core:** Synthesis (<http://catalog.gmu.edu/mason-core/>)

**Recommended Prerequisite:** At least 9 credits in NEUR, BIOL, CHEM, or BENG

**Registration Restrictions:**

**Required Prerequisites:** (BIOL 213<sup>C</sup> or 213<sup>XS</sup>).

<sup>C</sup> Requires minimum grade of C.

<sup>XS</sup> Requires minimum grade of XS.

Students with a class of Freshman or Sophomore may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 480:** *Biological Bases of Alzheimer's Disease*. 3 credits.

A survey of the causes, symptoms, drug treatments, risk factors and preventative measures associated with Alzheimer's disease. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). Limited to three attempts.

**Recommended Prerequisite:** PSYC 375; PSYC 376; PSYC 375 or equivalent or permission of instructor.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Undergraduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

## 500 Level Courses

**NEUR 554:** *Neuroscience of Consciousness*. 3 credits.

This course introduces you to the neuroscience of consciousness—a phenomenon that is so fundamental to our lives. You receive a neuroscience overview into the realms of consciousness and unconsciousness, including the hard problem of consciousness; mental processes and disorders of consciousness; consciousness in sleep, dreaming, and psychedelics; neural basis of consciousness, and neuroscientific theories of consciousness. You also learn about the neuroscience methods applied to unravel the neural signatures of consciousness. The course is designed for everyone who has ever wondered why we are conscious and how our brains create such unique subjective experiences. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 327 or NEUR 335, or the equivalent.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 592: *Special Topics in Neuroscience*. 3 credits.**

Special topics in neuroscience reflecting specialized areas or new subfields that not covered in fixed-content neuroscience courses. Course may be repeated for credit as needed. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May be repeated within the degree for a maximum 9 credits.

**Specialized Designation:** Topic Varies

**Recommended Prerequisite:** NEUR 327, NEUR 335 or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**600 Level Courses****NEUR 600: *Chemistry and the Brain*. 3 credits.**

Fundamentals of general chemistry, atoms, molecules, and reactions, with emphasis on water solutions. Organic compounds and functional groups, biosynthesis and properties, and examples from nervous system. Also includes biopolymers and their roles in cellular and neuronal organization, ionic channels, neurotransmitter receptors, and psychoactive substances. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** Admission to neuroscience PhD program or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 601: *Developmental Neuroscience*. 3 credits.**

Introduction to developmental neurobiology with overview of embryological development of the nervous system. Topics include neural induction, patterning/cell fate specification, and neural circuit assembly together with modern molecular methods for exploring neural development. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** Completion of 60 credits, including PSYC 372 or BIOL 213 or BIOL 303.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 602: *Cellular Neuroscience*. 3 credits.**

Detailed overview of the functioning and interactions of the cellular elements of the central nervous system. Topics include structure and function relationships, the chemical, physical, and electrical basis of neural signaling, local versus long-distance signaling, generation of action potentials, and essentials of synaptic communication. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** Admission to the PhD program in Neuroscience or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 603: *Mammalian Neuroanatomy*. 3 credits.**

Focus on mammalian brain organization and function, emphasizing human neurobiology. Modern experimental and clinical tools explain: gross and microscopic brain organization; functional brain circuits for sensory and motor processing; higher brain organization and function; and development of selected brain areas. The knowledge gained is then used to explain the clinical symptoms occurring after specific brain insults. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** One course in neuroscience (or equivalent biology course), or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 604: *Ethics in Scientific Research.*** 1-3 credits.

Reflects on purpose of scientific research and reviews foundational principles for evaluating ethical issues. Offers skills for survival in scientific research through training in moral reasoning and teaching of responsible conduct. Discusses ethical issues in research, and teaches how to apply critical thinking skills to design, execution, and analysis of experiments. Issues include using animals and humans in research, ethical standards in computer community, and research fraud. Currently accepted guidelines for behavior in data ownership, manuscript preparation, and conduct of persons in authority may be presented and discussed in terms of relevant ethical issues. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree, Undergraduate or Washington Consortium level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 611: *Philosophical Foundation of Neuroscience.*** 3 credits.

This course presents the joint histories of the nature of thought, the philosophy of science, the construct of self, and the nature of mind. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** Any course in neuroscience or permission of the instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 612: *Bioscience, Neurotechnology & Society.*** 3 credits.

Bioscience, Neurotechnology and Society explores the implications of developments in basic and clinical neuroscience on social and ethical issues. This course will survey emerging questions raised by recent biotechnology and neuroscientific discoveries on genetic and environmental factors that influence human behavior, decision-making, personality traits, and mental states. Grades will be based on article

presentation, class participation, and final written report. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 621: *Synaptic Plasticity.*** 3 credits.

Course on activity-dependent modification of functional connectivity in the central nervous system as it relates to development, cognition, and disease. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 602.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 634: *Neural Modeling.*** 3 credits.

Introduces the objectives, philosophy, and methodology of neuronal modeling. Instructs students in the use of some of the more popular neural modeling software packages. Students learn the syntax of several software packages, how to create neurons from subcellular components, and how to create networks by connecting neuron models. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 602 or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**



This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 651: *Molecular Neuropharmacology*. 3 credits.**

Presents key concepts in cellular and molecular neuropharmacology. Provides an in-depth survey of receptor driven cell function, which includes recent topics in cell structure, membrane function, electrical properties of neurons and intracellular signaling. Enables an introduction to research tools and trends in study of neuronal systems via a reading and an analysis of the primary literature. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 602 or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 689: *Topics in Neuroscience*. 3 credits.**

Selected topics in neuroscience reflecting specialized areas or new subfields not covered in fixed-content neuroscience courses. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May be repeated within the term for a maximum 12 credits.

**Specialized Designation:** Topic Varies

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lec/Sem #1, Lec/Sem #2, Lec/Sem #3, Lec/Sem #4, Lec/Sem #5, Lec/Sem #6, Lec/Sem #7, Lec/Sem #8, Lec/Sem #9, Lecture, Sem/Lec #10, Sem/Lec #11, Sem/Lec #12, Sem/Lec #13, Sem/Lec #14, Sem/Lec #15, Sem/Lec #16, Sem/Lec #17, Sem/Lec #18

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

## 700 Level Courses

**NEUR 701: *Neuroscience Laboratory*. 3 credits.**

Advanced training in experimental techniques used in current neuroscience research. Acquaints students with the theoretical basis of multiple techniques and trains the student in the laboratory skills necessary to perform each technique. Includes work in model systems or cell culture, microscopy, histology and data analysis. Notes: This lab requires working with live zebrafish embryos. Offered by Neuroscience

(<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 601 and admission to neuroscience PhD program, or permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 702: *Research Methods*. 3 credits.**

Trains students in research methodologies for life sciences. Covers the four aspects of biological research projects: experimental design, data collection, data analysis and research ethics. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 703: *Laboratory Rotation and Readings*. 3 credits.**

Intensive introduction to a research laboratory in neuroscience. The student will read background material pertinent to the problem under study, learn and practice research methods of the laboratory, and formulate a short final project, which may be a proposal or an actual project, demonstrating some mastery of the techniques and approaches employed. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May be repeated within the term for a maximum 9 credits.

**Specialized Designation:** Topic Varies

**Recommended Prerequisite:** Admission to the PhD program in Neuroscience.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** IND/INT #1, IND/INT #2, IND/INT #3, IND/INT #4, IND/INT #5, IND/INT #6, IND/INT #7, IND/INT #8, IND/INT #9, IND/INT #10, IND/INT #11, IND/INT #12, Independent Study, IND/INT #13, IND/INT #14, IND/INT #15, IND/INT #16, IND/INT #18, IND/INT #19, IND/INT #20

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 709: *Neuroscience Seminars*. 1 credit.**

Special seminar series for first year neuroscience PhD students. Detailed overview of neuroscience research at Mason. Each week, a different

neuroscience laboratory and principal investigator lectures to students. The lecture includes the neuroscience basics necessary to appreciate the laboratory research theme and mission, and a more practical description of the active research program, possibly including a visit to the laboratory. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** Admission to the Neuroscience PhD program.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 710: *Special Topics in Neuroscience*.** 1 credit.

Examines topics in neurosciences, including neurogenetics, neural imaging, and the competing computational and biological approaches to understanding the mind. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Specialized Designation:** Topic Varies

**Recommended Prerequisite:** Admission to the Neuroscience PhD program.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 734: *Computational Neurobiology*.** 3 credits.

Intense review of neurobiology for graduate students interested in studying how nerve cells integrate and transmit signals, and how behavior emerges from integrated actions of populations or circuits of nerve cells. Covers electrical and biochemical properties of single neurons, and electrical and chemical communication between neurons. Emphasizes mathematical descriptions and computational techniques to study and understand neurons and networks of neurons. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 602 and MATH 214, or permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 735: *Computational Neuroscience Systems*.** 3 credits.

Intensive introduction to systems neuroscience from quantitative perspective. Covers computational techniques used to study function of networks of neurons. Uses spike train statistics, neural encoding, and information theory to investigate behaviors that emerge from integrated actions of networks of neurons. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 734 or permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 741: *Introduction to Neuroimaging*.** 3 credits.

Introduction to physics and techniques of magnetic resonance imaging (MRI) and their applications to clinical and basic neuroscience. Students learn about the protocols used in the acquisition of images in both structural and functional contexts, and experimental paradigms applied to the exploration of cognition, learning, and development. Students gain experience with creating an experimental design for a study and understanding practical logistics involved in imaging, such as MRI safety and subject screening. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 602 or 603, or permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 742: *Cognitive Neuroscience*.** 3 credits.

Introduces cognitive neuroscience topics, including aspects of cognitive science covering an array of perceptual, sensory, cognitive, and affective processes. Incorporates studies of brain lesions, brain imaging, and animal and computational models. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 602 or NEUR 603 or permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 751:** *Applied Dynamics in Neuroscience*. 3 credits.

Covers recent developments in the application of applied dynamics to neuroscience. Emphasizes dynamical system approach to the understanding of neural processes. Topics include neural synchrony and control; formation of waves; oscillations; patterns within neural ensembles; network topology and dynamics of neurons; and decoding and encoding of neural signals. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** CSI 734, PSYC 531, or permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 752:** *Modern Instrumentation in Neuroscience*. 3 credits.

Builds on knowledge of how and what things are measured and controlled in modern bioinstrumentation. Topics include fundamental instrumentation; principles of sensing; basic electronics; computer interfaces and data acquisition; signals in biological systems; biopotential and ionic concentration measurements; and optical techniques. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** NEUR 602 or 734, or permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

## 800 Level Courses

**NEUR 851:** *Advanced Computation and Brain Dynamics*. 3 credits.

In-depth study of open issues and the state-of-the-art in advanced brain dynamics. Using mathematical and physical models, the course covers the neurodynamical aspects of neural nets, receptive fields, ion-channels, intercortical interactions, phase-locking, synchronicity, and the possible nontrivial role of quantum effects. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May not be repeated for credit.

**Recommended Prerequisite:** CSI 734, PSYC 531.

**Registration Restrictions:**

Enrollment is limited to Graduate level students.

**Schedule Type:** Lecture

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

## 900 Level Courses

**NEUR 996:** *Doctoral Reading and Research*. 3,6 credits.

Reading and research on specific topic in neuroscience under direction of faculty member. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May be repeated within the degree for a maximum 12 credits.

**Recommended Prerequisite:** Admission into the NEUR doctoral program and permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate level students.

**Schedule Type:** Independent Study

**Grading:**

This course is graded on the Graduate Regular scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 998:** *Dissertation Proposal*. 1-6 credits.

Covers development of a research proposal under guidance of dissertation director and doctoral committee. Proposal forms the basis for the doctoral dissertation. Notes: No more than a total of 24 credits in NEUR 998 and 999 may be applied toward satisfying doctoral degree requirements. Out of the 24, no more than 12 credits of NEUR 998 may be applied. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May be repeated within the degree.

**Recommended Prerequisite:** Admission to the Neuroscience Ph.D. program.

**Registration Restrictions:**

Enrollment is limited to Graduate level students.

**Schedule Type:** Dissertation

**Grading:**

This course is graded on the Satisfactory/No Credit scale. (<http://catalog.gmu.edu/policies/academic/grading/>)

**NEUR 999:** *Doctoral Dissertation*. 1-12 credits.

Doctoral research performed under the direction of the dissertation director. Notes: No more than a total of 24 credits in NEUR 998 and 999 may be applied toward satisfying doctoral degree requirements. Students must email [mhayes5@gmu.edu](mailto:mhayes5@gmu.edu) for permission and CRN to register. Offered by Neuroscience (<http://catalog.gmu.edu/colleges-schools/science/neuroscience-program/>). May be repeated within the degree.

**Recommended Prerequisite:** Advancement to candidacy in the Neuroscience Ph.D. program. Students must email [mhayes5@gmu.edu](mailto:mhayes5@gmu.edu) for permission and CRN to register.

**Registration Restrictions:**



Enrollment limited to students with a class of Advanced to Candidacy.

Enrollment is limited to Graduate level students.

**Schedule Type:** Dissertation

**Grading:**

This course is graded on the Satisfactory/No Credit scale. (<http://catalog.gmu.edu/policies/academic/grading/>)