NS&B102 Science Information Literacy
Information literacy is the set of skills needed to find, retrieve, analyze, and use information. This course will focus on teaching these skills as especially applied to scientific information. Students will learn to determine the nature and extent of information needed, to acquire needed information effectively and efficiently, to evaluate information and its sources critically, and to use information effectively to accomplish a specific purpose. Students will also examine the economic, ethical, legal, and social issues surrounding the use of information and how information literacy is important to lifelong learning and keeping current to new developments in his/her field. Topics will include the structure of scientific information and scientific publishing, the research process, types of information retrieval systems, search strategies and syntax, use of bibliographic management software (e.g., EndNote), criteria for critical evaluation, open-access publication, plagiarism, and copyright.
Offering: Crosslisting
Grading: OPT
Credits: 0.50
Gen Ed Area: None
Identical With: MB&B102, CHEM102, BIOL102, PHYS103, PSYC102, E&ES102, ASTR102, MB&B102, CHEM102, BIOL102, PHYS103, PSYC102, E&ES102, ASTR102
Prereq: None

NS&B149 Neuroethology: Sensory Basis of Animal Orientation and Navigation
This course is about the sensory and neuronal processes underlying the ability of animals to orient in and move through their environments. We will consider the basic functions of sensory and nervous systems that underlie the remarkable abilities of animals to orient themselves in personal space, move through their home range, and move through the world in long-distance migrations and in homing. Animals from invertebrates through fish, birds, and mammals will be considered. The format of the course will be seminar/discussion and some lectures with heavy student participation. The course is intended for first-years with high school level courses in at least two of the following: biology, chemistry, or physics.
Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB, NSM-NSB, NSM-PSYC, NSM-PSYC
Identical With: BIOL149, BIOL149, BIOL149, BIOL149, BIOL149, BIOL149, BIOL149, BIOL149, BIOL149
Prereq: None

NS&B210 Research Methods in Cognition
This course will examine the experimental method as a means of gaining knowledge about human cognition. Students in this course will learn about general research methods in cognitive psychology related to experimental design, understanding and interpreting research, and ethical issues involved in research with human subjects. Classic research paradigms in cognitive psychology will be explored through the use of interactive demonstrations and in-class experiments. In addition, students will be instructed in how to write well-organized research reports.
Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC
Identical With: PSYC210, PSYC210, PSYC210, PSYC210, PSYC210, PSYC210, PSYC210, PSYC210, PSYC210
Prereq: PSYC105 OR PSYC105 OR PSYC105 OR PSYC105

NS&B213 Behavioral Neurobiology
This course will introduce the concepts and contemporary research in the field of neuroscience and behavior. The course is intended for prospective neuroscience and behavior majors (for whom it is required) and for biology and psychology majors who wish a broad introduction to neuroscience. The initial few weeks will be devoted to fundamental concepts of neuroanatomy and neurophysiology. Subsequent classes will deal in-depth with fundamental problems of nervous system function and the neural basis of behavior, including neurotransmitter systems; organization of the visual system and visual perception; the control of movement; neurological and neuropsychiatric disorders; the endocrine system; control of autonomic behaviors such as feeding, sleep, and temperature regulation; the stress response; and language, learning, and memory. Experimental results from a variety of species, including humans, will be considered.
Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-NSB
Identical With: BIOL213, PSYC240
Prereq: None

NS&B215 Research Methods: Behavioral Methods in Animal Research
This is a research methods course that provides an understanding of the different approaches to animal research, particularly those using rodent models. It provides students with an understanding of the different techniques employed by researchers and the questions they address. Students will also get a sense of how to design a behavioral experiment, including the use of control groups and counterbalancing. The course will follow a lecture/discussion format where students will learn about different forms of conditioning (operant/classical) and how these apply to various behavioral tasks such as autoshaping, self-administration, fear conditioning, etc. (see readings for more examples). This will be combined with regular class discussion of research articles dealing with each topic, including some of the earlier reports and more recent applications. The focus of the course will be on trying to prepare students to design and carry out behavioral/animal research in a laboratory setting.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC
Identical With: PSYC215, PSYC215, PSYC215, PSYC215, PSYC215, PSYC215, PSYC215, PSYC215, PSYC215
Prereq: PSYC105 OR [NS&B213 or BIOL213 or PSYC240] OR PSYC105 OR [NS&B213 or BIOL213 or PSYC240]

NS&B217 Neuroscience Perspectives on Psychopathologies
The goals of this course are to (1) acquaint students with the signs and symptoms, cognitive sequelae, and functional consequences of a range of DSM-defined psychiatric categories, e.g., schizophrenia, bipolar illness, depression, attention-deficit disorder, and posttraumatic stress disorder, and to introduce standardized methods for describing and quantifying symptoms and cognitive skills in these disorders; (2) begin to critically evaluate links between disordered behavior and disrupted activity in anatomically- and neurochemically-defined neural systems based on contemporary structural and functional neuroimaging methodology, as well as links between common features of disordered behavior in psychiatric syndromes and neurological illnesses with well-defined pathophysiology; and (3) describe how emerging information regarding neural correlates of disordered behavior aids development of novel treatment technologies.
and song production in birds; and the effects of hormones on sexual behavior, reproductive and aggressive behavior in birds, lizards, and rodents; song learning and metamorphosis; sexual differentiation of the vertebrate brain and behavior; survey of our understanding of the relationship between endocrinology, the environment, and hormone secretion. This course will provide a critical expression of specific behaviors. How do behavior, social context, and the environment influence hormone secretion? This course will explore how the brain enables the mind. We will begin with an overview of the neural substrates of cognition and the tools for understanding the structure and function of the human brain. Then we will cover neural processes that support sensory perception and attention, memory, motor control, executive control, and emotional and social functioning. We will also discuss mechanisms of brain evolution, development, and repair, and their implications for various diseases and disorders.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC
Identical With: PSYC247, PSYC247
Prereq: PSYC105

**NS&B220 Cognitive Psychology**

This course offers a broad introduction to scientific theory and research in the study of human mental processes. Topics include perception, imagery, attention, memory, problem solving, decision making, and language. The course draws on both behavioral and cognitive neuroscience approaches and emphasizes the relationship between mind and brain; links to everyday experience and practical applications are also highlighted. Class activities include lectures, discussion, and demonstrations.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC
Prereq: PSYC105 OR PSYC105 OR (NS&B213 or BIOL213 or PSYC240)

**NS&B221 Human Memory**

This course is designed to provide students with an in-depth overview of the different human memory systems revealed by empirical research in the fields of cognitive psychology and cognitive neuroscience. The different systems include procedural memory, working memory, perceptual memory, semantic memory, and episodic memory.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC, SBS-PSYC, NSM-PSYC
Identical With: PSYC221, PSYC221, PSYC221, PSYC221, PSYC221, PSYC221
Prereq: PSYC105 OR (PSYC220 or NS&B220) OR (NS&B213 or BIOL213 or PSYC240) OR (PSYC222 or NS&B222)

**NS&B222 Sensation and Perception**

This course explores our perceptual systems and how they create and shape our experience of the world around us. We will consider the neurophysiology of perceptual systems as well as psychological approaches to the study of perception, covering all of the human senses with a special emphasis on vision. Class demonstrations will introduce students to interesting perceptual phenomena.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC
Identical With: PSYC222, PSYC222, PSYC222, PSYC222
Prereq: PSYC105 OR (NS&B213 or BIOL213 or PSYC240)

**NS&B224 Hormones, Brain, and Behavior**

Hormones coordinate the anatomical, physiological, and behavioral changes necessary for developmental, seasonal, and diurnal transition in animals. These molecules have profound effects on the development of the brain and on adult brain function. How do hormones orchestrate brain assembly and the expression of specific behaviors? How do behavior, social context, and the environment influence hormone secretion? This course will provide a critical survey of our understanding of the relationship between endocrinology, the brain, and behavior in a variety of animal systems. Select topics include insect metamorphosis; sexual differentiation of the vertebrate brain and behavior; reproductive and aggressive behavior in birds, lizards, and rodents; song learning and song production in birds; and the effects of hormones on sexual behavior and cognitive function in primates, including humans. The exploration of a variety of systems will provide students with an appreciation of the ways in which the relationships between hormones and behavior vary across species, as well as the extent to which these relationships are conserved.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIOL224
Prereq: [NS&B213 or BIOL213 or PSYC240] OR [BIOL182 or MB&B182]

**NS&B225 Cognitive Neuroscience**

This course provides an introduction to cognitive neuroscience—the study of how the brain enables the mind. We will begin with an overview of the neural substrates of cognition and the tools for understanding the structure and function of the human brain. Then we will cover neural processes that support sensory perception and attention, memory, motor control, executive control, and emotional and social functioning. We will also discuss mechanisms of brain evolution, development, and repair, and their implications for various diseases and disorders.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB, NSM-NSB
Identical With: PSYC225, PSYC225, PSYC225, PSYC225, PSYC225, PSYC225
Prereq: PSYC105 OR (NS&B213 or BIOL213 or PSYC240) OR (PSYC105 AND [NS&B213 or BIOL213 or PSYC240]) OR PSYC105 OR (NS&B213 or BIOL213 or PSYC240)

**NS&B227 Motivation and Reward**

This course will focus on motivation and reward, providing students with a background and understanding of the various theories and approaches to studying the topic of motivation, including an introduction to some of the history and the current advances in the field. It will do so by covering different forms of reward, including food, sex, drugs, and aggression, and examine cases of disordered motivation such as addiction.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB, NSM-NSB
Prereq: PSYC105 OR (NS&B213 or BIOL213 or PSYC240) OR NS&B213 OR PSYC2105

**NS&B228 Clinical Neuropsychology**

This introductory course will examine the relationship between brain functioning and cognition, behavior and emotion through the study of human brain disorders. The course will begin with a brief overview of basic human regional neuroanatomy, followed by an exploration of neuropsychological assessment and intervention (its history, rationale, goals, and procedures). These topics will provide a foundation for the discussion of more specific topics in neuropsychology (e.g., traumatic brain injury, dementia, psychiatric disorders, cerebrovascular disorders, seizure disorders, learning disabilities, autism, etc.) and the role that neuropsychologists play in the evaluation and treatment of individuals with these disorders.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC
Identical With: PSYC228, PSYC228, PSYC228, PSYC228
Offering: intracellular recording techniques.include studies of single cells and simple nervous systems using extracellular,signals from nerve and muscle cells. We will make use of a range of preparations
This course introduces a wide range of techniques for recording the electrical
Neuromuscular. The brain cannot be understood without first elucidating the properties and functions of its
component neurons. This course will focus on cell biological studies of the
behavior, and social dominance.

NS&B249 Neuroethology
Basic and integrative processes of nervous systems are considered with attention to their roles in species-typical behaviors. After a brief initial consideration of cellular properties of individual nerve cells, synaptic interactions and neuroanatomy form the basis for studying systems of neurons and their
behavioral significance during the remainder of the semester. The focus is on the neuronal basis of naturalistic behaviors in animals from mollusks and insects through fish, birds, and mammals. Topics include sensory transduction, central processing of sensory information, production and control of patterned behaviors and movements, neural basis of orienting and navigation, and sensory-motor integration.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: Neuroscience & Behavior
Idenitcal With: BIOL249, BIOL249, BIOL249, BIOL249
Prereq: [(BIOL182 or MB&B182) OR [(NS&B213 or PSYC240) AND (BIOL182 or MB&B182)] OR [(NS&B213 or BIOL182) OR (MB&B182) OR (BIOL182 or MB&B182) OR [(NS&B213 or BIOL182) OR (PSYC240) OR (BIOL196 or MB&B196)] OR [(NS&B213 or BIOL213) OR (PSYC240) OR (BIOL196 or MB&B196)] OR [(NS&B213 or BIOL196) OR (MB&B196)]]

NS&B247 Laboratory in Neurophysiology
This course introduces a wide range of techniques for recording the electrical signals from nerve and muscle cells. We will make use of a range of preparations and both invertebrate and vertebrate species (except birds and mammals). Experiments deal with sensory, motor, and coordinating elements and include studies of single cells and simple nervous systems using extracellular, intracellular recording techniques.
Offering: Crosslisting

NS&B243 Neurohistology
The aim of this course is to study the microscopic structure of the nervous system. Structural and functional relationships between neurons and glia, as well as the organization of major brain regions (cortex, hippocampus, and cerebellum) will be examined. In addition to traditional histological preparations, modern techniques including confocal microscopy and immunohistochemistry will be studied and performed. Laboratory exercises will include the preparation and visualization of microscopic slides using a variety of techniques. While this course will focus on mammalian nervous system, skills learned in this course will be applicable in a variety of research models.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: Neuroscience & Behavior
Idenitcal With: BIOL243, BIOL243, BIOL243, BIOL243, BIOL243, BIOS243, BIOL243
Prereq: [NS&B213 or BIOL213 or PSYC240]

NS&B245 Cellular Neurophysiology
This course will deal with basic aspects of neuronal physiology, including the function of excitable membranes and the transfer of information between cells (synaptic physiology, neurochemistry, membrane receptors). In connection with each of these topics, consideration will be given to short- and long-term modification of neuronal function. Toward the end of the course, we will examine the neurophysiology of auditory perception in birds and mammals, focusing on the initial transduction of sound waves into neuronal codes.
Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: Neuroscience & Behavior
Idenitcal With: BIOL245, BIOL245, BIOL245, BIOL245, BIOL245, BIOL245
Prereq: [NS&B213 or BIOL213 or PSYC240]

NS&B239 Functional Anatomy of the Human Brain
A mass of tissue the consistency of firm jello and weighing about 2.5 pounds in the adult human, the brain is an organ that controls nearly every function of the body. It also enables the highest cognitive functions of humans such as learning and memory, thinking, consciousness, aesthetic appreciation, etc. Its malfunction results in a variety of diseases such as senility, mood disorders, motor dysfunctions, etc. This course will examine in some detail the complex organization of this organ and how it performs some of its basic functions. It will be of special interest to premed students; NS&B, biology, and psychology majors; and anyone simply interested in how the brain works.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: Neuroscience & Behavior
Idenitcal With: BIOL239, PSYC239, BIOL239, PSYC239, BIOL239, PSYC239, BIOL239, PSYC239, BIOL239, PSYC239, BIOL239, PSYC239, BIOL239, PSYC239, BIOL239, PSYC239
Prereq: [NS&B213 or BIOL213 or PSYC240]
nervous system. We will explore the structure and function of neurons, synapses, and circuits. Using both text books and primary literature, we will examine the basic cellular and molecular mechanisms that underlie the formation, function, and plasticity of neurons and circuits. Areas studied will include polarity, synapse formation, synaptic transmission, intracellular transport, plasticity, and regeneration.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Identical With: BIOL252, BIOL252, BIOL252, BIOL252
Prereq: [NS&B213 or BIOL213 or PSYC240] OR ([MB&B181 or BIOL181] AND [NS&B213 or BIOL213 or PSYC240]) OR ([MBB195 or BIOL195] AND [NS&B213 or BIOL213 or PSYC240])

NS&B254 Comparative Animal Behavior
An introduction to the study of animal behavior, this course will examine the factors that control the behavior of vertebrates and invertebrates within evolutionary, social, and physiological contexts.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: BIOL254, BIOL254, BIOL254, BIOL254
Prereq: [BIOL182 or MB&B182] OR [BIOL196 or MB&B196] OR [NS&B213 or BIOL213 or PSYC240]

NS&B280 Applied Data Analysis
In this project-based course, you will have the opportunity to answer questions that you feel passionately about through independent research based on existing data. Students will have the opportunity to develop skills in generating testable hypotheses, conducting a literature review, preparing data for analysis, conducting descriptive and inferential statistical analyses, and presenting research findings. The course offers unlimited one-on-one support, ample opportunities to work with other students, and training in the skills required to complete a project of your own design. These skills will prepare you to work in many different research labs across the University that collect empirical data. It is also an opportunity to fulfill an important requirement in several different majors.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-QAC, NSM-QAC, NSM-QAC, NSM-QAC
Identical With: QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280, QAC201, SOC257, GOVT201, PSYC280
Prereq: None

NS&B299 Waves, Brains, and Music
Pressure waves bounce against the ear, and we create perceptions called sounds from them. We organize sounds to make music, making more waves, and the cycle goes forward. This course will provide an introduction to the fraction of these phenomena that can be measured and analyzed, focusing on the mathematics of signal analysis, auditory physiology, and the physiology of musical perception and production. Periodic waveforms include musical tones and the voltage fluctuations that can be measured from brains. The first third of this course (waves) is an introduction to the quantitative analysis of periodic waveforms, with the goal that the student will have a better understanding of how to interpret the analysis of both musical sounds and neuronal recordings. The second part of the course (brains) examines the known mechanical processes (physiology) by which the mammalian brain analyzes the periodic waveforms that we interpret as sound. The third part of the course uses these lessons to examine original research articles about the neurosciences of music, i.e., how neuronal networks produce musical perception.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: BIOL299, BIOL299, BIOL299, BIOL299, BIOL299, BIOL299, BIOL299, BIOL299, BIOL299, BIOL299
Prereq: [NS&B213 or BIOL213 or PSYC240]

NS&B303 Receptors, Channels, and Pumps: Advanced Topics in Membrane Protein Structure and Function
Membrane proteins constitute a third of all cellular proteins and half of current drug targets, but our understanding of their structure and function has been limited in the past by technological obstacles. In spite of this, the past 10 years have yielded a wealth of new membrane protein structures that have helped to uncover the mechanistic underpinnings of many important cellular processes. This class will examine some of the new insights gained through the various techniques of modern structural biology. We will start with a general review of membrane properties, structural techniques (x-ray crystallography, EM, NMR, etc.), and protein structure analysis. We will then look at common structural motifs and functional concepts illustrated by different classes of membrane proteins. Students will read primary literature sources and learn how to gauge the quality and limitations of published membrane protein structures. These tools will be generally applicable to evaluating soluble protein structures as well.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-MBB, NSM-MBB
Prereq: [CHEM251 AND CHEM252 AND {MB&B208 or BIOL208}]

NS&B308 Psychology of Action
This course will introduce students to the study of the coordination and control of action. Topics will include control of movement, motor planning, and the linkage between perception, action, and cognition.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC
Identical With: PSYC308
Prereq: None

NS&B316 Schizophrenia and Its Treatment: Neuroscientific, Historical, and Phenomenological Perspectives
The goal of the seminar will be to critically investigate the concept of schizophrenia as a unitary disease construct, from historical, neuroscientific, and phenomenological approaches, and the implications of these views for our understanding of treatment in the disorder. How are we to make sense of a psychiatric disorder that has changed so substantially in definition over time, with wide interindividual difference in symptom expression and functional outcome, a wide array of competing theories regarding etiology and biological mechanisms, and correspondingly diverse treatment interventions? We will engage these questions through three separate units that will evaluate the disorder from three different levels of analysis: (1) readings in the history of psychiatry and the perspective they cast on schizophrenia as a unitary disease concept; (2) an analysis of contemporary work in neuroimaging and experimental cognition in the disease and the current status of creating a coherent account...
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of neurocognitive mechanisms of the disease, as well as a neurocognitive approach to novel interventions; (3) new work on understanding the experience of the disease from first-person accounts and the systematic analysis of these accounts as a window to understanding heterogeneity in the disease and novel approaches for therapy.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC, NSM-PSYC
Identical With: PSYC316, PSYC316, PSYC316, PSYC316, PSYC316, PSYC316, PSYC316, PSYC316
Prereq: None

**NS&B317 Neuroethics**

Ethics or morality is one of the complex features of human behavior. This course will explore "Neuroethics" from two perspectives. (1) The neuroscience of ethics, i.e. the role of the human brain in ethical or moral behavior. (2) The ethics of neuroscience, i.e. the ethical implications of manipulating the brain. The first perspective will relate to the premise that human morality is embodied in and operates based on the principles of the functional architecture of the brain, in particular, the cerebral cortex. The course will examine the organization and neural networks, especially of the association cortices (prefrontal Cortex - ventromedial, dorsolateral and orbitofrontal cortex; the cingulate cortex; temporal association cortex; and the inferior and superior parietal lobes). The course will review studies on the development of moral values in children and their neural underpinnings, leading to studies of the functions of the adult brain in moral or ethical decision-making. Topics such as the neural basis of resolving the "Trolley Problem", neuroeconomics, altruism, poverty, forgiveness, compassion will provide the basis for this discussion. We will evaluate from a neuroscience perspective questions such as determinism and free will, and the sense of "self", which ideas have played a significant role in ethical theories. Based on this body of knowledge, we will look at emerging ethical issues arising from technological developments that allow for manipulating the normal and diseased brain. A variety of questions will be examined, among them - brain imaging and privacy, enhancement of normal brain function through chemical, electrical and electromagnetic stimulation, implanted neural interfaces, restoring brain damage, neuroscience and the law.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Prereq: [NS&B225 or PSYC225] OR [NS&B213 or BIOL213 or PSYC240] OR [NS&B225 or PSYC225] OR [NS&B213 or BIOL213 or PSYC240]

**NS&B325 Stem Cells: Basic Biology to Clinical Application**

This course will cover recent advances in stem cell biology, including adult and embryonic stem cells. We will examine the ethics as well as the science of this emerging field.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Prereq: BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, ENVS326, BIOL325, ENVS326, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325, BIOL325
Prereq: [(MB&B181 or BIOL181) AND (BIOL182 or MB&B182)] OR [BIOL182 or MB&B182] OR [BIOL196 or MB&B196]

**NS&B326 Drugs of Abuse from Neurobiology to Behavior**

This course provides a comprehensive analysis of the neuroscience of substance abuse. This is a lecture course with seminar-style student presentations and group discussions. The lecture portion of the course emphasizes basic principles of psychopharmacology, distribution and elimination of drugs, drug-receptor interactions and dose-response relationships, structure of neurons, neurophysiological mechanisms involved in synaptic activity, and the distribution of specific neurotransmitter systems. With a focus on pharmacokinetics, research methodology, and addiction processes, the mechanism of drug action as a basis for evaluation of behavioral functions will be explored. The seminar portion of the course will focus on the neurobiological actions of specific drug classes, including stimulants, depressants, hallucinogens, and opioids.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Identical With: BIOL326, BIOL326
Prereq: [NS&B213 or BIOL213 or PSYC240]

**NS&B328 Chemical Senses**

The least well understood of the senses, chemical sensation, is key to survival and behavior of many species. In this course, you will study the structure and function of sensory neurons in both the gustatory and olfactory systems, as well as in chemosensory irritation. We will examine coding of sensory information to understand how higher cortical areas interpret stimuli. We will look at a variety of animal models and discover common organizing principles across phyla. An emphasis will be placed on the cell biology of these systems. Students will participate in reading, analyzing, and presenting recent studies from different areas within chemical sense to highlight recent findings and where the emphasis in chemosensory research is focused.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Identical With: BIOL328, BIOL328, BIOL328, BIOL328, BIOL328, BIOL328, BIOL328, BIOL328, BIOL328, BIOL328
Prereq: [NS&B213 or BIOL213 or PSYC240]

**NS&B329 Neural Costs of War**

This course focuses on stress reactions that result of exposure to war, combat, and related atrocities. You will learn about the diagnosis of PTSD, including its development and history. There is a strong emphasis on the neural and cognitive mechanisms for stress-related psychopathology, and the overlap of psychological and neural systems with the damaging effects of traumatic brain injury are studied. While the impact of these mechanisms on the social, interpersonal, and occupational is considered, this is not the focus of the course. To be fully prepared for this course, students should have a solid grounding in neuroscience and behavior, as well as basic psychopathology.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: SBS-PSYC, SBS-PSYC
Identical With: PSYC329, PSYC329, PSYC329, PSYC329
Prereq: None

**NS&B334 Psychopharmacology**

The purpose of this course is to examine basic principles of psychopharmacology. After reviewing the bases of neural communication and functioning, the use and/or misuse of various classes of drugs will be reviewed. Special emphasis will be given to the role of drugs in treating psychological disorders. Topics to be discussed include treatment of psychological disorders, analgesic medications, pharmacology of drug abuse, and psychopharmacology of special populations (adolescents and geriatric populations). Class activities include lectures and discussions.
NS&B341 Psychology of Learning and Memory
This course aims to provide students with an in-depth overview/exploration of the psychological and neural processes underlying learning and memory. Topics to be covered include different memory systems and frameworks (e.g., working memory, semantic memory, episodic memory), remembering and forgetting (e.g., phenomenal experience of remembering, various mechanisms of forgetting), reality/source monitoring (e.g., memory attributions, true and false memories), and the influence of emotional and social factors on learning and memory (e.g., social remembering). We will explore these topics through critical reading/discussion of theoretical and empirical research articles in the fields of psychology and cognitive neuroscience. 
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: SBS-PSYC, SBS-PSYC
Identical With: PSYC334, PSYC334 
Prereq: [PSYC220 or NS&B220] OR [NS&B213 or BIOL213 or PSYC240]

NS&B347 Mammalian Cortical Circuits
While scientists are still very unsure of how the mammalian cortex enables conscious perception and thought, there has been a tremendous explosion of knowledge recently concerning the wide heterogeneity of neuronal classes and the specific kinds of connections between these classes. Detailed wiring diagrams of local cortical circuits are emerging, colored with dynamic connections that have created a wellspring of ideas motivated toward understanding the cortex with reverse-engineering strategies. This course will focus on cortical circuit studies in neocortex, with an emphasis on somatosensory cortex. Students will come to know, for example, many different varieties of inhibitory interneurons in terms of their firing properties, synaptic plasticities, the connections they make with other neurons, and what roles they might play in governing cortical dynamics. 
Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: BIOL347, BIOL347, BIOL347, BIOL347, BIOL347
Prereq: [NS&B213 or BIOL213 or PSYC240]

NS&B348 Origins of Knowledge
In this course we will discuss in-depth a selection of current topics in cognitive development, centering on questions concerning the origins of knowledge. (What kinds of knowledge do we possess even very early in life? How does that knowledge change over time?) We will examine these questions within specific subject areas such as object perception, space perception, number understanding, and understanding of other minds, surveying evidence from different stages of human individual development as well as evidence from different nonhuman species. 
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: SBS-PSYC, SBS-PSYC
Identical With: PSYC348, PSYC348, PSYC348, PSYC348
Prereq: None

NS&B351 Neurobiology of Learning and Memory
This course will focus primarily on vertebrate model systems such as chick, mouse, and fish. We will also examine human diseases, including muscular dystrophies and other neuromuscular disorders. 
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: SBS-PSYC, SBS-PSYC
Identical With: PSYC341, PSYC341, PSYC341, PSYC341, PSYC341, PSYC341, PSYC341
Prereq: None

NS&B343 Muscle and Nerve Development
We will examine the structure and function of muscle cells, the development of muscle cell identity, the development of motor neurons, and the interactions between nerve and muscle that lead to a functioning neuromuscular system. The course will focus primarily on vertebrate model systems such as chick, mouse, and fish. We will also examine human diseases, including muscular dystrophies and other neuromuscular disorders. 
Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL
Identical With: BOL343, NS&B543, BIOL543, BIOL343, NS&B543, BIOL543, BIOL343, NS&B543, BIOL343, NS&B543, BIOL543
Prereq: BOL218 OR [BOL182 or MB&B182] AND [BOL212 or MB&B212]) OR ([BOL182 or MB&B182] AND [NS&B213 or BIOL213 or PSYC240]) OR ([BOL196 or MB&B196] AND [BOL212 or MB&B212]) OR ([BOL196 or MB&B196] AND [NS&B213 or BIOL213 or PSYC240])

NS&B345 Developmental Neurobiology
Near the top of the list of unsolved mysteries in biology is the enigma of how the brain constructs itself. Here is an organ that can make us feel happy, sad, amused, and in love. It responds to light, touch, and sound; it learns; it organizes movements; it controls bodily functions. An understanding of how this structure is constructed during embryonic and postnatal development has begun to emerge from molecular-genetic, cellular, and physiological studies. In this course, we will discuss some of the important events in building the brain and explore the role of genes and the environment in shaping the brain. With each topic in this journey, we will ask what the roles of genes and the environment are in forming the nervous system. We will also discuss developmental disorders resulting from developmental processes that have gone astray. This is a reading-intensive seminar course emphasizing classroom discussions, with readings from a textbook and the primary scientific literature. 
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIOL345, NS&B545, BIOL545
animal's environment, making this process somewhat analogous to learning. In fact, the neural substrates for learning are likely to be a subset of the basic steps used during brain development. Moreover, the developmental rules guiding brain assembly place constraints on the what, how, and when of brain function and learning. Therefore, this course will also cover select topics in basic developmental neurobiology.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIOL351
Prereq: [NS&B213 or BIOL213 or PSYC240]

NS&B353 Neurobiology of Neurological Disorders
This course aims to provide a foundation in the underlying mechanisms of neurological and psychiatric disorders. We will explore through lectures and readings of primary literature a number of important neurological and psychiatric diseases, including autism, schizophrenia, Alzheimer's disease, mental retardation, epilepsy, and Parkinson's disease. This course focuses on the fundamental molecular and cellular mechanisms that underlie neurological disorders and is designed to engage students who wish to study basic aspects of brain function.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB
Identical With: BIOL353, PSYC353
Prereq: [NS&B213 or BIOL213 or PSYC240]

NS&B356 Neurodevelopmental Disorders
This course aims to provide a foundation in the underlying mechanisms of neurodevelopmental disorders. We will explore through lectures and readings of primary literature a number of important neurological and psychiatric diseases, including genetic disorders such as Down syndrome, Fragile X, and Williams syndrome; spectrum disorders such as autism and fetal alcohol syndrome; ADHD, Tourettes, Cerbral Palsy, and some motor disorders including developmental coordination disorder, stereotypic movement disorder, sensory inigation disorder, and neonatal hypoxia. This course focuses on the fundamental molecular and cellular mechanisms that underlie neurological disorders and is designed to engage students who wish to study basic cellular aspects of brain function.

Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB
Identical With: BIOL356, PSYC356, BIOL356, PSYC356, BIOL356, PSYC356, BIOL356, PSYC356
Prereq: [NS&B213 or BIOL213 or PSYC240] OR [NS&B213 or BIOL213 or PSYC240]

NS&B360 Capstone Experience in Neuroscience and Behavior
In this cohesive and interactive experience for junior and senior neuroscience and behavior majors, students read the primary literature on the topic of how experience changes the brain, gain proficiency in scientific writing and editing, and carry out service-learning projects in local high schools. This course is part of the course clusters in Disability Studies and Service Learning, as well as the certificate in Writing.

Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-NSB, NSM-NSB, NSM-NSB, NSM-NSB, NSM-NSB
Identical With: BIOL360, BIOL360, BIOL360, BIOL360
Prereq: [NS&B213 or BIOL213 or PSYC240]

NS&B381 Advanced Seminar in Memory Theory and Research
This course is designed to allow students to conduct supervised research in the area of human memory. Working as a team with the instructor, students will undertake a semester-long project. Current research is focused on the use of a memory camera, called SenseCam, to enhance the retention of everyday events for people with unimpaired memory ability, as well as with people who suffer from different memory impairments.

Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC
Identical With: PSYC381, PSYC381
Prereq: None

NS&B382 Advanced Research in Decision Making
This course is designed to allow students to conduct supervised research in the area of the cognitive psychology of reasoning and decision making. Working as a team with the instructor and other members of the research group, students will undertake a semester-long experimental research project on a topic in reasoning and decision making.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: SBS-PSYC, SBS-PSYC
Identical With: PSYC382, PSYC382
Prereq: None

NS&B383 Advanced Research in Learning and Memory
This course is designed to allow students to conduct supervised research in the area of human learning and memory. In this advanced research course, students will become familiar with both classic and contemporary studies in memory and undertake a semester-long experimental research project that seeks to answer a current question in the field of memory research either individually or as a group. Students will get to work on all aspects of the research project, including reviews of the background literature; generation of research ideas; the design, conduct, and analysis of a study; and a write-up of research findings in a journal-article format.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: SBS-PSYC, SBS-PSYC
Identical With: PSYC383, PSYC383, PSYC383, PSYC383
Prereq: None

NS&B390 Experimental Investigations into Reading
Experienced readers can easily recognize thousands of words. The mental dictionaries of these readers are efficiently organized to allow rapid and seemingly effortless word recognition. There are still many unanswered questions about the processes involved in visual word recognition. In this class, students will work together with the instructor to design and carry out an experimental investigation relating to reading and word recognition. The semester will provide students with a chance to integrate all aspects of the experimental process: idea formation, experimental design, data collection and analysis, interpretation, write-up, and presentation.

Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC
Identical With: PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390, PSYC390
Prereq: None
NS&B392 Behavioral Methods in Affective Neuroscience
This research methods course teaches experimental design and methods in experimental psychopathology using tools to conduct behavioral research in cognitive-affective neuroscience. Course material includes studies from the contemporary psychopathology research literature, with a focus on emotion interactions. Methods taught include statistical procedures (e.g., repeated measures ANOVA) and tools for carrying out research and analyzing data (e.g., computer programming for stimuli presentation and data processing). Neuroimaging techniques including the Evoke Response Potential are also sometimes included. Students in this course are expected to work independently.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC, NSM-PSYC
Identical With: PSYC392, PSYC392, PSYC392, PSYC392, PSYC392, PSYC392
Prereq: None

NS&B393 Advanced Research in Cognition and Neuropsychiatric Illness
Students in this advanced undergraduate research course will work in teams on novel and ongoing research studies focused on understanding neurocognitive dysfunction and its treatment in neuropsychiatric illness. Students will be matched to a research project and will participate in different aspects of this research including background literature review, acquiring elementary skills in neurocognitive and symptom assessment, and collecting and/or analyzing extant data using SPSS. Students may also be involved in learning cognitive training procedures.
Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC
Identical With: PSYC393, PSYC393
Prereq: None

NS&B398 Advanced Research in Auditory Cognitive Neuroscience
This course provides in-depth training on the methods of auditory cognitive neuroscience. We will review contemporary studies in auditory cognitive neuroscience, specifically in speech, language, and music. Students will design and implement a group project, learn to analyze the data, and write up the results in an end-of-term paper.
Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-PSYC
Identical With: PSYC398
Prereq: None

NS&B399 Lab in Gambling, Drugs and Junk-Food
This intensive laboratory course provides in-depth training on the experimental methods of behavioral neuroscience of motivation and reward using rodent research techniques including the hardware and software necessary for this type of research, and will be encouraged to adapt existing behavioral paradigms to answer new questions.
Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC, NSM-PSYC
Identical With: PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399, PSYC399
Prereq: None

NS&B400 Academic Skills
The objectives of this course are 1) build a supportive cohort that will help students sustain their goals when they enter graduate school, and 2) provide students with skills they will need to succeed in graduate school. Students will work on writing, presentation, and discussion skills. This will be done by reading some classic books on writing, critiquing the ability of different figures and graphs to convey information, reading and discussing scientific papers and giving research presentations.
Offering: Crosslisting
Grading: A-F
Credits: 0.25
Gen Ed Area: NSM-EES, NSM-EES, NSM-EES, NSM-EES
Identical With: E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400, E&ES400, PHYS400, PSYC400
Prereq: None

NS&B401 Individual Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
Offering: Host
Grading: OPT

NS&B402 Individual Tutorial, Undergraduate
Offering: Host
Grading: OPT

NS&B407 Senior Tutorial
Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor.
Offering: Host
Grading: A-F

NS&B408 Senior Tutorial
Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor.
Offering: Host
Grading: A-F

NS&B409 Senior Thesis Tutorial
Offering: Host
Grading: OPT

NS&B410 Senior Thesis Tutorial
Offering: Host
Grading: OPT

NS&B411 Group Tutorial, Undergraduate
Offering: Host
NS&B543 Muscle and Nerve Development
We will examine the structure and function of muscle cells, the development of muscle cell identity, the development of motor neurons, and the interactions between nerve and muscle that lead to a functioning neuromuscular system. The course will focus primarily on vertebrate model systems such as chick, mouse, and fish. We will also examine human diseases, including muscular dystrophies and other neuromuscular disorders.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIOL345, NS&B345, BIOL545

NS&B549 Developmental Neurobiology
Near the top of the list of unsolved mysteries in biology is the enigma of how the brain constructs itself. Here is an organ that can make us feel happy, sad, amused, and in love. It responds to light, touch, and sound; it learns; it organizes movements; it controls bodily functions. An understanding of how this structure is constructed during embryonic and postnatal development has begun to emerge from molecular-genetic, cellular, and physiological studies. In this course, we will discuss some of the important events in building the brain and explore the role of genes and the environment in shaping the brain. With each topic in this journey, we will ask what the roles of genes and the environment are in forming the nervous system. We will also discuss developmental disorders resulting from developmental processes that have gone astray. This is a reading-intensive seminar course emphasizing classroom discussions, with readings from a textbook and the primary scientific literature.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-BIOL
Identical With: BIOL345, NS&B345, BIOL545
Credits: 1.00
Gen Ed Area: NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL, NSM-BIOL
Identical With: BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL250, NS&B250, BIOL555, BIOL555, BIOL555, BIOL555

Prereq: [NS&B213 or BIOL213 or PSYC240] OR (NS&B213 AND MBB181 AND BIOL182) OR (NS&B213 AND MBB181 AND BIOL196) OR (NS&B213 AND MBB195 AND BIOL182) OR (NS&B213 AND MBB195 AND BIOL196)

NS&B589 Advanced Research, BA/MA
Intensive investigation of special research problems leading to a BA/MA thesis.
Offering: Host
Grading: A-F

NS&B590 Advanced Research, BA/MA
Intensive investigation of special research problems leading to a BA/MA thesis.
Offering: Host
Grading: OPT

NS&B591 Advanced Research, Graduate
Offering: Host
Grading: OPT