NEUROSCIENCE (Div III)

Chair: Professor Tim Lebestky

Advisory Committee

- Matt E. Carter, Associate Professor of Biology; affiliated with: Neuroscience Program; on leave Fall 2021
- Victor A. Cazares, Assistant Professor of Psychology; affiliated with: Neuroscience Program
- Amie A. Hane, Professor of Psychology, Chair of Public Health Program; affiliated with: Neuroscience Program, Public Health Program
- Tim J. Lebestky, Associate Professor of Biology, Chair of Neuroscience Program; affiliated with: Neuroscience Program
- Martha Marvin, Lecturer in Neuroscience
- Shivon A. Robinson, Assistant Professor of Psychology; affiliated with: Neuroscience Program
- Noah J. Sandstrom, Chair and Professor of Psychology; affiliated with: Neuroscience Program
- Heather Williams, William Dwight Whitney Professor of Biology; affiliated with: Neuroscience Program; on leave Spring 2022

Neuroscience is a rapidly growing interdisciplinary field concerned with understanding the relationship between brain, mind, and behavior. The interdisciplinary nature of the field is apparent when surveying those who call themselves neuroscientists. Among these are anatomists, physiologists, chemists, psychologists, philosophers, molecular biologists, computer scientists, linguists, and ethologists. The areas that neuroscience addresses are equally diverse and range from physiological and molecular studies of single neurons, to investigations of how systems of neurons produce phenomena such as vision and movement, to the study of the neural basis of complex cognitive phenomena such as memory, language, and consciousness. Applications of neuroscience research are rapidly growing and include the development of drugs to treat neurodegenerative disorders such as Alzheimer's disease and Parkinson's disease, the use of noninvasive techniques for imaging the human brain such as fMRI and near infrared optical imaging, and the development of methods for repair of the damaged human brain such as the use of brain explants and implants. Combining this wide range of approaches and research methods to study a single remarkably complex organ—the brain—and the behavioral outcomes of its activity requires a unique interdisciplinary approach. The Neuroscience Program is designed to provide students with the opportunity to explore this approach.

THE PROGRAM

The program in neuroscience consists of seven courses: The Cell (Biology 101); Introductory Psychology (Psychology 101); Neuroscience (Neuroscience 201); Topics in Neuroscience (Neuroscience 401); and three electives. Either Biology 101 or Psychology 101 must be taken prior to enrolling in the core course, Neuroscience (Neuroscience 201), which is the foundational neuroscience course and provides the background for upper-level electives in the concentration. Ideally, Neuroscience is taken the fall of the sophomore year. Electives are designed to provide in-depth coverage of specific areas within the field and many electives include laboratory experiences. At least one elective course is required from those designated as Group A (Neuroscience courses cross-listed with Biology). At least one elective course is required from those designated as Group B (Neuroscience courses cross-listed with Psychology). A third required elective may come from Group A or Group B offerings or it may come from Group C which consists of courses that are not cross-listed with neuroscience but include significant neuroscience content. Students may also petition the advisory committee to consider courses that are not listed among these groups including neuroscience-related courses that may be taken while studying abroad. Topics in Neuroscience (Neuroscience 401) is designed to provide an integrative culminating experience and is taken by all senior concentrators during the senior year.

Required Courses

BIOL 101(F) LEC The Cell

Taught by: Damian Turner, Cynthia Holland
Catalog details

NSCI 201 / BIOL 212 / PSYC 212(F) LEC Neuroscience

Taught by: Tim Lebestky, Victor Cazares
Catalog details

NSCI 401(F) SEM Topics in Neuroscience

Taught by: Victor Cazares
Catalog details

PSYC 101(F, S) LEC Introductory Psychology

Taught by: Noah Sandstrom, Nate Kornell, Clarence Gillig

Catalog details

Students can ask the Neuroscience Program Chair whether courses not listed here might count as electives.

Elective Courses

Three elective courses are required. At least one elective must be from Group A and at least one elective must be from Group B. The third elective may come from Group A, Group B, or Group C. Students may also consult the Chair to consider courses that are not listed among these groups including neuroscience-related courses that may be taken while studying abroad.

Group A

BIOL 311 / NSCI 311 LEC Neural Systems and Circuits

Taught by: Matt Carter
Catalog details

BIOL 312 / NSCI 312(F) LEC Sensory Biology

Taught by: Heather Williams
Catalog details

BIOL 407 / NSCI 347(S) SEM Neurobiology of Emotion

Taught by: Tim Lebestky
Catalog details

BIOL 412 / NSCI 342 SEM Neural and Hormonal Basis of Hunger

Taught by: Matt Carter
Catalog details

BIOL 455 / NSCI 455 SEM Neural Regeneration

Taught by: Martha Marvin
Catalog details

Group B

PSYC 312 / NSCI 322(S) SEM From Order to Disorder(s): The Role of Genes & the Environment in Psychopathology

Taught by: Victor Cazares
Catalog details

PSYC 313 / NSCI 313(F) SEM Opioids and the Opioid Crisis: The Neuroscience Behind an Epidemic

Taught by: Shivon Robinson
Catalog details

PSYC 315 / NSCI 315 LEC Hormones and Behavior

Taught by: Noah Sandstrom
Catalog details

PSYC 319 / NSCI 319 / STS 319(S) TUT Neuroethics

Taught by: Noah Sandstrom
Catalog details

Group C

BIOL 204(S) LEC Animal Behavior

Taught by: Manuel Morales
Catalog details

BIOL 335(F) LEC Chronobiology

Taught by: Vincent van der Vinne
Catalog details

BIOL 421 TUT Thermoregulation: From Molecules to Organisms

Taught by: Steven Swoap
Catalog details

PSYC 335 SEM Early Experience and the Developing Infant

Taught by: Amie Hane
Catalog details

THE DEGREE WITH HONORS IN NEUROSCIENCE

The degree with honors in Neuroscience provides students with the opportunity to undertake an original research project under the supervision of one or more of the Neuroscience faculty. In addition to completing the requirements of the Neuroscience Program, candidates for an honors degree must enroll in Neuroscience 493-W31-494 and write a thesis based on an original research project. Presentation of a thesis, however, should not be interpreted as a guarantee of a degree with honors. Students interested in pursuing a degree with honors should contact the Neuroscience Advisory Committee by winter study of their junior year.

STUDY ABROAD

FAQ

Students MUST contact departments/programs BEFORE assuming study away credit will be granted toward the major or concentration.

Can your department or program typically pre-approve courses for major/concentration credit?

Yes, in some cases, if appropriate course information is available in advance (e.g. syllabi and/or course descriptions). Securing syllabi is often difficult, so a discussion with the program Chair is certainly necessary. Under no circumstances should a student assume that a course taken at another institution will count toward the concentration.

What criteria will typically be used/required to determine whether a student may receive major/concentration credit for a course taken while on study away?

The program Chair and advisory committee will consider the course title, course description, and complete syllabus, including readings/assignments. Exams or other written work will also be considered. Written work may be requested if the course description suggests that it is only tangentially related to the field of neuroscience. Written work would, therefore, need to demonstrate that there was sufficient emphasis on neuroscience material.

Does your department/program place restrictions on the number of major/concentration credits that a student might earn through study away?

Yes. Generally there is a maximum of 2 credits that can be completed through a study abroad program.

Does your department/program place restrictions on the types of courses that can be awarded credit towards your major?

No.

Are there specific major requirements that cannot be fulfilled while on study away?

Yes. NSCI 201 and NSCI 401 can not generally be completed abroad. NSCI should be taken during the sophomore year if possible and includes a laboratory component that is rarely comparable in study abroad courses.

Are there specific major requirements in your department/program that students should be particularly aware of when weighing study away options? (Some examples might include a required course that is always taught in one semester, laboratory requirements.)

NSCI 201 is only taught during the fall semester. As such, students planning to study away should plan to take it during the sophomore year.

Give examples in which students thought or assumed that courses taken away would count toward the major or concentration and then learned they wouldn't:

Some students (rarely) have failed to discuss the course in advance of their study abroad experiences. They may also have assumed that approval of a course by another department (e.g., Biology or Psychology) would necessarily mean that they would receive Neuroscience credit for the course. This is not necessarily the case.

NSCI 201 (F) Neuroscience

Cross-listings: BIOL 212 NSCI 201 PSYC 212

Primary Cross-listing

This course is designed to give an overview of the field of neuroscience progressing from a molecular level onwards to individual neurons, neural circuits, and ultimately regulated output behaviors of the nervous system. Topics include a survey of the structure and function of the nervous system, basic neurophysiology and neurochemistry, development, learning and memory, sensory and motor systems, and clinical disorders. Throughout the course, many examples from current research in neuroscience are used to illustrate the concepts being considered. The lab portion of the course will emphasize a) practical hands-on exercises that amplify the material presented in class; b) interpreting and analyzing data; c) presenting the results in written form and placing them in the context of published work; and d) reading and critiquing scientific papers.

Requirements/Evaluation: Evaluation will be based on participation in discussion groups, exercises, problem sets and quizzes performed in small groups, lab reports, two midterm exams, and a final exam.

Prerequisites: PSYC 101 or BIOL 101; open to first-year students only with permission of instructor

Enrollment Limit: 72

Enrollment Preferences: sophomores and Biology and Psychology majors

Expected Class Size: 72

Grading: yes pass/fail option, no fifth course option

Unit Notes: does not satisfy the distribution requirement for the Biology major

Distributions: (D3)

This course is cross-listed and the prefixes carry the following divisional credit:

BIOL 212 (D3) NSCI 201 (D3) PSYC 212 (D3)

Attributes: COGS Interdepartmental Electives NSCI Required Courses PSYC 200-level Courses

Fall 2021

LEC Section: 01 TR 9:55 am - 11:10 am Tim J. Lebestky, Victor A. Cazares

LAB Section: 02 M 1:00 pm - 4:00 pm Martha J. Marvin

LAB Section: 03 T 1:00 pm - 4:00 pm Martha J. Marvin

LAB Section: 04 W 1:00 pm - 4:00 pm Martha J. Marvin

NSCI 311 (F) Neural Systems and Circuits

Cross-listings: BIOL 311 NSCI 311

Secondary Cross-listing

This course will examine the functional organization of the mammalian brain, emphasizing both neuroanatomy and neurophysiology. How do specific populations of neurons and their connections encode sensory information, form perceptions of the external and internal environment, make cognitive decisions, and execute movements? How does the brain produce feelings of reward/motivation and aversion/pain? How does the nervous system regulate homeostatic functions such as sleep, food intake, and thirst? We will explore these questions using a holistic, integrative approach, considering molecular/cellular mechanisms, physiological characterizations of neurons, and connectivity among brain systems. Journal article discussions will complement course topics, providing experience in reading, understanding, and critiquing primary research papers. Writing an original literature review article will provide experience in expository writing and anonymous peer review. Laboratory sessions will provide experience in examining macroscopic and microscopic neural structures, as well as performing experiments to elucidate the structure and function of neural systems using classical and cutting-edge techniques.

Class Format: In Fall 2020, this course will be offered in a hybrid format, with in-person experiences for students on campus, as well as the ability to complete discussions/labs remotely. Exact details to be announced prior to the first day of the course.

Requirements/Evaluation: Class participation, completion of labs, literature review assignment, hour exams, a final exam

Prerequisites: BIOL 212 (same as PSYC 212 or NSCI 201) or BIOL 205

Enrollment Limit: 12

Enrollment Preferences: Biology majors and Neuroscience concentrators

Expected Class Size: 12

Grading: no pass/fail option, no fifth course option

Unit Notes: does not satisfy the distribution requirement for the Biology major

Distributions: (D3)

This course is cross-listed and the prefixes carry the following divisional credit:

BIOL 311 (D3) NSCI 311 (D3)

Attributes: NSCI Group A Electives

Not offered current academic year

NSCI 312 (F) Sensory Biology

Cross-listings: NSCI 312 BIOL 312

Secondary Cross-listing

How do animals sense properties of the physical world? How do they convert physical or chemical energy to a signal within a cell that carries information? How is that information represented? What are the limits on what can be sensed? We will look for answers to these questions by

investigating the molecular and cellular mechanisms of sensory transduction and how these mechanisms constrain the types of information that the nervous system encodes and processes. We will also ask how natural selection shapes the type of sensory information that animals extract from the world, and what adaptations allow some species to have "special" senses. Some of the examples we will consider are: bat echolocation (hair cells in the ear), detecting visual motion (amacrine cells in the mammalian retina), the constant reshaping of the olfactory system (chemical mapping of odors), what makes a touch stimulus noxious, and enhanced color vision (in birds, bees, and shrimp). Laboratory exercises will focus on the nematode *C. elegans*, an important model system, to explore and extend how we understand touch, temperature sensation, chemosensation, and light sensation.

Requirements/Evaluation: Four take-home exams, an independent research project (proposal, followed by results/discussion), presentation about a non-standard sensory system, short quizzes, and lab + class participation.

Prerequisites: BIOL 101 and either BIOL 212/NSCI 201 or BIOL 205

Enrollment Limit: 24

Enrollment Preferences: Preference to senior Biology majors who need a 300-level course; then to senior Neuroscience concentrators who need a Group A elective; then to Biology majors. Not open to students who have taken Biology 213.

Expected Class Size: 20

Grading: no pass/fail option, no fifth course option

Unit Notes: Does not satisfy the distribution requirement for the Biology major.

Distributions: (D3)

This course is cross-listed and the prefixes carry the following divisional credit:

NSCI 312 (D3) BIOL 312 (D3)

Attributes: BIMO Interdepartmental Electives NSCI Group A Electives

Fall 2021

LEC Section: 01 TR 8:30 am - 9:45 am Heather Williams

LAB Section: 02 T 1:00 pm - 4:00 pm Heather Williams

LAB Section: 03 R 1:00 pm - 4:00 pm Heather Williams

NSCI 313 (F) Opioids and the Opioid Crisis: The Neuroscience Behind an Epidemic

Cross-listings: NSCI 313 PSYC 313

Secondary Cross-listing

Opioid misuse, including addiction, has emerged as a major health epidemic in the United States. This course will explore the science of opioids as well as the historical and societal context surrounding their use and abuse. We will examine the neurobiological mechanisms through which opioids interact with pain pathways and reward circuits within the brain and we will explore how changes in these systems contribute to opioid tolerance, dependence, and addiction. We will consider how genetic, environmental and behavioral factors can powerfully influence these processes. Finally, we will consider alternative approaches to pain management as well as interventions for the treatment of opioid abuse. Students will be expected to design and conduct an empirical project related to the course material. Critical evaluation of peer-reviewed primary literature from animal and human studies will serve as a foundation for class discussions. Evaluation will be based on class presentations, participation in discussions and empirical projects, written assignments, and a poster presentation of the empirical project.

Requirements/Evaluation: class presentations, participation in discussions and empirical projects, five short position papers (approximately 2 pages double-spaced), an APA style empirical paper (approximately 20 pages double-spaced) and poster presentation of the empirical project.

Prerequisites: PSYC 212 (same as BIOL 212 or NSCI 201)

Enrollment Limit: 16

Enrollment Preferences: Psychology majors and Neuroscience concentrators

Expected Class Size: 16

Grading: no pass/fail option, no fifth course option

Distributions: (D3)

This course is cross-listed and the prefixes carry the following divisional credit:

NSCI 313 (D3) PSYC 313 (D3)

Attributes: NSCI Group B Electives PHLH Biomedical Determinants of Health PSYC Area 1 - Behavioral Neuroscience PSYC Empirical Lab

Course

Fall 2021

SEM Section: 01 MR 1:10 pm - 2:25 pm Shivon A. Robinson

LAB Section: 02 W 1:00 pm - 4:00 pm Shivon A. Robinson

NSCI 315 (F) Hormones and Behavior

Cross-listings: PSYC 315 NSCI 315

Secondary Cross-listing

In all animals, hormones are essential for the coordination of basic functions such as development and reproduction. This course studies the dynamic relationship between hormones and behavior. We will review the mechanisms by which hormones act in the nervous system. We will also investigate the complex interactions between hormones and behavior. Specific topics to be examined include: sexual differentiation; reproductive and parental behaviors; stress; aggression; and learning and memory. Students will critically review data from both human and animal studies. All students will design and conduct an empirical research project as part of a small research team.

Class Format: empirical lab course

Requirements/Evaluation: presentations and participation in discussions, approximately seven 1-2 page response papers, midterm, written (15-20 page) and oral presentation of the research project

Prerequisites: PSYC 212 (same as BIOL 212 or NSCI 201)

Enrollment Limit: 16

Enrollment Preferences: Psychology majors and Neuroscience concentrators

Expected Class Size: 16

Grading: no pass/fail option, no fifth course option

Distributions: (D3)

This course is cross-listed and the prefixes carry the following divisional credit:

PSYC 315 (D3) NSCI 315 (D3)

Attributes: NSCI Group B Electives PSYC Area 1 - Behavioral Neuroscience PSYC Empirical Lab Course

Not offered current academic year

NSCI 319 (S) Neuroethics (WS)

Cross-listings: PSYC 319 NSCI 319 STS 319

Secondary Cross-listing

Neuroscience studies the brain and mind, and thereby some of the most profound aspects of human existence. In the last decade, advances in our understanding of brain function and in our ability to manipulate brain function have raised significant ethical challenges. This tutorial will explore a variety of important neuroethical questions. Potential topics will include pharmacological manipulation of "abnormal" personality; the use of "cosmetic pharmacology" to enhance cognition; the use of brain imaging to detect deception or to understand the ability, personality or vulnerability of an individual; the relationship between brain activity and consciousness; manipulation of memories; the neuroscience of morality and decision making. In addition to exploring these and other ethical issues, we will explore the basic science underlying them.

Requirements/Evaluation: six 5-page position papers and five 2-page response papers as well as participation in discussions

Prerequisites: PSYC 212 (same as BIOL 212 or NSCI 201); or permission of instructor

Enrollment Limit: 10

Enrollment Preferences: Psychology majors and Neuroscience concentrators

Expected Class Size: 10

Grading: no pass/fail option, no fifth course option

Distributions: (D3) (WS)

This course is cross-listed and the prefixes carry the following divisional credit:

PSYC 319 (D3) NSCI 319 (D3) STS 319 (D2)

Writing Skills Notes: In alternating weeks, each student in a tutorial pair will write a 5-page essay based on the assigned readings. Essays will be discussed during tutorial meetings and written feedback from the professor will be provided for each essay. At the end of the semester, students will choose one of their prior essays to revise as their final submission. Students will receive from the instructor timely comments on their writing skills, with suggestions for improvement.

Attributes: NSCI Group B Electives PSYC Area 1 - Behavioral Neuroscience

Spring 2022

TUT Section: T1 TBA Noah J. Sandstrom

NSCI 322 (S) From Order to Disorder(s): The Role of Genes & the Environment in Psychopathology

Cross-listings: NSCI 322 PSYC 312

Secondary Cross-listing

This course examines how experimental methods in neuroscience can be used to understand the role of nature (genes) and nurture (the environment) in shaping the brain and behavior. In particular, we will explore how neuroscience informs our understanding of psychiatric disorders such as anxiety, depression, and schizophrenia. We will investigate the biological underpinning of these disorders as well as their treatments. Readings will include human studies as well as work based on animal models. Topics will include: the ways in which environmental and genetic factors shape risk and resiliency in the context of psychiatric disease, the neural circuits and peripheral systems that contribute to psychopathology, and the mechanisms through which interventions may act. In the laboratory component of the course, students will gain hands-on experience in using animal models to study complex behavior and their associated neural mechanisms.

Requirements/Evaluation: class presentations, participation in discussions, project proposal (5 pages), empirical project paper (5-7 pages), poster and poster presentation, participation in all phases of the empirical project research experience (experiment design, data collection, data graphing, data analysis) including oral and written presentation of key findings.

Prerequisites: PSYC 212 (same as BIOL 212 or NSCI 201)

Enrollment Limit: 16

Enrollment Preferences: Psychology majors and Neuroscience concentrators

Expected Class Size: 16

Grading: no pass/fail option, no fifth course option

Distributions: (D3)

This course is cross-listed and the prefixes carry the following divisional credit:

NSCI 322 (D3) PSYC 312 (D3)

Attributes: BIGP Courses NSCI Group B Electives PSYC Area 1 - Behavioral Neuroscience PSYC Empirical Lab Course

Spring 2022

SEM Section: 01 TR 9:55 am - 11:10 am Victor A. Cazares

LAB Section: 02 W 1:00 pm - 4:00 pm Victor A. Cazares

NSCI 342 (S) Neural and Hormonal Basis of Hunger

Cross-listings: BIOL 412 NSCI 342

Secondary Cross-listing

Hunger and satiety are highly regulated behavioral states that maintain energy homeostasis in animals. This course will focus on readings from the primary literature to track numerous recent advances in how the brain and endocrine systems regulate appetite. Topics include how organ systems communicate with the brain to regulate appetite, how different populations of neurons in the brain interact to regulate appetite, how brain systems that regulate appetite affect other behaviors, and how the neural and hormonal basis of hunger compare with brain systems that regulate other homeostatic systems such as thirst. By tracing the advances in appetite regulation within the past decade, we will also trace the advent of cutting-edge molecular, genetic, and optical-based tools that are transforming multiple fields within physiology and neuroscience. Students in this class will have the opportunity to improve skills in written and oral scientific presentation.

Requirements/Evaluation: written assignments, oral presentations, and participation

Prerequisites: BIOL 205 or BIOL/PSYC 212, or permission of instructor

Enrollment Limit: 12

Enrollment Preferences: seniors who have not taken a 400-level course

Expected Class Size: 12

Grading: no pass/fail option, no fifth course option

Unit Notes: does not satisfy the distribution requirement for the Biology major

Distributions: (D3)

This course is cross-listed and the prefixes carry the following divisional credit:

BIOL 412 (D3) NSCI 342 (D3)

Attributes: NSCI Group A Electives

Not offered current academic year

NSCI 347 (S) Neurobiology of Emotion

Cross-listings: BIOL 407 NSCI 347

Secondary Cross-listing

Emotion is influenced and governed by a number of neural circuits and substrates, and emotional states can be influenced by experience, memory, cognition, and many external stimuli. We will read and discuss articles about mammalian neuroanatomy associated with emotion as defined by classic lesion studies, pharmacology, electrophysiology, fMRI imaging, knockout mouse studies, as well as new opti-genetic methods for investigating neural circuit function in order to gain an understanding of the central circuits and neurotransmitter systems that are implicated in emotional processing and mood disorders.

Class Format: three hours per week

Requirements/Evaluation: class participation and several short papers

Prerequisites: BIOL 202 and 212; open to juniors and seniors

Enrollment Limit: 12

Enrollment Preferences: senior Biology majors who have not taken a 400-level Biology course; then to eligible NSCI concentrators

Expected Class Size: 12

Grading: yes pass/fail option, yes fifth course option

Unit Notes: does not satisfy the distribution requirement for the Biology major

Distributions: (D3)

This course is cross-listed and the prefixes carry the following divisional credit:

BIOL 407 (D3) NSCI 347 (D3)

Attributes: BIMO Interdepartmental Electives NSCI Group A Electives

Spring 2022

SEM Section: 01 TR 9:55 am - 11:10 am Tim J. Lebestky

SEM Section: 02 TR 11:20 am - 12:35 pm Tim J. Lebestky

NSCI 397 (F) Independent Study: Neuroscience

Independent study.

Requirements/Evaluation: Determined by individual instructors

Prerequisites: Permission of instructor

Enrollment Limit: none

Enrollment Preferences: Upperclass students

Expected Class Size: NA

Grading: yes pass/fail option, yes fifth course option

Distributions: (D3)

Fall 2021

IND Section: 01 TBA Tim J. Lebestky

NSCI 398 (S) Independent Study: Neuroscience

Independent study.

Requirements/Evaluation: Determined by individual instructors

Prerequisites: Permission of instructor

Enrollment Limit: none

Enrollment Preferences: Upperclass students

Expected Class Size: NA

Grading: yes pass/fail option, yes fifth course option

Distributions: (D3)

Spring 2022

IND Section: 01 TBA Tim J. Lebestky

NSCI 401 (F) Topics in Neuroscience

Neuroscientists explore issues inherent in the study of brain and behavior. The overall objective of this seminar is to create a culminating senior experience in which previous course work in specific areas in the Neuroscience Program can be brought to bear in a synthetic, interdisciplinary approach to understanding complex problems. The specific goals for students in this seminar are to evaluate original research and critically examine the experimental evidence for theoretical issues in the discipline. Topics and instructional formats will vary somewhat from year to year, but in all cases the course will emphasize an integrative approach in which students will be asked to consider topics from a range of perspectives including molecular, cellular, systems, behavioral and clinical neuroscience. Previous topics have included autism, depression, stress, neurogenesis, novel neuromodulators, language, retrograde messengers, synaptic plasticity, and learning and memory.

Requirements/Evaluation: participation in class discussion, presentation of research articles, three short research "preview" articles (500-1,000 words), one research review paper (2,000-3,000 words)

Prerequisites: open only to seniors in the Neuroscience program

Enrollment Limit: 20

Enrollment Preferences: Senior Neuroscience concentrators

Expected Class Size: 20

Grading: no pass/fail option, yes fifth course option

Unit Notes: required of all senior students in the Neuroscience program

Distributions: (D3)

Attributes: NSCI Required Courses

Fall 2021

SEM Section: 01 TR 11:20 am - 12:35 pm Victor A. Cazares

NSCI 455 (S) Neural Regeneration

Cross-listings: NSCI 455 BIOL 455

Secondary Cross-listing

Injury to the human nervous system can cause lasting impairment, but non-mammalian animals have prodigious capacity to regenerate neurons,

regrow axons, and repair scars. What accounts for these differences? Regeneration can occur in multiple modes: replacement of injured neurons, repairs such as axonal regrowth to reconnect to a target structure, or repurposing existing neurons for new tasks through neural plasticity. We will explore the molecular foundations that underlie neuronal proliferation, neural plasticity, and inflammatory responses. We will consider the potential for translating these findings to inform treatments for humans who suffer from neural injury or neurodegenerative disease. Class discussions will focus on readings from the primary literature.

Class Format: Discussion, 3 hours per week

Requirements/Evaluation: Evaluation will be based on class participation, brief weekly responses, and four short research proposals.

Prerequisites: BIOL 212/NSCI 201 or permission of instructor.

Enrollment Limit: 10

Enrollment Preferences: Biology seniors who have not yet taken a 400 level course and Neuroscience senior concentrators who need a Group A elective.

Expected Class Size: 10

Grading: no pass/fail option, no fifth course option

Distributions: (D3)

This course is cross-listed and the prefixes carry the following divisional credit:

NSCI 455 (D3) BIOL 455 (D3)

Attributes: NSCI Group A Electives

Not offered current academic year

NSCI 493 (F) Senior Thesis: Neuroscience

Neuroscience senior thesis; this is part of a full-year thesis (493-494). Independent research for two semesters and a winter study under the guidance of one or more neuroscience faculty. After reviewing the literature in a specialized field of neuroscience, students design and conduct an original research project, the results of which are reported in a thesis. Senior thesis work is supervised by the faculty participating in the program.

Requirements/Evaluation: Determined by the thesis advisor

Prerequisites: Permission of the thesis advisor

Enrollment Limit: none

Enrollment Preferences: Senior Neuroscience concentrator

Expected Class Size: NA

Grading: yes pass/fail option, yes fifth course option

Distributions: (D3)

Fall 2021

HON Section: 01 TBA Tim J. Lebestky

NSCI 494 (S) Senior Thesis: Neuroscience

Neuroscience senior thesis; this is part of a full-year thesis (493-494). Independent research for two semesters and a winter study under the guidance of one or more neuroscience faculty. After reviewing the literature in a specialized field of neuroscience, students design and conduct an original research project, the results of which are reported in a thesis. Senior thesis work is supervised by the faculty participating in the program.

Requirements/Evaluation: Determined by the thesis advisor

Prerequisites: Permission of the thesis advisor

Enrollment Limit: none

Enrollment Preferences: Senior Neuroscience concentrator

Expected Class Size: NA

Grading: yes pass/fail option, yes fifth course option

Distributions: (D3)

Spring 2022

HON Section: 01 TBA Tim J. Lebestky

Winter Study ----------

NSCI 10 (W) The Neuroscience of Learning

An interactive and collaborative exploration of what neuroscience research reveals about how the brain learns and what factors can be influenced to facilitate successful learning. Topics include the neuroscience of attention, emotion, understanding, memory, and executive functions. Students will make connections to building their own learning processes and strategies as well how to apply these to teach others. Students will engage in evaluating primary neuroscience research articles using the medical model to evaluate validity. They will apply their understanding identify valid research related to learning and the brain. Small group discussions about the reading in class will include their interpretations of the research and potential applications to learning strategies and interventions. A final project will be a class presentation, on a topic of personal relevance to each student, where they will use the strategies they've learned about and experienced to promote learning in their classmates.

Requirements/Evaluation: final project or presentation

Prerequisites: none

Enrollment Limit: 12

Enrollment Preferences: no preference

Grading: pass/fail only

Unit Notes: Dr. Judy Willis combined her 15 years as a board-certified practicing neurologist with ten subsequent years as a classroom teacher to become a leading authority in the neuroscience of learning. Dr. Willis has written nine books and more than 100 articles for professional journals applying neuroscience research to successful teaching strategies. Dr. Willis travels nationally and internationally doing presentations on how the brain learns best.

Materials/Lab Fee: none

Attributes: EXPE Experiential Education Courses

Winter 2022

LEC Section: 01 TBA Judy Willis

NSCI 31 (W) Senior Thesis: Neuroscience

To be taken by students registered for Neuroscience 493-494.

Class Format: thesis

Grading: pass/fail only

Winter 2022

HON Section: 01 TBA Tim J. Lebestky

NSCI 99 (W) Independent Study: Neuroscience

Open to upperclass students. Students interested in doing an independent project (99) during Winter Study must make prior arrangements with a faculty sponsor. The student and professor then complete the independent study proposal form available online. The deadline is typically in late September. Proposals are reviewed by the pertinent department and the Winter Study Committee. Students will be notified if their proposal is approved prior to the Winter Study registration period.

Class Format: independent study

Grading: pass/fail only

Winter 2022

IND Section: 01 TBA Tim J. Lebestky