Neuroscience

Nicole Dudukovic, Director
neuro@uoregon.edu
541-346-7225

Neuroscience is the interdisciplinary study of neural function, development, and behavior. The University of Oregon offers an undergraduate major in Neuroscience. The graduate training program in neuroscience is centered in the Institute of Neuroscience (ion.uoregon.edu (https://ion.uoregon.edu)). Affiliated faculty members in the undergraduate major as well as participating faculty members in the graduate training program are drawn from the Departments of Biology, Human Physiology, and Psychology, along with the Phil and Penny Knight Campus for Accelerating Scientific Impact.

Graduate Studies

The Interdepartmental Neuroscience Graduate Program (INGP), administered through the Institute of Neuroscience offers robust graduate training in Neuroscience across departments at the University of Oregon. The goal of INGP is to train students to think independently, creatively, and critically about problems in neuroscience. We aim to train students in a variety of skills that will prepare students for a successful research, teaching, policy or industry career. Students can enter INGP through the department of biology (https://biology.uoregon.edu/), human physiology (https://physiology.uoregon.edu/), psychology (https://psychology.uoregon.edu/), mathematics (https://math.uoregon.edu/), and physics (https://physics.uoregon.edu/), depending on their interest. The majority of our students enter through the department of biology, which allows students to complete three rotations during their first year, in order to help students identify a laboratory in which to do their dissertation research. Students who enter through psychology, human physiology and mathematics begin in their dissertation labs immediately. Regardless of how students enter INGP, they are provided with a set of mentors at the peer, and faculty level. All graduate students are required to teach for at least one academic year during their graduate career; at least a portion of this teaching takes place the first year.

The two training programs we offer are: 1) cellular, developmental and molecular neuroscience, and 2) systems, cognitive and theoretical neuroscience. Students take courses and journal clubs specific to these topics to enhance their knowledge.

Typical courses, journal clubs and meetings:

- Cellular, Developmental and Molecular
  - Courses: Molecular genetics, advanced biochemistry, developmental neurobiology, developmental genetics, cellular neuroscience, systems neuroscience.
  - Journal clubs: developmental and cell biology, developmental neurobiology.
  - Meetings: developmental interest group, zebrafish groupie.
- Systems, Cognitive and Theoretical
  - Courses: cellular neuroscience, systems neuroscience, cognitive neuroscience, computational neuroscience, combinatorics, stochastic processes, neural networks.
  - Journal clubs: systems neuroscience, theoretical neuroscience.
  - Meetings: neural circuits and behavior, zebrafish groupie, joint theory lab meetings.

Students who want to enter the neuroscience graduate program should apply to the PhD program of a participating department and indicate their interest in neuroscience. Typically, students interested in cognitive neuroscience apply to the psychology department; students interested in molecular, cellular, developmental, or systems neuroscience apply to the biology department. Such applications are reviewed by the neuroscience faculty as well as the departmental admission committee. Answers to specific questions about prerequisites and deadlines may be obtained by writing directly to one of the participating departments, University of Oregon, Eugene, Oregon 97403. Additional information about the Institute of Neuroscience may be obtained from the institute website. See also the Institute of Neuroscience section in the Research Centers and Institutes **(**http://catalog.uoregon.edu/archive/2022-2023/research/**)** area of this catalog.

Courses

Biology. Molecular Genetics (BI 320 (http://catalog.uoregon.edu/archive/2022-2023/search/?P=BI%20320)), Cell Biology (BI 322), Developmental Biology (BI 328), Sensory Physiology (BI 353), Animal Physiology (BI 356), Neurobiology (BI 360), Experimental Course: [Topic] (BI 410) (Neurobiology of Motivation & Addiction, Neural Basis of Cognition, Neurogenetics), Experimental Course: [Topic] (BI 410) (Analysis of Neural Data, Data Visualization, Matlab for Biologists), Protein Toxins in Cell Biology (BI 422), Molecular Genetics of Human Disease (BI 427), Systems Neuroscience (BI 461), Cellular Neuroscience (BI 463), Developmental Neurobiology (BI 466), Experimental Course: [Topic] (BI 510) (Neurobiology of Motivation & Addiction, Neural Basis of Cognition, Neurogenetics), Experimental Course: [Topic] (BI 510) (Analysis of Neural Data, Data Visualization, Matlab for Biologists), Protein Toxins in Cell Biology (BI 522), Molecular Genetics of Human Disease (BI 527), Systems Neuroscience (BI 561), Cellular Neuroscience (BI 563), Developmental Neurobiology (BI 566), Experimental Course: [Topic] (BI 610) (Advanced Cellular Neuroscience)

Human Physiology. Motor Control (HPHY 333), Sleep Physiology (HPHY 412), Neural Development (HPHY 432), Neurophysiology of Concussion (HPHY 433), Movement Disorders (HPHY 434), Clinical Neuroscience (HPHY 436),Sleep Physiology (HPHY 512), Neural Development (HPHY 532), Neurophysiology of Concussion (HPHY 533), Movement Disorders (HPHY 534), Clinical Neuroscience (HPHY 536)

Psychology. Biopsychology (PSY 304), Cognition (PSY 305), Music and the Brain (PSY 348), Psychoactive Drugs (PSY 383), Learning and Memory (PSY 433), Human Performance (PSY 436), Perception (PSY 438), , Brain Mechanisms of Behavior (PSY 445), Cognitive Neuroscience (PSY 449), Hormones and Behavior (PSY 450), Decision-Making (PSY 458), Cognitive Development (PSY 475), Learning and Memory (PSY 533), Human Performance (PSY 536), Perception (PSY 538), Brain Mechanisms of Behavior (PSY 545), Cognitive Neuroscience (PSY 549), Hormones and Behavior (PSY 550), Decision-Making (PSY 558), Cognitive Development (PSY 575), Experimental Course: [Topic] (PSY 610) (Advanced Cognitive Neuroscience)

Affiliated Faculty

Elliot Berkman, psychology

Melynda Casement, psychology

Robert Chavez, psychology

Paul Dassonville, psychology

Chris Doe, biology

Judith Eisen, biology

Tim Gardner, Knight Campus

Ian Greenhouse, human physiology

Tory Herman, biology

Benjamin Hutchinson, psychology

Adrianne Huxtable, human physiology

Santiago Jaramillo, biology

Brice Kuhl, psychology

Shawn Lockery, biology

Michelle Marneweck, human physiology

Ulrich Mayr, psychology

Luca Mazzucato, biology

David McCormick, biology

Adam Miller, biology

Kate Mills, psychology

James Murray, biology

Cris Niell, biology

Jennifer Pfeifer, psychology

Jonathan Reeder, Knight Campus

Margaret Sereno, psychology

Matt Smear, psychology

Nicki Swann, human physiology

Emily Sylwestrak, biology

Terry Takahashi, biology

Nash Unsworth, psychology

Philip Washbourne, biology

Michael Wehr, psychology

Monte Westerfield, biology

Dasa Zeithamova, psychology

Neuroscience

As outlined below, the Neuroscience majors consists of the following components: 1) foundation courses in the natural sciences; 2) math and statistics coursework; 3) life science fundamentals; 4) a core neuroscience sequence; 5) upper-division elective courses; and 6) advanced skills courses and/or research experience. The total number of credits is 104-107 (depending on whether majors complete the General Biology Sequence or the Biology Honors Sequence).

Code	Title	Credits
Foundation Courses in Natural Sciences:		**46-49**
BI 211	General Biology I: Cells	
& BI 212	and General Biology II: Organisms	
& BI 214	and General Biology IV: Mechanisms	
or BI 281H	Honors Biology I: Cells, Biochemistry and Physiology	
& BI 282H	and Honors Biology II: Genetics and Molecular Biology	
& BI 283H	and Honors Biology III: Evolution, Diversity and Ecology	
CH 221	General Chemistry I	
& CH 222	and General Chemistry II	
& CH 223	and General Chemistry III	
or CH 224H	Advanced General Chemistry I	
& CH 225H	and Advanced General Chemistry II	
& CH 226H	and Advanced General Chemistry III	
PHYS 201	General Physics	
& PHYS 202	and General Physics	
& PHYS 203	and General Physics	
or PHYS 251	Foundations of Physics I	
& PHYS 252	and Foundations of Physics I	
& PHYS 253	and Foundations of Physics I	
CH 227	General Chemistry Laboratory	
& CH 228	and General Chemistry Laboratory	
& CH 229	and General Chemistry Laboratory	
or PHYS 204	Introductory Physics Laboratory	
& PHYS 205	and Introductory Physics Laboratory	
& PHYS 206	and Introductory Physics Laboratory	
PSY 201	Mind and Brain	
Math and Statistics Courses:		**8**
MATH 246	Calculus for the Biological Sciences I	
or MATH 251	Calculus I	
PSY 302	Statistical Methods in Psychology	
or MATH 425	Statistical Methods I	
or ANTH 470	Statistical Analysis of Biological Anthropology	
Life Science Fundamentals:		**8**
HPHY 211	Medical Terminology	
HPHY 212	Scientific Investigation in Physiology	
Core Neuroscience: Sequence order is recommended but not required		**18**
HPHY 321	Human Anatomy I	
& HPHY 322	and Human Physiology I (Fall)	
PSY 304	Biopsychology (Winter)	
BI 360	Neurobiology (Spring)	
Upper Division Electives: [1]		**16**
Molecular/Cellular/Developmental		
BI 320	Molecular Genetics	
BI 322	Cell Biology	
BI 328	Developmental Biology	
BI 356	Animal Physiology	
BI 422	Protein Toxins in Cell Biology	
BI 427	Molecular Genetics of Human Disease	
BI 466	Developmental Neurobiology	
HPHY 432	Neural Development	

Systems		
BI 353	Sensory Physiology	
BI 399	Special Studies: [Topic]	
BI 410	Experimental Course: [Topic]	
BI 461	Systems Neuroscience	
HPHY 333	Motor Control	
HPHY 412	Sleep Physiology	
HPHY 433	Neurophysiology of Concussion	
HPHY 434	Movement Disorders	
HPHY 436	Clinical Neuroscience	
PSY 445	Brain Mechanisms of Behavior	
PSY 450	Hormones and Behavior	
Cognitive		
BI 410	Experimental Course: [Topic] (Neural Basis of Cognition)	
PSY 305	Cognition	
PSY 348	Music and the Brain	
PSY 383	Psychoactive Drugs	
PSY 433	Learning and Memory	
PSY 436	Human Performance	
PSY 438	Perception	
PSY 449	Cognitive Neuroscience	
PSY 458	Decision-Making	
PSY 475	Cognitive Development	
Advanced Skills Courses and Research Experience		**8**
BI 401	Research: [Topic]	
BI 403	Thesis	
BI 407	Seminar: [Topic]	
BI 410	Experimental Course: [Topic] (Introduction to Programming for Biologists)	
BI 410	Experimental Course: [Topic] (Matlab for Biologists)	
BI 410	Experimental Course: [Topic] (Analysis Neural Data)	
BI 485	Techniques in Computational Neuroscience	
CS 472	Machine Learning	
HPHY 401	Research: [Topic]	
HPHY 403	Thesis	
PSY 401	Research: [Topic]	
PSY 403	Thesis	
PSY 412	Applied Data Analysis	
Total Credits		**104-107**

[1] 16 required credits with at least 12 credits from 400-level courses; at least one course from each of the three area

All courses counted towards the Neuroscience Major requirements must be taken for a letter grade and passed with a grade of C or better.

At least 34 credits of coursework applied to the major must be taken at the University of Oregon.

Criteria for Honors

To graduate with Honors in Neuroscience, the following requirements must be met:

1. A completed Neuroscience Honors application with signature of a faculty research advisor from BI, HPHY or PSY
2. Completion of all Neuroscience major requirements
3. A minimum 3.5 GPA in all courses applied to the major
4. At least three credits in BI 403, HPHY 403, or PSY 403 Thesis (*These credits may be applied to the advanced skills courses and research experience requirement).*
5. Completion of an honors thesis under supervision of a committee, consisting of one BI, HPHY, or PSY faculty member and at least one other committee member (Ph.D. student, postdoctoral scholar, or faculty) from BI, HPHY, or PSY.

Four-Year Degree Plan

The degree plan shown is only a sample of how students may complete their degrees in four years. There are alternative ways. Students should consult their advisor to determine the best path for them.

Neuroscience Bachelor of Arts

Course	Title	Credits Milestones
First Year		
Fall		
CH 111	Introduction to Chemical Principles	4
MATH 111	College Algebra	4
WR 121	College Composition I	4
Language 101		4
	Credits	**16**
Winter		
CH 221	General Chemistry I	4
CH 227	General Chemistry Laboratory	2
MATH 112	Elementary Functions	4
WR 123	College Composition III	4
Language 102		4
	Credits	**18**
Spring		
CH 222	General Chemistry II	4
CH 228	General Chemistry Laboratory	2
MATH 246	Calculus for the Biological Sciences I	4
Language 103		4
	Credits	**14**
Second Year		
Fall		
BI 211	General Biology I: Cells	4
CH 223	General Chemistry III	4
CH 229	General Chemistry Laboratory	2
HPHY 211	Medical Terminology	3
Language 201		4
	Credits	**17**
Winter		
BI 212	General Biology II: Organisms	4
HPHY 212	Scientific Investigation in Physiology	4
PSY 201	Mind and Brain	4

Language 202		4
	Credits	**16**
Spring		
BI 214	General Biology IV: Mechanisms	4
PSY 302	Statistical Methods in Psychology	4
Core education course		4
Language 203		4
	Credits	**16**
Third Year		
Fall		
HPHY 321	Human Anatomy I	5
HPHY 322	Human Physiology I	5
PHYS 201	General Physics	4
BI 401 or HPHY 401 or PSY 401	Research: [Topic] or Research: [Topic] or Research: [Topic]	2
	Credits	**16**
Winter		
PSY 304	Biopsychology	4
PHYS 202	General Physics	4
Core education course		4
BI 401 or HPHY 401 or PSY 401	Research: [Topic] or Research: [Topic] or Research: [Topic]	2
	Credits	**14**
Spring		
BI 360	Neurobiology	4
PHYS 203	General Physics	4
Core education course		4
BI 401 or HPHY 401 or PSY 401	Research: [Topic] or Research: [Topic] or Research: [Topic]	2
	Credits	**14**
Fourth Year		
Fall		
Upper-division NEURO elective		4
Core education course		4
Core education course		4
BI 401 or HPHY 401 or PSY 401	Research: [Topic] or Research: [Topic] or Research: [Topic]	2
	Credits	**14**
Winter		
Upper-division NEURO elective		4
Upper-division NEURO elective		4
Core education course		4
Elective course		1
	Credits	**13**
Spring		
Upper-division NEURO elective		4
Core education course		4
Core education course		4
	Credits	**12**
	Total Credits	**180**

Neuroscience Bachelor of Science

Course	Title	Credits Milestones
First Year		
Fall		
CH 111	Introduction to Chemical Principles	4
MATH 111	College Algebra	4
WR 121	College Composition I	4
Core education course		4
	Credits	**16**
Winter		
CH 221	General Chemistry I	4
CH 227	General Chemistry Laboratory	2
MATH 112	Elementary Functions	4
WR 123	College Composition III	4
	Credits	**14**
Spring		
CH 222	General Chemistry II	4
CH 228	General Chemistry Laboratory	2
MATH 246	Calculus for the Biological Sciences I	4
PSY 201	Mind and Brain	4
Elective course		1
	Credits	**15**
Second Year		
Fall		
BI 211	General Biology I: Cells	4
CH 223	General Chemistry III	4
CH 229	General Chemistry Laboratory	2
HPHY 211	Medical Terminology	3
	Credits	**13**
Winter		
BI 212	General Biology II: Organisms	4
HPHY 212	Scientific Investigation in Physiology	4
Core education course		4
Core education course		4
	Credits	**16**
Spring		
BI 214	General Biology IV: Mechanisms	4
PSY 302	Statistical Methods in Psychology	4
Core education course		4
Elective or Cultural Literacy course		4
	Credits	**16**

Third Year

Fall

HPHY 321	Human Anatomy I	5
HPHY 322	Human Physiology I	5
PHYS 201	General Physics	4
BI 401 or HPHY 401 or PSY 401	Research: [Topic] or Research: [Topic] or Research: [Topic]	2
	Credits	**16**

Winter

PSY 304	Biopsychology	4
PHYS 202	General Physics	4
Core education course		4
BI 401 or HPHY 401 or PSY 401	Research: [Topic] or Research: [Topic] or Research: [Topic]	2
Elective course		1
	Credits	**15**

Spring

BI 360	Neurobiology	4
PHYS 203	General Physics	4
Core education course		4
BI 401 or HPHY 401 or PSY 401	Research: [Topic] or Research: [Topic] or Research: [Topic]	2
	Credits	**14**

Fourth Year

Fall

Upper-division NEURO elective		4
Upper-division NEURO elective		4
Core education course		4
BI 401 or HPHY 401 or PSY 401	Research: [Topic] or Research: [Topic] or Research: [Topic]	2
	Credits	**14**

Winter

Upper-division NEURO elective		4
Upper-division NEURO elective		4
Core education course		4
Elective or Cultural Literacy course		4
	Credits	**16**

Spring

Upper-division NEURO elective		4
Elective courses		9
	Credits	**13**
	Total Credits	**178**