NEUROSCIENCE

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Neuroscience is the interdisciplinary study of the nervous system and how it gives rise to perception, cognition, emotion, and behavior. Integrating perspectives from biology, psychology, chemistry, computer science, mathematics, physics, philosophy, and other disciplines, neuroscience seeks to understand nervous systems across multiple levels of organization, from molecules and cells to neural circuits, cognition, and behavior. Research in neuroscience spans basic investigations of the fundamental mechanisms of nervous system function to translational and clinical studies that advance our understanding of brain, behavior, health, and disease.

Overview of the Major

The neuroscience major provides students with a rigorous, hands-on exploration of brain function through laboratory investigation, quantitative analysis, and scientific inquiry. Students develop the knowledge and analytical skills needed to investigate complex questions about the brain and behavior while integrating perspectives from multiple disciplines. Opportunities for interdisciplinary learning, faculty-mentored research, internships, and engagement with the broader neuroscience community prepare students for careers in research, healthcare, biotechnology, education, and graduate study.

Intended Learning Outcomes for the Major

Recommendations for Graduate Study

Graduate programs in neuroscience vary widely in their admission requirements, so students intending to attend graduate school in neuroscience are advised to determine the requirements of the specific programs they are considering. In general, however, a number of neuroscience graduate programs recommend chemistry, genetics, and statistics; many cognitive neuroscience programs emphasize coursework in psychology.

Requirements

Requirements for the Neuroscience Major

Code	Title	Credits
NEURO 125	Introduction to Neuroscience	1.00
NEURO 210	Cell Biology of the Neuron	1.00
NEURO 251	Systems and Circuits	1.00
NEURO 252	Behavioral and Cognitive Neuroscience	1.00
NEURO 300	Potentiating for the Long -Term	0.25
NEURO 391	Special Topics Seminar	1.00
Elective Courses (from approved list on Courses tab)		3.00
Total Credits		**8.25**

Approved Electives:

BIO 233 Intermediate Genetics

BIO 247 Animal Physiology

BIO 364 Molecular Biology

BIO 278 Developmental Biology

BIO 386 Animal Behavior

BIO 387 Neuroethology

BIO 391 Selected Topics (when topic is "Developmental Neurobiology or Computational Neuroscience")

CHEM 379 Biochemistry I

CSCI 121 Introduction to Computer Science

CSCI 379 Foundations of Artificial Intelligence

MATH 220 Elementary Linear Algebra

MATH 230 Differential Equations I

PHIL 231 Philosophy of Mind

PHIL 244 Philosophy of Science

PHIL 251 Science, Ethics, and Religion

PHYS 246 Electronics

PSYCH 222 Psychology of Hearing

PSYCH 235 Sensation and Perception

PSYCH 236 Conditioning and Learning

PSYCH 237 Cognitive Psychology

PSYCH 239 Drugs, the Brain and Behavior

PSYCH 336 Neuroscience of Addiction

PSYCH 337 Neurobiology of Learning and Memory

PSYCH 338 Neurobiology of Psychopathology

PSYCH 339 Cognitive Neuroscience

PSYCH 340 Frontiers in Aging: Cells to Society

PSYCH 393 Advanced Research Collaborations (ARC) (when topic is Neuroscience-based and in consultation with neuroscience program director)

SDS 164 Data Science 1

SDS 172 Statistics 1

SDS 264 Data Science 2

SDS 272 Statistics 2

SDS 333 High-Dimensional Data Analysis

SDS 341 Algorithms for Decision Making

Note: some approved electives require prerequisites.

**By completing this major, the student also satisfies the OLE Core Writing in the Major requirement.*

Courses

NEURO 125: *Integrative Introduction to Neuroscience*
Neuroscience is an interdisciplinary field that explores the nervous system from molecules and cells to circuits, behavior, and social interaction. Drawing on biology, psychology, chemistry, physics, computer science, engineering, mathematics, and philosophy, this course introduces foundational concepts, methods, and tools used to study the brain. Students examine major open questions, explore how neuroscience benefits society, and learn how the components of the neuroscience major integrate into a coherent program of study. Offered annually during fall and spring semester. Open only to first year students.

NEURO 210: *Cell Biology of the Neuron*
Students explore the cellular and molecular foundations of nervous system function, integrating principles of cell biology with neuroscience. Topics include neuronal structure and diversity, membrane biophysics and electrical signaling, synaptic transmission, sensory transduction, and neural coding. Laboratory exercises emphasize electrophysiology techniques and computational modeling to investigate neuronal function. Students develop skills in experimental design, data analysis, and scientific communication through hands-on research experiences. Offered annually during fall semester.
Prerequisite: NEURO 125 or permission of instructor.

NEURO 239: *Cellular and Molecular Neuroscience*
Neuroscience is one of the fastest-growing fields in the sciences, with research interests ranging from molecular genetics to whole animal behavior. Topics include membrane biophysics, synaptic transmission and plasticity, intracellular signaling, sensory transduction, motor control systems, and development. Students attend lectures plus one three-hour laboratory per week. Offered annually in the spring semester.
Prerequisite: BIO 143 or BIO 227 or PSYCH 238.

NEURO 251: *Systems and Circuits*
Students explore how neural circuits process information, guide behavior, and adapt across development and experience. Building on foundational knowledge of individual neurons, this course examines how interconnected neurons form functional networks in sensory, motor, and integrative systems. Students investigate circuit motifs, neural coding strategies, and sensorimotor transformations through experimental and theoretical approaches. Emphasis is placed on understanding how structure gives rise to function at the circuit level, with applications to real biological systems. Offered annually during spring semester.
Prerequisite: NEURO 210.

NEURO 252: *Behavioral and Cognitive Neuroscience*
This course challenges the traditional dichotomy between "bottom-up" behavioral and "top-down" cognitive processes by examining how complex behaviors emerge from integrated neural networks spanning subcortical to cortical regions. Students explore how human and animal research complement each other in revealing the continuous, omnidirectional and blended nature of neural processing from receptor to cortex. Rather than treating behavioral and cognitive neuroscience as separate domains, this course demonstrates their inherent synergistic contributions to understanding brain function. May be taken concurrently with NEURO 251. Offered annually during spring semester.
Prerequisite: NEURO 210.

NEURO 294: *Academic Internship*

NEURO 298: *Independent Study*
Independent work is guided by a faculty member. Students need to have the necessary background, including appropriate coursework, before an independent project is approved. A student may not substitute an IS/IR course for a course regularly offered in a department or program. IS/IR culminates in at least one product (a paper, laboratory report, work of art, etc.). Normally, the student and faculty instructor are expected to meet at least once a week. See catalog for more information under registration and course enrollment.
Prerequisites: at least second-year standing; at least 2 relevant courses for 298 (IS); approval from the faculty instructor, the academic advisor, and the department chair or program director.

NEURO 300: *Potentiating for the Long-Term (0.25)*
This student-driven seminar offers hands-on experience and vocational discernment. Students who are currently participating in or have recently participated in approved research, internships, or clinical or other neuroscience-related experiences share their reflections while cultivating their oral presentation skills. Students consider and articulate the role of their neuroscience coursework in their pursuit of a meaningful, productive, and satisfying professional life after St. Olaf. Pass/No Pass only. Offered annually.
Prerequisite: Junior or senior standing and completion of either NEURO 251 or NEURO 252.

NEURO 391: *Special Topics in Neuroscience*
Students explore specific topics in neuroscience based on student interest and available teaching staff. Class work includes comprehensive review of literature on the specific topic. Class meetings present topics in discussion format. May be repeated if topic is different. Offered annually.
Prerequisite: NEURO 251 or NEURO 252, as determined by instructor.

NEURO 394: *Academic Internship*

NEURO 396: *Directed Undergraduate Research*
This course provides a comprehensive research opportunity, including an introduction to relevant background material, technical instruction, identification of a meaningful project, and data collection. The topic is determined by the faculty member in charge of the course and may relate to their research interests. Offered based on department decision. May be offered as a 1.00 credit course or .50 credit course.
Prerequisite: determined by individual instructor.

NEURO 398: *Independent Research*
Independent work is guided by a faculty member. Students need to have the necessary background, including appropriate coursework, before an independent project is approved. A student may not substitute an IS/IR course for a course regularly offered in a department or program. IS/IR culminates in at least one product (a paper, laboratory report, work of art, etc.). Normally, the student and faculty instructor are expected to meet at least once a week. See catalog for more information under registration and course enrollment.
Prerequisites: at least second-year standing; at least 5 relevant courses for 398 (IR); approval from the faculty instructor, the academic advisor, and the department chair or program director.

Approved Electives:

Code	Title	Credits
BIO 233	Intermediate Genetics	1.00
BIO 247	Animal Physiology	1.00
BIO 278	Developmental Biology	1.00
BIO 364	Molecular Biology	1.00
BIO 386	Animal Behavior	1.00
BIO 387	Neuroethology	1.00
BIO 391	Selected Topics (when topic is "Developmental Neurobiology" or "Computational Neuroscience")	1.00
CHEM 379	Biochemistry I	1.00
CSCI 121	Introduction to Computer Science	1.00
CSCI 379	Foundations of Artificial Intelligence	1.00
MATH 220	Elementary Linear Algebra	1.00
MATH 230	Differential Equations I	1.00
PHIL 231	Philosophy of Mind	1.00
PHIL 244	Philosophy of Science	1.00
PHIL 251	Science, Ethics, and Religion	1.00
PHYS 246	Electronics	1.00
PSYCH 222	Psychology of Hearing	1.00
PSYCH 235	Sensation and Perception	1.00
PSYCH 236	Conditioning and Learning	1.00
PSYCH 237	Cognitive Psychology	1.00
PSYCH 239	Drugs, the Brain and Behavior	1.00
PSYCH 336	Neuroscience of Addiction	1.00
PSYCH 337	Neurobiology of Learning and Memory	1.00
PSYCH 338	Neurobiology of Psychopathology	1.00
PSYCH 339	Cognitive Neuroscience	1.00
PSYCH 340	Frontiers in Aging: Cells to Society	1.00
PSYCH 393	Advanced Research Collaborations (when topic is Neuroscience-based and in consultation with neuroscience program director)	1.00
SDS 164	Data Science 1	1.00
SDS 172	Statistics 1	1.00
SDS 264	Data Science 2	1.00
SDS 272	Statistics 2	1.00
SDS 333	High-Dimensional Data Analysis	1.00
SDS 341	Algorithms for Decision Making	1.00
Note: some approved electives require prerequisites.		

Plan of Study
Neuroscience Major - Plan of Study

This is a sample plan that meets the prescribed requirements for the Neuroscience major at St. Olaf. This tool is meant as a guide and does not replace working closely with the student's academic advisor.

Course	Title	Credits
First Year		
Fall Semester		
FYS 120 or WRIT 120	First-Year Seminar (or Conversation Program) or Writing and Rhetoric	1.00
World Language or OLE Core Course (depending on placement)		1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
	Credits	**4**
January Term		
Elective/OLE Core Course		1.00
	Credits	**1**
Spring Semester		
NEURO 125	Integrative Introduction to Neuroscience	1.00
WRIT 120 or FYS 120	Writing and Rhetoric (or Conversation Program) or First-Year Seminar	1.00
World Language or OLE Core Course (depending on placement)		1.00
Elective/OLE Core Course		1.00
	Credits	**4**
Sophomore Year		
Fall Semester		
NEURO 210	Cell Biology of the Neuron	1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
	Credits	**4**
January Term		
Elective/OLE Core Course		1.00
	Credits	**1**
Spring Semester		
NEURO 251	Systems and Circuits	1.00
Elective Course (from Approved Courses list)		1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
	Credits	**4**
Junior Year		
Fall Semester		
NEURO 300	Potentiating for the Long-Term (0.25)	0.25
Elective Course (from Approved Courses list)		1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		0.25
Elective/OLE Core Course		0.50
	Credits	**4**

January Term		
Elective/OLE Core Course		1.00
	Credits	**1**
Spring Semester		
NEURO 252	Behavioral and Cognitive Neuroscience	1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
	Credits	**4**
Senior Year		
Fall Semester		
Elective Course (from Approved Courses list)		1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
	Credits	**4**
Spring Semester		
NEURO 391	Special Topics in Neuroscience	1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
Elective/OLE Core Course		1.00
	Credits	**4**
	Total Credits	**35**

Students must successfully complete the equivalent of 35 or more St. Olaf credits, through a combination of full-credit and fractional-credit courses, one major, and all other degree requirements to earn the Bachelor of Arts degree**.**

Visit the Neuroscience department webpage for more information.

Faculty

Program Director, 2026-2027
Norman Lee
Associate Professor of Biology
systems neuroscience; sensory neuroscience; neuroethology; auditory neuroscience

Kevin M. Crisp
Professor of Biology; Health Professions Committee Chair
electrophysiology; computational neuroscience; microglia

Jay A. Demas
Associate Professor of Physics and Biology
neuronal biophysics; sensory circuits; retinal neurophysiology

Shelly D. Dickinson
Associate Professor of Psychology
behavioral neuroscience; addiction; conditioning and learning; psychopharmacology

Jeremy L. Loebach
Associate Professor of Psychology
cognitive neuroscience; speech and hearing sciences; psycholinguistics

Gary M. Muir
Professor of Psychology; Grace A. Whittier Endowed Chair of Science; Associate Dean of Natural Sciences and Mathematics
behavioral neuroscience; cognitive neuroscience; neurobiology of spatial navigation; neurobiology of learning and memory

Jessica R. Petok
Professor of Psychology
aging; adult development; cognition; memory and learning

Lindsay Sailer
Assistant Professor of Biology
behavioral neuroendocrinology; developmental neuroscience; stress neurobiology; social neuroscience