

# NEUROSCIENCE

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Department Office: Biology Department, Hixson-Lied Science Building, Room 422

The Neuroscience Program, housed within the Biology department, is a multidisciplinary program designed to provide an integrated, comprehensive, and investigatory learning experience that imparts a broad and strong understanding of the fundamental concepts and research principles that form the neurosciences.

Neuroscience is the study of 1) how the nervous system controls and responds to bodily functions and directs behavior; 2) how nervous system structure and function are determined by genes and the environment; and 3) how the brain serves as the foundation of the mind, awareness and thought. The Bachelor of Science with a major in Neuroscience is intended for students interested in pursuing careers in a variety of health professions and graduate programs, scientific research in academia and industry, or related life science careers.

The mission of the Neuroscience major is to deliver a comprehensive curriculum in neuroscience providing students with thorough understanding of neuroscience principles and modern application. This program will provide technical and intellectual skills for neuroscience and neuroscience related careers. Our role is also to work with colleagues across disciplines in the College of Arts and Sciences and Health and Professional Schools to develop students who understand what science contributes and what methodologies it necessitates. Our program will explain and reinforce how neuroscience contributes to our understanding of human behavior and will join with the Magis Core curriculum at Creighton to shape well-informed students/citizens.

## Participating Departments and Faculty

Various faculty from the following departments participate in our multidisciplinary major: Biology, Psychology, Physics, Computer Science, Mathematics, Chemistry, Philosophy, Theology, and Pharmacology and Neuroscience.

## B.S., Major in Neuroscience

### Requirements for Admission to the Neuroscience Major

- Admission to the B.S., Major in Neuroscience program requires sophomore standing, completion of General Biology lecture and laboratory series, General Chemistry lecture and laboratory series, and Introduction to Psychology courses, with a grade of "C" or better in those pre-requisites.

### Prerequisite Courses

Code	Title	Credits
BIO 201	General Biology: Organismal and Population	3
BIO 202	General Biology: Cellular and Molecular	3
BIO 205	General Biology: Organismal and Population Laboratory	1
BIO 206	General Biology: Cellular and Molecular Laboratory	1
PSY 201	Introductory Psychology	3
CHM 203	General Chemistry I	3
CHM 204	General Chemistry I Laboratory	1
CHM 205 or CHM 285	General Chemistry II Advanced General Chemistry II	3

CHM 206 or CHM 286	General Chemistry II Laboratory Chemical and Statistical Analysis Laboratory	1
<b>Total Credits</b>		<b>19</b>

## Support Courses

Code	Title	Credits
<b>Chemistry support</b>		<b>4</b>
CHM 321	Organic Chemistry I	
CHM 322	Organic Chemistry I Laboratory	
<b>Physics support</b>		<b>6</b>
Choose 1 of the Physics course sequences below:		
Option 1 (recommended for pre-medical, pre-health and pre-graduate program students)		
PHY 201	General Physics for the Life Sciences	
PHY 205	General Physics Laboratory I	
PHY 202	General Physics for the Life Sciences II	
PHY 206	General Physics Laboratory II	
Option 2 (recommended for students interested in electives requiring calculus-based physics)		
PHY 213	General Physics for the Physical Sciences I	
PHY 205	General Physics Laboratory I	
PHY 214	General Physics for the Physical Sciences II	
PHY 206	General Physics Laboratory II	
Option 3 (given approval from the Physics Department)		
PHY 221	Advanced General Physics I: Modeling the Physical World	
PHY 223	Project Physics Laboratory I	
PHY 222	Advanced General Physics II: Modeling the Physical World	
PHY 224	Project Physics Laboratory II	
<b>Total Credits</b>		<b>10</b>

## B.S., Neuroscience (40 Credits)

**Neuroscience Core Requirements (Maximum of 33 Credits, Depending on Course Selections. Completion of Required Courses will fulfill Designated Courses within the Magis Core.)**

Code	Title	Credits
<b>Required Courses:</b>		
PSY 437	Behavioral Neuroscience	3
BIO 462	Neurobiology	3
BIO 463	Neurobiology Laboratory	1
PHR 350	Introduction to Neuropharmacology	3
PHL 424	Philosophy of Mind	3
NES 510	Neurophysiology Lab	2
NES 592	Neuroscience Senior Seminar	1
Select one of the following:		3
BIO 467	Developmental Biology	
NES/BIO 464	Neurobiology of Disease	
PHL 404	Bioethics and Society	
PHL 425	Sciences, Ethics & Society	
PHL 457	Biomedical Ethics: Philosophical and Theological Approaches	
Select one of the following:		3

BIO 449	Physiology	
PHA 404	Human Physiology (Follows Pharmacy School Schedule)	
Select one of the following:		3
BIO 362	Cell Structure and Function	
CHM 371	Biochemistry of Metabolism	
Select one of the following:		3
BIO 311	Biostatistics	
MTH 360	Elementary Probability and Statistics	
MTH 361	Probability and Statistics in the Health Sciences	
Electives		12
<b>Total Credits</b>		<b>40</b>

Electives: 4 courses

Code	Title	Credits
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A minimum of 4 additional courses from any of the groups listed below may be selected. Electives may also fulfill Magis Core requirements.

#### Cellular and Organismal Neuroscience

NES 464	Neurobiology of Disease	
NES 466	Pharmacology of Drugs and Abuse	
NES 500	Introduction to Clinical Neuroscience	
BIO 371	Animal Behavior	
BIO 372	Animal Behavior Laboratory	
BIO 467	Developmental Biology	
BIO 567	Current Topics in Neuroscience	

#### Behavioral Neuroscience

PSY 351	Psychopathology	
PSY 361	Neuropsychology	
PSY 431	Cognitive Psychology	
or PSY 441	Cognitive Neuroscience	
PSY 434	Principles of Behavior	
PSY 436	Sensation and Perception	

#### Physical Neuroscience

PHY 301	Modern Physics	
PHY 302	Modern Physics Laboratory	
PHY 303	Electronics Laboratory	
PHY 351	Physics in Medicine	
PHY 353	Introduction to Biological Physics	
PHY 565	Radiation Biophysics	
PHY 566	Physics of Medical Imaging I	
PHY 567	Physics of Medical Imaging II	

#### Computational Neuroscience

BIO 501	Bioinformatics	
MTH 429	Advanced Linear Algebra	
MTH 445	Advanced Differential Equations	
MTH 448	Mathematics in Medicine and Life Sciences II	
CSC 321	Data Structures	
CSC 421	Algorithm Design and Analysis	
CSC 550	Introduction To Artificial Intelligence	
CSC 590	Special Topics	

#### Philosophical Neuroscience

PHL 321	Epistemology	
PHL 333	Philosophy Of The Human Sciences	
PHL 334	Philosophy Of The Natural Sciences	
PHL 342	Metaphysics	

#### Theological Neuroscience

THL 304	Ultimate Questions: Where Theology Meets Neuroscience	
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## Service Learning

### Independent Study Service Learning Course (Optional - Instructor Consent)

This course is designed to allow students to receive credit for educational outreach. The course may be taken up to four times. Outreach of 0 credits may be taken if the student has reached 18hrs of course credit. Students will use knowledge acquired in Neuroscience major specific course work and develop content to support Neuroscience education outreach and high school student tutoring in preparation for the Brain Bee. The Brain Bee is a high school level, Neuroscience competition that is held at Creighton annually. The winner of this competition qualifies for the national competition. The Brain Bee is delivered by Creighton's Chapter of Nu Rho Psi, the Neuroscience Honor Society under the direction of Dr. Gwen King.

Code	Title	Credits
<b>Neuroscience Outreach</b>		
NES 498	Neuroscience in the Community	0-3

## Research COURSES

### Introduction to Research Design and Methods (Optional - Instructor Consent)

This course allows students to receive credit for research activities. The course may be taken one time. Research of 0 credits may be taken if the student has reached 18hrs of course credit.

Code	Title	Credits
NES 297	Directed Research	0-3

### Neuroscience Research Designation (Optional - Instructor Consent)

An equivalent of **two semesters** worth of directed research credit is required (NES 397, NES 497). Research of 0 credits may be taken if the student has reached 18hrs of course credit. The research designation will be met by submission of a written abstract and evaluation of a presentation (oral and/or written) of the research project at a local, regional, and/or national meetings for each semester of NES 397 or NES 497.

Code	Title	Credits
NES 397	Directed Independent Research (Extramural)	0-3
NES 497	Directed Independent Research (Intramural)	0-3