NEUROSCIENCE (Div III)
Chair: Professor Tim Lebestky

Advisory Committee: Professors: N. Sandstrom, H. Williams, B. Zimmerberg. Associate Professor: M. Carter, T. Lebestky. Assistant Professor: S. Robinson. Visiting Assistant Professor: M. Clasen. Affiliated Faculty: Professor A. Hane. Lecturer: M. Marvin.

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

BIO 101 (F) The Cell
Taught by: Janis Bravo, Deborah Carlisle, Daniel Lynch, Steven Swoap, Damian Turner
Catalog details
NSCI 201 / BIOL 212 / PSYC 212 (F) Neuroscience
Taught by: Tim Lebestky, Martha Marvin, Shivon Robinson
Catalog details
NSCI 401 (F) Topics in Neuroscience
Taught by: Shivon Robinson
Catalog details
PSYC 101 (F, S) Introductory Psychology
Taught by: Clarence Gillig, Nate Kornell, Noah Sandstrom
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 213 / NSCI 213 (F) Sensory Biology
Taught by: Heather Williams
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.

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**NSCI 201 (F) Neuroscience**

**Cross-listings:** BIOL 212  NSCI 201  PSYC 212

**Primary Cross-listing**

A study of the relationship between brain, mind, and behavior. Topics include a survey of the structure and function of the nervous system, basic neurophysiology, development, learning and memory, sensory and motor systems, consciousness and clinical disorders such as schizophrenia, autism, Parkinson's disease, and addiction. The laboratory focuses on current topics in neuroscience.

**Class Format:** lecture, three hours a week and laboratory, every other week

**Requirements/Evaluation:** a lab practical, lab reports, two hour 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

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**Fall 2019**

**LEC Section: 01**  TR 9:55 am - 11:10 am  Tim J. Lebestky, Shivon A. Robinson

**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 213  (F)  Sensory Biology

Cross-listings:  BIOL 213  NSCI 213

Secondary Cross-listing

What properties of the physical world do organisms sense, and which ones do they ignore? How do they convert physical or chemical energy to a signal within a cell? We will look for answers to these questions by investigating the molecular and cellular mechanisms of sensory transduction—and how these mechanisms define the types of information that the nervous system extracts and encodes. We will also ask how natural selection shapes the type of sensory information that animals extract from the world. Some of the examples we will consider are: bat echolocation (hair cells in the ear), detecting visual motion (amacrine cells in the retina), the constant reshaping of the mammalian olfactory system (chemical mapping of odors), what makes a touch stimulus noxious (in worms and mice), enhanced color vision (in birds, bees, and shrimp), and differences in the way males and females sense odors (pheromones and the vomeronasal organ). Laboratory exercises will cover a range of techniques, including electrophysiological recording, the role of mutations in single genes, and behavioral assays.

Class Format: six hours per week

Requirements/Evaluation:  take-home exams, problem sets, lab reports, and class participation

Prerequisites:  BIOL 101

Enrollment Limit:  28

Enrollment Preferences:  Biology majors and Neuroscience concentrators

Expected Class Size:  24

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 213 (D3) NSCI 213 (D3)

Attributes:  NSCI Group A Electives

Fall 2019

LEC Section: 01  TR 11:20 am - 12:35 pm  Heather  Williams

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

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

NSCI 310  (F)  Neural Development and Plasticity

Cross-listings:  BIOL 310  NSCI 310

Secondary Cross-listing

Development can be seen as a tradeoff between genetically-determined processes and environmental stimuli. The tension between these two inputs is particularly apparent in the developing nervous system, where many events must be predetermined, and where plasticity, or altered outcomes in response to environmental conditions, is also essential. Plasticity is reduced as development and differentiation proceed, and the potential for regeneration after injury or disease in adults is limited; however some exceptions to this rule exist, and recent data suggest that the nervous system is not hard-wired as previously thought. In this course we will discuss the mechanisms governing nervous system development, from relatively simple nervous systems such as that of the fruitfly, to the more complicated nervous systems of humans, examining the roles played by genetically specified programs and non-genetic influences.

Class Format: lecture

Requirements/Evaluation:  exams

Prerequisites:  BIOL 212 (same as PSYC 212 or NSCI 201) and BIOL 202 (or permission of instructor)

Enrollment Limit:  24

Enrollment Preferences:  Biology majors; Neuroscience concentrators; Psych majors

Expected Class Size:  24
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 vertebrate brain, emphasizing both neuroanatomy and neurophysiology. How do specific populations of neurons and their connections analyze 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 brain 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. 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: six hours per week

Requirements/Evaluation: class participation, hour exams, and 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 310 (D3) NSCI 310 (D3)

Attributes: NSCI Group A Electives

Not offered current academic year

Fall 2019

LEC Section: 01 MWF 9:00 am - 9:50 am Matt E. Carter

LAB Section: 02 M 1:00 pm - 4:00 pm Matt E. Carter

NSCI 313 (S) 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.
Class Format: empirical lab course
Requirements/Evaluation: class presentations, participation in discussions and empirical projects, written assignments, and a 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  PSYC Area 1 - Behavioral Neuroscience  PSYC Empirical Lab Course

Spring 2020
SEM Section: 01  TF 2:35 pm - 3:50 pm  Shivon A. Robinson
LAB Section: 02  R 1:00 pm - 4:00 pm  Shivon A. Robinson

NSCI 314  (S) Drug Addiction and Obesity: Tales of a Disordered Brain
Cross-listings: NSCI 314  PSYC 314
Secondary Cross-listing
Drug addiction and obesity are two of the biggest health problems facing our world today. Although obesity and drug addiction are two qualitatively different disorders, recent literature suggests that they share similar neural substrates. The first third of this class will discuss the behavioral and neural underpinnings of drug addiction, the second third of this class will discuss the behavioral and neural underpinnings of obesity, and the last third of the class will discuss their interaction in many different facets. In so doing, students will learn about the animal models used to study drug addiction and obesity (i.e., intravenous self-administration, intracranial self-stimulation, conditioned place preference, conditioned taste avoidance, and locomotor sensitization) and the neurobiological techniques used to understand their underlying mechanisms (i.e., DREADDs, optogenetics, and immunohistochemistry). Utilizing these tools, students will design and conduct an empirical laboratory experiment to study these dysregulated behaviors.
Class Format: seminar
Requirements/Evaluation: presentations and participation in discussions; written assignments; weekly lab meetings will be held and empirical projects presented in a final poster session
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 314 (D3) PSYC 314 (D3)
Attributes: NSCI Group B Electives  PSYC Area 1 - Behavioral Neuroscience  PSYC Empirical Lab Course

Spring 2020
SEM Section: 01  TR 11:20 am - 12:35 pm  Matthew M. Clasen
LAB Section: 02  W 1:00 pm - 4:00 pm  Matthew M. Clasen

NSCI 315  (F) Hormones and Behavior
Cross-listings: NSCI 315  PSYC 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, short papers, midterm, written 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: yes pass/fail option, yes fifth course option

Distributions: (D3)

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

NSCI 315 (D3) PSYC 315 (D3)

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

Not offered current academic year

NSCI 317  (S)  Nature via Nurture: Topics in Developmental Psychobiology

Cross-listings: PSYC 317  NSCI 317

Secondary Cross-listing

Do your genes determine who you are? This course examines the relative contributions of nature (genetics) and nurture (the environment) that lead to individual differences in behavior. Modern neuroscience techniques have discovered new relationships between genes and behavior. Conversely, recent studies on the effects of social factors suggest critical environmental influences on the expression of these genetic determinants. This tutorial will explore the theoretical and empirical issues in animal models of behavioral epigenetics. Topics include child neglect, antisocial behavior, addiction, anxiety, risk-taking, empathy, and depression. Each tutorial pair will design and conduct an empirical laboratory project that will explore their own experimental question about the interaction of genes and environment in determining behavioral phenotypes.

Requirements/Evaluation: each week, students will either present an oral argument based on a 5-page position paper or respond to their partners’ paper; Weekly lab meetings will be held and empirical projects presented in a final poster session

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

Enrollment Limit: 10

Enrollment Preferences: Neuroscience concentrators and Psychology majors

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:

PSYC 317 (D3) NSCI 317 (D3)

Attributes: NSCI Group B Electives  PHLH Biomedical Determinants of Health  PHLH Reproductive, Maternal and Child Health  PSYC Area 1 - Behavioral Neuroscience  PSYC Empirical Lab Course

Not offered current academic year

NSCI 319  (F)(S)  Neuroethics  (WS)
Cross-listings: STS 319  NSCI 319  PSYC 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:

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

Fall 2019
TUT Section: T1  TBA  Noah J. Sandstrom

Spring 2020
TUT Section: T1  Cancelled

NSCI 342  (S)  Neural and Hormonal Basis of Hunger

Cross-listings: NSCI 342  BIOL 412

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:
NSCI 342 (D3) BIOL 412 (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: discussion, 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 2020
SEM Section: 01 Cancelled
SEM Section: 02 TR 11:20 am - 12:35 pm Tim J. Lebestky

NSCI 397 (F) Independent Study: Neuroscience

Independent study.

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

Distributions: (D3)

Fall 2019
IND Section: 01 TBA Tim J. Lebestky

NSCI 398 (S) Independent Study: Neuroscience

Independent study.

Class Format: independent study

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

Distributions: (D3)

Spring 2020
**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.

**Class Format:** tutorial meetings

**Requirements/Evaluation:** presentations, short papers, and a term paper

**Prerequisites:** open only to seniors in the Neuroscience program

**Enrollment Limit:** 18

**Expected Class Size:** 14

**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

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**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.

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

**Distributions:** (D3)

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**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.

**Class Format:** independent study

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

**Distributions:** (D3)

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**Winter Study**

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**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. Emphasis will be on the neuroscience itself with opportunities for students to make connections to their own learning processes and strategies. Students will engage in evaluating primary neuroscience research articles using the medical model to evaluate validity. They will develop their own evaluation systems for identifying valid research related to learning and the brain. Small groups of 2-3 students will be assigned different articles on the same topic and engage in class discussions based on their reading. These will include their interpretations of the research and potential applications to learning strategies and interventions. A final project will a paper and class presentation about topics they select based on their interests and goals for taking the course. Adjunct Instructor Bio: Judy Willis, M.D. 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. She is on expert consulting staff for NBC News Education Nation, Edutopia, and media liaison for American Academy of Neurology.

**Requirements/Evaluation:** short paper and final project or presentation

**Prerequisites:** none

**Enrollment Limit:** 12

**Enrollment Preferences:** upper grade priority

**Grading:** pass/fail only

**Attributes:** EXPE Experiential Education Courses

Winter 2020

LEC Section: 01    TWR 10:00 am - 12:50 pm    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 2020

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 2020

IND Section: 01    TBA    Tim J. Lebestky