

# NEUROSCIENCE

The study of neuroscience is one of the most rapidly growing areas of life sciences, reflecting the importance of the fundamental and applied interest in how the nervous system is coordinated and regulated. The field of neuroscience examines the physiology, anatomy, pharmacology, development, growth, maintenance, and evolution of nervous system processes.

Students working toward completion of this degree will be able to concentrate in one of two tracks (Molecular/ Cellular Neuroscience or Integrative/Behavioral Neuroscience) or take courses that provide a blended combination of these complementary areas of neuroscience. The major provides both content and hands-on experience in various areas of neuroscience, and is an excellent choice for students with interests in pursuing neuroscience-related graduate programs, health careers (for example, students with post-graduate aspirations for attending medical, PA, dental, veterinary, or nursing school), or careers in private industry. Students will emerge from the major with the ability to think across disciplines, to formulate questions and seek answers, to interpret data and draw conclusions, and to effectively communicate the outcome of these processes to a larger audience. This suite of skills makes neuroscience majors eligible for a variety of career opportunities both within and outside the discipline of neuroscience.

## Other Information

All coursework taken for the neuroscience major must be completed with a grade of "C-" or better.

### Note for Double Majors in Neuroscience and Biology:

Beyond the neuroscience fundamentals courses, students cannot use a 3000/4000 level course to count toward both majors.

**Note for Double Majors in Neuroscience and Psychology:** Beyond the neuroscience fundamentals courses, students cannot use a 3000/4000 level course to count toward both majors. Students may overlap 3000/4000 level PSYC courses between the Psychology Neuroscience & Behavior concentration and the Neuroscience major.

### Note for Students Completing a Neuroscience Major and Psychology Minor:

No psychology coursework will be allowed to count toward both programs.

### Note for Students Completing a Neuroscience Major and Biology Minor:

No 3000/4000 level course(s) may count toward both programs.

## Additional Laboratory Experiences

Students wishing additional laboratory experiences can enroll in Experiential Study in Neuroscience (NEUR 4960) or seek independent research opportunities with faculty conducting neuroscience research at UNO, UNMC, Creighton University, or Boys Town National Research Hospital.

## Student Group

Nu Rho Psi – National Honor Society in Neuroscience  
<http://nurhopsi.org>

## Contact

Neuroscience Director, Dr. Suzanne Sollars: 402.554.3981  
[ssollars@unomaha.edu](mailto:ssollars@unomaha.edu)

Website (<http://www.unomaha.edu/college-of-arts-and-sciences/neuroscience/>)

## Degrees Offered

- Neuroscience, Bachelor of Science (<http://catalog.unomaha.edu/undergraduate/college-arts-sciences/neuroscience/neuroscience-bs/>)

## Writing in the Discipline

All students are required to take a writing in the discipline course within their major. For the Neuroscience major this is fulfilled with PSYC 3140.

Neuroscience is a rapidly growing field, with a faster than average projected jobs growth of 8% in the next ten years (U.S. Department of Labor). Students in our program have been highly successful in admissions to graduate and medical schools, and obtaining employment in neuroscience-related fields. Alumni from our Neuroscience Program have outstanding jobs as physicians, researchers, nurses, physician assistants, teachers, dentists, medical industry experts, technicians, and CEO's of neuroscience-related businesses.

Within your Neuroscience Program, you will gain knowledge in all aspects of how the brain and body function, with tracks in cellular and molecular neuroscience, and integrative behavioral neuroscience. Built within the curriculum are opportunities for hands-on experimental experiences. We currently have faculty with expertise in development, endocrinology, gerontology, genetics, sensory systems, behavior, and biomechanics. Your curriculum will focus on understanding and engaging with new and innovative research within neuroscience, science writing, data analysis, and applications of the latest concepts in the field.

Career Opportunities:

- Research & Development
- Hospitals
- Universities/Colleges
- Laboratories
- Government Agencies
- Health Care
- Pharmaceutical & Other Science Industries
- Laboratory Software and Equipment
- Science Writing
- Consultancies
- Medical Illustrators

### NEUR 1520 INTRODUCTION TO NEUROSCIENCE I (3 credits)

The nervous system is intricate, complex, and is the subject of one of the most exciting fields in the life sciences. This course is part 1 of a 2-semester sequence designed for neuroscience majors or students who are contemplating neuroscience as a major. This course will focus on understanding how the nervous system interacts at the cellular and molecular levels: anatomy and function of neurons, communication within and between neurons, and how neurons interact to perceive and process sensory information.

**Prerequisite(s)/Corequisite(s):** High school biology and chemistry. Not open to non-degree graduate students.

### NEUR 1540 INTRODUCTION TO NEUROSCIENCE II (3 credits)

The nervous system is intricate, complex, and is the subject of one of the most exciting fields in the life sciences. This course is part 2 of a 2-semester sequence designed for neuroscience majors or students who are contemplating neuroscience as a major. This course will focus on understanding how the nervous system interacts at the organismal, behavioral and cognitive levels: how the nervous system develops, how the motor system, hormones, and physiology influences behavior, and how cognition and systems neuroscience leads to understanding of the mind.

**Prerequisite(s)/Corequisite(s):** NEUR 1520 or permission of instructor. Not open to non-degree graduate students.

**NEUR 3500 BIOLOGICAL PRINCIPLES OF AGING (3 credits)**

The Biological Bases of Aging Course provides a survey of the primary topics in the biology of aging field for undergraduate students. This a required course for the Gerontology major. By the end of the course, students will understand major theories, biological methods, and seminal research studies in the biology of aging field. Furthermore, students will learn how to critically analyze and interpret primary research about biological aging. This course provides preparation for students considering graduate school in gerontology or biology, geriatric nursing and social work, geriatric medicine, neuroscience, psychology, and exercise science. (Cross-listed with GERO 3500, BIOL 3500)

**Prerequisite(s)/Corequisite(s):** Sophomore/Junior/Senior Standing. Not open to non-degree graduate students.

**NEUR 4000 SYSTEMS NEUROSCIENCE (3 credits)**

This is an advanced course for the Neuroscience major designed to provide a solid understanding of the peripheral and central connections that make the systems of the body function. Data and theories of brain-behavior relationships from current research in neuroscience will be discussed. (Cross-listed with NEUR 8006).

**Prerequisite(s)/Corequisite(s):** NEUR 1520 and NEUR 1540, BIOL 1450, BIOL 1750; or permission. Not open to non-degree graduate students.

**NEUR 4050 ADVANCED BIOLOGY OF AGING (3 credits)**

This course covers biological aging topics at an advanced level, and is designed for undergraduate and graduate students who have some prior knowledge about biology or aging. The course will be interdisciplinary in nature and focus on topics relevant to gerontology, biology, psychology, and exercise science. Students will learn how to think critically about primary research in the biology of aging. Furthermore, they will apply their knowledge of the biology of aging field by creating a handbook of healthy aging for older adults. (Cross-listed with GERO 4050, GERO 8056).

**NEUR 4200 ADVANCED NEUROSCIENCE LABORATORY (3 credits)**

This course is designed as a capstone laboratory course for Neuroscience majors. The course will provide students with hands-on experience in collecting data in diverse areas of neuroscience, analyzing these data, interpreting the data, and preparing written and verbal presentations of the data.

**Prerequisite(s)/Corequisite(s):** NEUR 1520, NEUR 1540, PSYC 3130, PSYC 3140, and BIOL 1450. Not open to non-degree graduate students.

**NEUR 4290 NEUROETHOLOGY (3 credits)**

In the field of Neuroethology a major goal is to understand the neural bases of animal behaviors in a natural context. In this course students will investigate how behaviors are generated and modulated by the nervous system in organisms ranging from insects to mammals. We will explore the neural mechanisms underlying a variety of animal behaviors as they interact with their natural environment ranging from sensory perception of the world (e.g. echolocation, electrolocation), to locomotor movements (e.g. flying, swimming), to more complex behaviors (e.g. learning, memory). (Cross-listed with BIOL 4290, BIOL 8296, PSYC 8296).

**Prerequisite(s)/Corequisite(s):** NEUR 1520, NEUR 1540 and BIOL 1750; or by permission of instructor. Not open to non-degree graduate students.

**NEUR 4330 SOCIAL NEUROSCIENCE (3 credits)**

This course will evaluate the biological substrates of sociality and social behavior, and explore the impact of social environments on brain function and development. Students in the course will explore the molecular, cellular, neurotransmitter, and endocrine influences on social behavior, including affiliative care, aggression, social bonding, altruism, and social cognition. (Cross-listed with PSYC 8336)

**Prerequisite(s)/Corequisite(s):** NEUR 1520 or NEUR 1540, and BIOL 1450, or permission of Instructor. Not open to non-degree graduate students.

**NEUR 4650 NEUROMECHANICS OF HUMAN MOVEMENT (3 credits)**

A study of basic principles of neural process as they relate to human voluntary movement. Applications of neural and mechanical principles through observations and assessment of movement, from learning to performance, as well as development. (Cross-listed with BMCH 4650).

**Prerequisite(s)/Corequisite(s):** NEUR 1540 or permission of instructor

**NEUR 4870 MOLECULAR AND CELLULAR NEUROBIOLOGY (3 credits)**

This course presents foundational topics in molecular and cellular neurobiology in the context of how the nervous system is functionally organized. Topics include: nervous system cell types and their subcellular organization; electrical properties of neurons and glia; energy metabolism and biochemistry of the brain; intra- and intercellular neuronal signaling; the regulation of gene expression in neuronal cells; synaptic plasticity; and how these are altered in disease. (Cross-listed with BIOL 4870, BIOL 8876, NEUR 8876).

**Prerequisite(s)/Corequisite(s):** NEUR 1500, or both NEUR 1520 and NEUR 1540, or BIOL 3020, or permission of instructor.

**NEUR 4890 GENES, BRAIN, AND BEHAVIOR (3 credits)**

This course will evaluate the complex interaction between an organism's genome and neural activity pattern in the nervous system as related to behavior. In this course students will explore how changes in gene expression (allelic variants, epigenetics, differential regulation) and gene networks within neural tissue can reciprocally influence behaviors such as communication, foraging, reproduction, and cognition. (Cross-listed with BIOL 4890, BIOL 8896, PSYC 8896)

**Prerequisite(s)/Corequisite(s):** NEUR 1520, NEUR 1540, and BIOL 2140. Or by permission of instructor. Not open to non-degree graduate students.

**NEUR 4910 SPECIAL TOPICS IN NEUROSCIENCE - BLOCK 1 (3 credits)**

Fulfills Neuroscience BLOCK 1 or Neuroscience Elective requirement. A study of designated special topic in neuroscience. Students may repeat this class as long as the specific topic is not duplicated.

**Prerequisite(s)/Corequisite(s):** NEUR 1520, junior-senior status (sophomore status by permission), or instructor permission. Not open to non-degree graduate students.

**NEUR 4920 SPECIAL TOPICS IN NEUROSCIENCE - BLOCK 2 (3 credits)**

This course fulfills Neuroscience BLOCK 2 or Neuroscience Elective requirements. A study of designated special topic in neuroscience. Students may repeat this class as long as the specific topic is not duplicated.

**Prerequisite(s)/Corequisite(s):** NEUR 1520 or NEUR 1540, junior-senior status (sophomore status by permission), or instructor permission. Not open to non-degree graduate students.

**NEUR 4960 EXPERIENTIAL STUDY IN NEUROSCIENCE (1-3 credits)**

Focused research projects, data analysis, and/or directed readings with faculty supervision. Oral and written reports based on empirical research are expected outcomes.

**Prerequisite(s)/Corequisite(s):** NEUR 1520; PSYC 3130. PSYC 3140 recommended. Instructor permission required.