NEUROSCIENCE

http://krieger.jhu.edu/neuroscience (http://krieger.jhu.edu/neuroscience/)

Neuroscience is the study of the nervous system and how it functions. Neuroscientists study the nervous system from all levels, ranging from molecules interacting with cell membranes to brain systems subserving cognitive functions such as language. Dramatic progress has been made at all levels, and the field continues to grow. On the Homewood campus, researchers studying the nervous system are in the departments of Biology, Biomedical Engineering, Biophysics, Cognitive Science, and Psychological and Brain Sciences and in the Krieger Mind/Brain Institute. Their presence provides the opportunity for an innovative, interdepartmental program which offers a broad overview of the neuroscience field, as well as more advanced training in one of four focus areas.

Cellular and Molecular Neuroscience (CM) focuses on the mechanisms by which information flows within and between cells in the nervous system, and the mechanisms through which the cellular structure of the nervous system develops and is maintained. Topics include the molecular basis of membrane permeability, action potentials, sensory transduction, synaptic transmission, neuronal modulation, mechanisms of drug action, and the molecular basis of genetic disorders of the nervous system.

Cognitive Neuroscience (CG) focuses on how cognitive functions, such as vision or language, are implemented by the brain. Drawing upon a variety of techniques for probing the working brain at cognitive and neural levels, including functional neuroimaging, analysis of cognitive impairments in brain-damaged patients, and electrophysiological techniques, research in cognitive neuroscience seeks to relate mental representations and computations to brain mechanisms and processes.

Computational Neuroscience (CP) focuses on applying mathematical tools and theories to investigate brain function. This discipline incorporates a diverse set of approaches from mathematics, physics, engineering, and computer science, to understand how the nervous system processes information. Such principles are used to answer questions across a variety of domains of neuroscience: cellular/molecular, systems and circuits, behavioral and cognitive.

Systems Neuroscience (ST) seeks to relate brain structure and functioning to behaviors and related physiological processes. Research in this area explores the description and analysis of neural circuits. This includes identifying the brain nuclei and interconnections making up a circuit, identifying and investigating the implicated neurotransmitters, and characterizing the intrinsic and extrinsic factors that modulate the development and adult functioning of the circuit. Topics as diverse as learning and memory, communication, sensory systems, and motivated behaviors (e.g., reproduction, feeding, and aggression) are explored from this perspective.

Neuroscience Program Committee

The Neuroscience Program Committee coordinates course offerings, oversees the program's interdepartmental courses, reviews and updates the administration of the program, makes decisions about admission to the B.S./M.S. program, approves proposed research programs and mentors for students in the B.S./M.S. mentored research program, and evaluates the final reports and presentations from the research year.

Programs

- Neuroscience, Bachelor of Science (https://e-catalogue.jhu.edu/arts-sciences/full-time-residential-programs/degree-programs/neuroscience/neuroscience-bachelor-science/)
- Neuroscience, Bachelor of Science/Master of Science (https://e-catalogue.jhu.edu/arts-sciences/full-time-residential-programs/degree-programs/neuroscience/neuroscience-bachelor-science-master/)

For current course information and registration go to https://sis.jhu.edu/classes/

Courses

AS.080.140. Neuroscience and Human Behavior. 1 Credit.
Consider how behavioral neuroscience can help you understand these curiosities and more: a native Australian man suffers a stroke, recovers, but can only speak Chinese; altering but one neural receptor in the prairie vole will change it from a monogamous to polygamous animal; neurodegenerative disease can cause fits of uncontrollable laughter, despite nothing being funny. Learn how cells and chemicals result in complex behavior and critically examine whether or not the mind is an organic computer in this behavioral neuroscience program.

AS.080.160. Neurobiology: Cellular & Systems. 1 Credit.
Establish a foundation for advanced study of neuroscience in research and medicine. Your curriculum will cover university-level cellular, network, and behavioral neurobiology using engaging evidence-based educational models that encourage enthusiasm and uninhibited critical thought. Additional emphasis will be placed on familiarizing you with the laboratory and research methods useful in a scientific career. There are no prerequisites, but a background in biology is helpful.

AS.080.250. Neuroscience Laboratory. 3 Credits.
This course will give students the "hands-on" experience of the inter-disciplinary nature of neuroscience. Students will use anatomical and neuro-physiological techniques to understand the basic underlying principles of neuroscience.
(AS.080.305 AND AS.080.306) OR AS.200.141

AS.080.301. Behavioral Assessment of Animal Models of Cognition and Neuropsychiatric Disorders. 3 Credits.
What does a rat exploring it's environment tell us about memory? How can a mouse help us better understand schizophrenia? This course will focus on procedures that are routinely used to study behavior in animal models of cognition and neuropsychiatric disorders. Topics will include motor function, emotional and motivational states, disorders such as dementia and schizophrenia, among others. Throughout the course, we will read and discuss original research articles to illustrate and compare some of the measures and results from the various procedures.
AS.200.141 OR AS.080.105 OR (AS.080.305 and AS.080.306), OR by instructor permission.

AS.080.303. Structure of the Nervous System. 3 Credits.
This course takes a structural biological approach to studying the nervous system. In using a systems approach it provides students of cellular-molecular and computational neuroscience with a thorough introduction to functional, microscopic and submicroscopic organization of the brain, spinal cord and peripheral nervous system.
AS.080.305 AND AS.080.306

AS.080.304. Neuroscience Learning and Memory. 3 Credits.
This course is an advanced survey of the scientific study of learning and memory. Different perspectives will be used to review the science of learning and memory including the cellular-molecular basis of synaptic plasticity, the functional circuitry involved in learning and memory and memory systems in the brain. The course is designed to provide a deep understanding of the issues and current debates in learning and memory research and focuses specifically on animal models of memory and memory impairment. This is an interactive lecture course with a strong emphasis on student participation.
AS.200.141 OR (AS.080.305 AND AS.080.306) OR (AS.020.312 AND AS.020.306) or instructor permission.

AS.080.305. Neuroscience: Cellular and Systems I. 3 Credits.
(Formerly Nervous Systems I) Neuroscience: Cellular and Systems I is a fully integrated, two-semester course that surveys the cellular and molecular biology of neurons as well as the structure and function of the nervous system. Students must register for Neuroscience: Cellular and Systems II offered in the second term. Course open to JHU undergraduates only.
AS.080.203 OR AS.050.203 OR AS.200.141 OR AS.080.105 OR AS.050.105 or instructor permission.

AS.080.306. Neuroscience: Cellular and Systems II. 3 Credits.
(Formerly Nervous Systems II) Neuroscience: Cellular and Systems II uses the functional organization of the somatosensory system as a means to examine mechanisms of neutral development. Generation and maturation of neurons, guidance of axons, formation of synapses and the regressive events that shape the adult nervous system will be examined. At the same time we will explore the structure and function of brain regions that allow us to feel pain and temperature, detect vibration, recognize shape and perceive where we are in space. Finally, the single-neuron events that lead to adaptive changes in function will be explored in the context of central nervous system control of movement and of higher order functions of speech and memory. Students who do not register for Neuroscience: Cellular and Systems I offered during the first term should not register for this class.
AS.080.305

AS.080.308. Neuroeconomics. 3 Credits.
Every day decisions often require us to weigh the costs and benefits of engaging in a particular course of action in order to obtain some expected outcome. Unfortunately, we often lack the information necessary to obtain our desired goal with complete certainty. Economists have long been interested in understanding human decision-making under these circumstances. In parallel, neuroscientists have made great strides at describing the underlying neural basis of simple decision-making. However, despite much progress in both fields, our understanding of how the brain makes decisions is incomplete. In order to strengthen and further research in both fields, the interdisciplinary field of Neuroeconomics arose. This course will survey the field of Neuroeconomics focusing on theoretical concepts developed by economists and the role these theories are playing in guiding current experimental neuroscience.
AS.080.306 OR AS.200.141 OR AS.020.312

AS.080.310. Synaptic Function and Plasticity. 3 Credits.
The function of the nervous system is based on synaptic transmission between neurons. Synapses are not static structures, but dynamically change with experience. Experience-dependent synaptic plasticity not only allows proper development of the nervous system in tune with the environment, but also is the basis for learning and memory. This course will cover the structure and function of synapses, and how they are altered by experience to encode information.
(AS.020.305 AND AS.020.306) OR (AS.080.305 AND AS.080.306)

AS.080.314. How to Live a SPECtacular Life. 3 Credits.
Good mental health is key to living a happy and healthy life. This statement is true whether you are an elementary, middle, high school, or college student. It is also true if you are a recent graduate in the work force, middle aged, retired or elderly. According to the literature, to achieve good mental health you need to focus on the role that the brain plays in our Social, Physical, Emotional and Cognitive (SPEC) health. These are four key components needed to achieve and maintain good mental health. The main focus of the course will be mental health. Using the research, we will come up with tools to help educate individuals, at any point in their lifespan, on how to live a SPECtacular life.
Area: Writing Intensive
AS.080.306

AS.080.316. Prefrontal Cortex- Computational Models and Neurophysiology. 3 Credits.
The course will cover the function of the prefrontal cortex. We will discuss various computational models of prefrontal function and neurobiological evidence for these models. The class will consist of lectures, student presentations, and discussions.
AS.080.305 AND AS.080.306 or Instructor Permission.

AS.080.321. Computational Neuroscience. 3 Credits.
This course is designed to give students an overview of computational neuroscience. The topics discussed will cover many exciting domains of the field including neural coding, decision-making, learning, attention and connectomics. Lectures will be complemented with hands on experience working with computational models using Matlab and/or other programming language. The overarching goal of the course is to increase overall literacy in the field of computational neuroscience and to gain an appreciation of the interplay between experimental and theoretical neuroscience.
AS.080.306 OR AS.200.141. Familiarity with programing in Matlab will be helpful but not necessary.

AS.080.326. Neurobiology and Diseases of the Peripheral Nervous System. 3 Credits.
This course will cover neurobiology and disorders of the peripheral nervous system (PNS). A particular emphasis will be on cellular interactions within the PNS and with target tissues. For example, the two principal components of the peripheral nerves- axons and Schwann cells- have intimate and continuous cellular communications that are critical for physiological function of the PNS. The course will teach how these cellular interactions are developed, maintained throughout life, and are impacted by injury and diseases.
AS.080.305 AND AS.080.306

AS.080.328. Behavioral Neuroscience Lab. 3 Credits.
Class designed to give students first-hand knowledge of the behavioral procedures and techniques used to study behavior in the field of neuroscience. Students will gain hands-on experience by carrying out some of the behavioral tasks used to assess animals under specific behavioral domains, discuss why certain aspects (i.e. genotype, environment conditions, group size, etc.) are important factors to consider when designing, planning, and carrying out such experiments, and learn the relevance of behavioral research in translational medicine.
AS.200.141 OR AS.200.302 OR AS.080.301 OR (AS.080.305 AND AS.080.306) or permission by instructor.

AS.080.334. Unraveling Circuits in Systems Neuroscience- Emerging Techniques. 3 Credits.
Rapid technological development in neuroscience provides researchers with new tools and strategies to ask important questions about the neural basis of behavior. In this course, we will examine some of these emerging techniques, along with a sampling of the questions they have allowed scientists to answer. We will consider the conceptual insights that arise from answering these questions, as well as investigate the fundamental science behind the cutting-edge techniques that allow us to understand brain function in health and disease.
AS.080.305 AND AS.080.306 or Instructor Approval

AS.080.336. Brain-Body Interactions in Health and Disease. 3 Credits.
Both classical and recent primary research papers that deal with cross signaling of other major organs with the nervous system, particularly the central nervous system, will be discussed. Students will be exposed to emerging literature on how peptides, signaling molecules, and hormones effect the nervous system function both in health and in diseases.
AS.080.305 AND AS.080.306

AS.080.339. Cognitive Neuroscience of Aging. 3 Credits.
When will I start forgetting things? Do I have Alzheimer's disease? What can I do to minimize the chances I experience cognitive decline with aging? This class will spend a significant amount of time exploring the answers to all of these questions and many more. We will review basic information about cognitive neuroscience techniques such as fMRI, DTI, PET, and EEG and explore how aging changes the brain. The heart of the class will be about cognitive changes with aging with a focus on attention, executive function, memory, and emotion. The class will end with discussions about Alzheimer's disease and Parkinson's disease as well as lifestyle choices that increase/decrease the chances of healthy aging.
Area: Writing Intensive
AS.200.141 OR AS.080.306

AS.080.345. Great Discoveries in Neuroscience. 3 Credits.
This course examines the historical and intellectual context of selected, key advances in neuroscience, how they were made and the impact they had on an understanding of the nervous system. Particular attention will be paid to advances in cellular and molecular neuroscience. Among the topics covered will be the discovery of monoamine neurotransmitters and of endocannabinoids, the role of neurotrophins in neural development, and prion-based diseases of the brain.
AS.080.306

AS.080.355. Computational Principles of Biological Vision. 3 Credits.
Even though we take it for granted, vision is a superpower. It is so central to how most of us interact with the world, and so effortless, that we are unaware of the astronomically complex computations that underlie it. There are no computer vision programs that can match the performance of the human visual system in understanding the real, physical, 3D world. On the biological side, vision is the most thoroughly studied sensory system. As such, vision is a rich target for computational understanding of the brain. Vision is the topic that both of us actively study, and remain passionately excited about. In this course, we present our up-to-the-minute synthesis of what we consider to be the most important insights into how vision, especially object vision, works, at the level of biological information processing. We believe the result is a coherent, mechanistic account of how the brain transforms images into visual understanding. We know of no textbook that provides a comparable viewpoint. In addition to presenting this visual information processing framework, we hope to teach you how to critically evaluate current research papers within that framework. To this end, we will be incorporating discussions of current research papers into our lectures and assignments. The course will feature a series of weekly lectures (delivered as videos) and a weekly assignment. The weekly assignment will be an essay, and will make up the largest portion of your grade. The remainder of your grade will come from one larger final essay. We will offer 2 weekly, voluntary Zoom meetings to discuss any questions about the material that might have come up.

AS.080.360. Diseases & Disorders of the Nervous System. 3 Credits.
(EN.580.421 AND EN.580.422) OR (AS.020.305 AND AS.020.306) OR AS.080.306 or instructor permission.

AS.080.366. Neuroscience of Pain. 3 Credits.
This course is a systems-oriented course focusing on the basic neural processing of pain signals in both the spinal cord and the brain. Class lectures will cover the anatomical and molecular basis for the transmission and perception of pain signals, basic concepts such as allodynia, hyperalgesia, peripheral and central sensitization, remodeling, the pathophysiology of chronic pain disorders and the cognitive and emotional aspects of pain. We will also discuss the regulation of pain signals by descending systems, and current practices and new advances in the treatment of pain.
Area: Writing Intensive
AS.080.305 OR AS.080.306 OR AS.020.312 or permission of instructor.

AS.080.370. The Cerebellum: Is it just for motor control?. 3 Credits.
The cerebellum is traditionally thought to be involved in movement and motor control, and observations of patients with cerebellar damage do in fact show motor deficits. However, since the proliferation of functional MRI, cerebellar activations have been observed in a surprising number of brain activation studies that were designed to investigate the neural correlates of cognitive function. Over the past 2 decades, an increasing number of investigators have tried to characterize the role of the cerebellum in cognitive function. Through lectures and reading discussions this course will survey cerebellar circuitry, neuroimaging and neuromodulatory methods for investigating the cerebellum, and traditional and non-traditional functions of the cerebellum, including cerebellar involvement in cognitive functions such as language, working memory, and executive control.
(AS.080.306 AND AS.080.203) OR AS.050.203

AS.080.411. Advanced Seminar: Neuroscience I. 3 Credits.
For students in the first semester of the BS/MS Program. Instructor permission required.

AS.080.412. Advanced Seminar: Neuroscience II. 3 Credits.
For students in the 2nd semester of the BS/MS Program. Permission Required.

AS.080.413. Advanced Seminar: Neuroscience III. 3 Credits.
For students in the 3rd semester of the BS/MS Program. Permission Required.

AS.080.500. Scientific Communication: Neuroscience. 0.5 Credits.
Scientific communication is crucial to encouraging engagement with the public and advancing science. The Scientific Communication course consists of a two hour research orientation session held at the beginning of the semester and a two hour exit session held at the end of the semester. In addition to the two in-person sessions, students will work with faculty and peers to hone their ability to communicate complex topics to a broad audience. These interactions will take place over the course of the semester via Blackboard and have a more flexible timeline. See special notes section for specific meeting day/time for the two in-person sessions. Students need to complete two semesters of Scientific Communications. Students are strongly encouraged to only take Scientific Communications when they are either actively involved in research or have completed at least three credits of research. See Neuroscience Research website for more details.
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.505. Practicum in Language Disorders- Community Based Learning. 2 Credits.
This course provides the opportunity to learn about adult aphasias, language disorders which are one of the most common consequences of stroke. You will receive training in supportive communication techniques and work as a communication partner with an individual with aphasia for two hours per week. Three class meetings for orientation and reading assignments will be held on campus; training and practicum will be conducted at a local aphasia support center. Independent mode of transportation required. Co-listed as AS.050.500 in Cognitive Science. Find out more about the practicum site at https://www.leagueforpeople.org/scale.
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.;Students must have earned an A- or Better in AS.050.105 OR AS.050.203 OR AS.080.203 OR AS.050.311, or obtain instructor's permission.

AS.080.511. Independent Study. 1 - 3 Credits.
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.531. Research Neuroscience-Freshmen. 1 - 3 Credits.
Students will receive a hands-on experience conducting Neuroscience Research. In addition to participating in laboratory research students are required to submit a research style paper summarizing their work (https://krieger.jhu.edu/neuroscience/research/research-paper-guidelines/). Students are also strongly encouraged to take Scientific Communication when they are either actively involved in research or have completed at least three credits of research. See the Neuroscience Research website for more details (https://krieger.jhu.edu/neuroscience/research/research-credit-requirements/).
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.534. Neuroscience Research- Freshmen. 1 - 3 Credits.
Students will receive a hands-on experience conducting Neuroscience Research. In addition to participating in laboratory research students are required to submit a research style paper summarizing their work (https://krieger.jhu.edu/neuroscience/research/research-paper-guidelines/). Students are also strongly encouraged to take Scientific Communication when they are either actively involved in research or have completed at least three credits of research. See the Neuroscience Research website for more details (https://krieger.jhu.edu/neuroscience/research/research-credit-requirements/).
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.541. Research Neuroscience – Neuroscience Majors. 1 - 3 Credits.
Students will receive a hands-on experience conducting Neuroscience Research. In addition to participating in laboratory research students are required to submit a research style paper summarizing their work (https://krieger.jhu.edu/neuroscience/research/research-paper-guidelines/). Students are also strongly encouraged to take Scientific Communication when they are either actively involved in research or have completed at least three credits of research. See the Neuroscience Research website for more details (https://krieger.jhu.edu/neuroscience/research/research-credit-requirements/).
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.544. Research Neuroscience – Neuroscience Majors. 1 - 3 Credits.
Students will receive a hands-on experience conducting Neuroscience Research. In addition to participating in laboratory research students are required to submit a research style paper summarizing their work (https://krieger.jhu.edu/neuroscience/research/research-paper-guidelines/). Students are also strongly encouraged to take Scientific Communication when they are either actively involved in research or have completed at least three credits of research. See the Neuroscience Research website for more details (https://krieger.jhu.edu/neuroscience/research/research-credit-requirements/).
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.555. Neuroscience DUS Approved Research. 1 - 3 Credits.
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You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.582. Neuroscience: Internship. 1 - 3 Credits.
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.592. Research Neuroscience – Freshmen. 1 - 3 Credits.
Students will receive a hands-on experience conducting Neuroscience Research. In addition to participating in laboratory research students are required to submit a research style paper summarizing their work (https://krieger.jhu.edu/neuroscience/research/research-paper-guidelines/). Students are also strongly encouraged to take Scientific Communication when they are either actively involved in research or have completed at least three credits of research. See the Neuroscience Research website for more details (https://krieger.jhu.edu/neuroscience/research/research-credit-requirements/).
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.594. Research Neuroscience – Neuroscience Majors. 1 - 3 Credits.
Students will receive a hands-on experience conducting Neuroscience Research. In addition to participating in laboratory research students are required to submit a research style paper summarizing their work (https://krieger.jhu.edu/neuroscience/research/research-paper-guidelines/). Students are also strongly encouraged to take Scientific Communication when they are either actively involved in research or have completed at least three credits of research. See the Neuroscience Research website for more details (https://krieger.jhu.edu/neuroscience/research/research-credit-requirements/).
You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration > Online Forms.

AS.080.601. Neuroeconomics -Graduate Level.
Every day decisions often require us to weigh the costs and benefits of engaging in a particular course of action in order to obtain some expected outcome. Unfortunately, we often lack the information necessary to obtain our desired goal with complete certainty. Economists have long been interested in understanding human decision-making under these circumstances. In parallel, neuroscientists have made great strides at describing the underlying neural basis of simple decision-making. However, despite much progress in both fields, our understanding of how the brain makes decisions is incomplete. In order to strengthen and further research in both fields, the interdisciplinary field of Neuroeconomics arose. This course will survey the field of Neuroeconomics focusing on theoretical concepts developed by economists and the role these theories are playing in guiding current experimental neuroscience. Only graduate students can register for this course. Instructor signature is required.

AS.080.610. Experiential Learning: HopKids – Kennedy Krieger Institute.
This experiential learning experience provides the opportunity to learn and interact with children recovering from brain, spinal, and musculoskeletal injuries. Students will travel to the Kennedy Krieger Institute to volunteer in the Child Life Department where they will participate in a variety of therapeutic activities including playing with the children and helping them achieve goals on Saturdays (days/times TBA). Students will gain valuable clinical experience while learning patient empathy. Students MUST attend a mandatory orientation and a mandatory exit session held on the Homewood campus (see section web notes for days/times). Students are required to present a written description of their experiences and to discuss their experiences at the exit session. Transportation will be provided by the JHMI shuttle. No credit - S/U Grading Only

AS.080.612. Experiential Learning: KEEN (Kids Enjoying Exercise Now).
In this experiential learning experience, students will work with children who have a variety of neurological disabilities, including autism, cerebral palsy and Down syndrome through exercise and recreational activities. We partner with the KEEN (Kids Enjoy Exercise Now), a nonprofit organization. Student “coaches” will receive a profile for the KEEN athlete that they will pair up with during a session. Students will receive initial training and then select 4 sessions to attend. Sessions are held on the first and third Sunday of each month during the semester at KEEN centers in Maryland. Students MUST attend a mandatory orientation and a mandatory exit session held on the Homewood campus (see section web notes for days/times). Students are required to present a written description of their experiences and to discuss their experiences at the exit session. Transportation will be via student carpools using Zipcars, personal vehicles or Hop Vans. No credit - S/U Grading Only

AS.080.614. Experiential Learning: Making Neuroscience Fun.
The goal of Making Neuroscience Fun (MNF), a community outreach program, is to educate Baltimore city and county elementary school students, on how to achieve good mental health by focusing on the role the brain plays in our Social, Physical, Emotional and Cognitive (SPEC) health. The MNF- Brain Health: It’s SPECtacular program focuses on using scientific research as the foundation for developing information about mental health and relaying the information in an age-appropriate manner. The elementary school students (pre-K through 5th grade) learn about their brain and how to keep it healthy and our students learn valuable communication skills. Hopkins students will receive initial training and certification on content & presenting skills prior to participating and will then be part of the new launch of the program. In order to participate, students must be available either 7am-11am or 11am-3pm at least one day per week, Monday-Friday. Students MUST attend a mandatory orientation and a mandatory exit session held on the Homewood campus (see section web notes for days/times of the orientation/exit sessions). Transportation to the schools will be via student carpools using Zipcars or personal vehicles. No credit - S/U Grading Only

AS.080.616. Experiential Learning: HopKids- Children's Center.
This experiential learning experience provides students the opportunity to learn, play and interact with children receiving treatment in over 20 different specialties including dermatology, endocrine, GI, immunology, urology, plastics and hematology. Students will volunteer in outpatient clinics at the Johns Hopkins Children’s Center where they will encourage, provide developmentally supportive play for children and participate in a variety of activities including art projects, coloring, board games, and reading. Students will gain valuable clinical experience and be exposed to a wide range of children with a variety of diseases/illnesses. Students MUST attend a mandatory orientation and a mandatory exit session held on the Homewood campus (see section web notes for days/times. Students will sign up for 5 shifts on a first-come, first-serve basis after the mandatory orientation. Shifts are Mondays 1pm-3pm, Tuesdays 10am-12pm, Wednesdays 1pm-3pm, Thursdays 10am-12pm and Fridays 10am-12pm throughout the semester. Students are required to present a written description of their experiences and to discuss their experiences at the exit session. Volunteer shifts will take place at outpatient clinics in the Rubenstein Child Health Building. Transportation will be provided by the JHMI shuttle. No credit - S/U Grading Only

AS.080.618. Experiential Learning: Helping an Aging Community: Social and Cognitive Support for Seniors.
This experiential learning opportunity provides a hands-on experience, working side-by-side with elderly individuals at the Keswick Multi-care Center and the Roland Park Place. Students will have a chance to interact with residents that have both short-term and long-term cognitive and physical impairments. The residents typically live on the premises but may also be participating in a daytime care only program. Students will interact with the residents in various enriching ways in order to develop a better understanding of how our mind and body ages with time. Students will gain hands-on experience working with residents with dementia, Alzheimer's and other cognitive impairments that effect the body and the brain. 4 students per semester. Students MUST attend a mandatory orientation and a mandatory exit session to be held onsite (Day/Time TBD). Students are required to provide a written description of their experiences and to discuss their experiences at the exit session. Time Commitment: 2-3 hours a week for the entire semester. Must provide medical immunization records to include- flu shot and PPD (tuberculosis). Transportation will be provided by the JHMI shuttle. No credit - S/U Grading Only

AS.080.620. Theoretical and Computational Neuroscience.
The objective of this class is to introduce fundamentals of quantitative neuroscience. The focus is on understanding basic information processing in neurons and networks of neurons, with some more advanced topics added. Knowledge of basic calculus and linear algebra is required.

AS.080.630. Bodian Seminar Series.
The Bodian Seminar is an interdisciplinary colloquium for discussion of current research into the neural basis of mental processes. Leading researchers, generally from outside the University, are invited to give lectures, which will be announced per e-mail. Undergraduate students who register for this course are asked to study a publication by the speaker, as provided with the announcement, and to prepare a question for each speaker together with a brief discussion of the possible answers. Permission required for undergraduate students.

AS.080.631. Bodian Seminar Series.
Graduate students and Seniors with instructor permission. The Bodian Seminar is an interdisciplinary colloquium for discussion of current research into the neural basis of mental processes. Leading researchers, generally from outside the University, are invited to give lectures. About 12 lectures are scheduled per semester (see http://www.mb.jhu.edu/seminars.asp). Speakers, titles of lectures, and dates are announced to participants per e-mail. The announcements also include links to one or two recent publications of the speaker. Undergraduate students who register for this course are asked to study these papers and to prepare a question for each speaker together with a brief discussion of the possible answers. Question and discussion have to be in writing and turned in the day before the lecture. Undergraduates must e-mail the instructor for permission (cfetsch@jhu.edu) prior to registering for the course.

AS.080.660. Commencement Project.
This course is for BA/MS students that have completed their year of research and are now working on their final thesis. In this course, students devote their semester to preparing their final thesis documentation and move forward with their Master's Thesis Defense which is the last piece to the program. This course is for BA/MS student only and students should only register for this course in their last semester in the program.

AS.080.849. Teaching Practicum.
Permission required. Graduate students only.

AS.080.850. Mentored Research: Neuroscience I.
For students in the BS/MS Program first semester. Permission required.

AS.080.851. Mentored Research: Neuroscience.
Permission Required. For students in the BS/MS Program.
Area: Writing Intensive

AS.080.852. Mentored Research: Neuroscience II.
For students in the BS/MS Program second semester. Permission required.

ME.440.300. Research Practicum. 0 Credits.
N/A

ME.440.301. Research in Neuroscience (Undergraduate). 1 Credit.
N/A

ME.440.699. Neuroscience Elective. 0 Credits.
For Medical Students only. Specialized Topics in Neuroscience. Refer to Medical Student Electives Book located at https://www.hopkinsmedicine.org/som/students/academics/electives.html.

ME.440.701. Diseases of the Brain. 0 Credits.

ME.440.702. Cellular Substrates of Learning and Memory. 1 Credit.

ME.440.705. Cellular and Molecular Basis of Neural Development II. 1.5 Credits.
This is a seminar and reading course devoted to the discussion of the cellular and molecular processes underlying neuronal development.

ME.440.707. Molecular Mechanisms in Synaptic Transmission. 2 Credits.
An advanced seminar and reading course devoted to the molecular and cellular mechanisms underlying synaptic transmission and the regulation of synaptic plasticity. We will discuss fundamental discoveries in th eareas of synapse formation, transmitter release, vesicle recycling, ribbon synapses, dendritic modulation, LTP/LTD, and homeostatic regulation. Students will present two papers and provide written answers to questions about the assigned reading.

ME.440.709. Neuropharmacology. 1.5 Credits.
The course will illustrate the use of diverse approaches (molecular, biochemical, electrophysiological and behavioral) to decipher how psychotropic drugs impact the brain. The course will utilize a lecture format for the first two classes and then switch to a "journal club" format in which students will present classic and recent articles. Topics to be covered include: opiates, benzodiazepines, antipsychotic drugs, and antidepressant drugs.

ME.440.710. Molecular Mechanisms Of Cell Death: Necrosis To Apoptosis. 0 Credits.

ME.440.711. Cellular and Molecular Basis of Neural Development I: Neuronal Differentiation. 1.5 Credits.
A seminar and reading course devoted to the discussion of the cellular and molecular processes underlying neuronal development. Topics include cell proliferation and migration, nervous system patterning, differentiation of neurons and glia, morphogen and growth factor signaling mechanisms, neuronal polarity, and neural stem cell biology. Examples from vertebrate and invertebrate model systems will be covered. This course is designed to complement The Cellular and Molecular Basis of Neural Development II: Axon Guidance and Synaptogenesis, offered alternate years.

ME.440.712. Science, Ethics and Society. 0.5 Credits.
This is a required course for first year Neuroscience students. The course format will consist of focused discussions with the course director and rotating faculty on pre-assigned case studies and more informal discussions about various topics.

ME.440.715. Trends in the Neurobiology of Aging. 0.5 Credits.
This course will reveiw recent research progress in the fields of agin and neurodegenerative disorders with coverage of cellular, moleular, and systems neuroscience.

ME.440.718. Neurobiology. 1 Credit.
For Non-Neuroscience Program students only. This course provides a comprehensive introduction to cellular and molecular neurobiology. Areas covered by the basic science faculty include the following: Neural development (cell specificaion, differentiation, axon guidance, synapse formation); Cellular electrophysiology (ionic conductances, resting potential, action potentials); Molecular biology of synaptic transmission (neurotransmitters and receptors); Sensory transduction (phototransduction, other sensory systems); Synaptic plasticity (mechanisms of synapse modification); and Cellular basis of neurological and psychiatric disorders.

ME.440.720. The Retinal Ganglion Cell. 0 Credits.

ME.440.721. Development and Function of the Spinal Cord Circuitry. 0 Credits.

ME.440.722. Visual System. 0 Credits.
From outer segments of photoreceptors to the Fusiform Face Area of the cerebral cortex we hav ecome to understand how the visual system works at each of many fundamental levels. This course examines the basis for perception of visible objects at each of these levels. We will use teh secondary literature (scientific reviews) to accent the hard-won truths about visual system functional organization and to highlight ongoing controversies. Students will be led through carefully chosen reviews in a series of lectures and written summaries prepared by faculty. Three exams and a final exam will test students not on their memorization of minutiae but on their understanding of fundamental principles.

ME.440.723. Writing About the Brain. 3 Credits.
The goal of this course is to train working neuroscientists to effectively and clearly communicate ideas aboout nervous system function of a general audience

ME.440.724. Neuroscience Career Skills. 1 Credit.
This course is intended to help graduate students in the Neuroscience Graduate Program obtain an appreciation of options, challenges, and steps towards careers in the field of neuroscience.

ME.440.725. Neurobiology of Substance Abuse Disorders. 0 Credits.

ME.440.726. The Hypothalamus: The Brain's Master Homeostat. 1.5 Credits.
The hypothalamus is he central regulator of a broad range of homeostatic behaviors essential to survival, and plays a key role in controlling emotional and appetitive behaviors. This course offers an overview of both historical and recent work on this vital brain region. Topics covered will include the evolution and development of the hypothalamus, control of circadian rhythms and sleep, regulation of hunger and body temperature, as well as hypothalamic regulation of sexual, defensive, and affiliative behavior.

ME.440.727. Brain Diseases: Neurodevelopmental Diseases. 2 Credits.
This course will consider the emerging unity of approaches and concepts in understanding a range of brain diseases such as schizophrenia, bipolar disorder, autism and related disorders.

ME.440.728. Brain Diseases: Neurodegenerative Diseases. 2 Credits.
The course will provide an in-depth examination of the biology of the classic neurodegenerative diseases such as Huntington's disease, Parkinson's disease, ALS and Alzheimer's disease, and other diseases may be considered depending on student and faculty interest.

ME.440.729. Emerging Strategies in Understanding Innate Behaviors. 0 Credits.
This course will focus on the neural control of homeostatic, appetitive and emotional behaviors, with an emphasis on the pypothalamus. It offers an overview of bothhistorical and recent work on this vital brain region. Topics covered will include the evolution and development of the hypothalamus, control of circadian rhythms and sleep, regulation of hunger and body temperature, as well as hypothalamic regulation of sexual, defensive, and social behavior. Each class will include 20-30 minutes of introductory lecture, followed by in-class discussion of 2 relevant recent papers. The final grade will be based on class participation and one 6- page review article or mock grant proposal on any related topic. An optional lecture on good grant writing practices will also be offered.

ME.440.730. Submitting Your First Paper. 0.5 Credits.
This course is taught by Neuroscience Training Program faculty and provide "how to" training and guidance to second year Neuroscience students.This course covers: knowing when you are ready to write, getting started, writing transparent methods, generating figures, writing an effective discussion section, citation manager, writing for rigor and reproduciblity, choosing appropriate statistics, how to choose a journal, peer review, and how to respond to reviews.

ME.440.800. Research in Neuroscience. 0 Credits.
Research in Neuroscience.

ME.440.801. Readings in Neuroscience (Journal Club). 1 Credit.
A weekly talk on current literature topics of special interest. Students present either journal articles or their own research depending on their year in the program.

ME.440.802. Current Topics in Neuroscience (Research Seminar). 1 Credit.
Weekly lecture on current research by active researchers. Topics are chosen so that an overall balance of subjects in neuroscience are covered in the course of a year. Students receive a reading list before the seminar and will be given an opportunity to meet with outside speakers.

ME.440.803. Teaching in Neuroscience. 0 Credits.
TBD

ME.440.804. Directed Readings in Neuroscience. 0 Credits.
Independent course work, directed by assigned faculty member.

ME.440.807. Topics in Somatosensory Research. 0 Credits.
TBD

ME.440.808. Physiology of Sensory Transduction. 1.5 Credits.
A reading/presentation course focusing on visual and chemical transductions. The electrophysiological approach will be emphasized. A couple of long or several short papers will be presented and discussed by students each week.

ME.440.810. Readings In Systems Neuroscience. 1 Credit.
A weekly talk on current literature topics of special interest. Students present journal articles for discussion.

ME.440.811. Neuroscience Cognition I. 4.5 Credits.
This is the first half of a 4-quarter course on the cellular and molecular basis of neural function adn the neural basis of perception, cognition, and behavior. Topics covered in this half include (1) development and structure of the nervous system, (2) cellular neurophysiology, (3) neural signaling and coding, and (4) audition, vocalization, and language. Lectures will be presented by faculty in the Neuroscience, Neurology, Biomedical Engineering, Psychology, and Cognitive Science departments. The course will also include discussion sections based current literature and several neurotechniques sessions designed to familiarize student with current experimental approaches in cellular, systems and molecular neurosciences. This course is required of all students in the Neuroscience Graduate Program.

ME.440.812. Neuroscience Cognition II. 4.5 Credits.
This is the second half of a 4-quarter course on the cellular and molecular basis of neural function and the neural basis of perception, cognition, and behavior. Topics covered in this half include (1) perception of objects, space, and self, (2) movement and balance, (3) learning and memory, (4) neurological and psychiatric disorders, and (5) global function in the nervous system. Lectures will be presented by faculty in the Neuroscience, Neurology, Biomedical Engineering, Psychology, and Cognitive Science Departments. The course will also have a laboratory component. This course is required of all students in the Neuroscience Graduate Program.

ME.440.813. Current Issues in Systems and Cognitive Neuroscience. 1 Credit.
The mammalian brain is an information processing system without parallel. It excels at recognizing objects and substances, reconstructing space, making decisions, and controllig complex behaviors. The neural mechanisms underlying these abilities are studied by a large community of systems and cognitive neuroscientists. This research has generated a rapidly evolving field of high-profile discoveries and lively debates between competing laboratories. Our course aims to convey a clear sense of this field by focusing on current experimental and conceptual controversies regarding organization and function in the primate nervous system. Each week will focus on a different topic represented by two or more recent papers (selected by an instructor) reflecting timely questions or opposing points of view. Students will present the papers informally and direct a debate over the relative merits of hte conflicting view points.

ME.440.814. Research in Neuroscience (BCMB). 0 Credits.
Thesis Research

ME.440.815. Stem Cells: Unit of Development and Unit of Regeneration. 0 Credits.
This is a seminar and reading course devoted to discussion of different types of stem cells. The course will highlihgt ongoing research at JHU and current advances in the stem cell field.

ME.440.816. Topics in Cortical Plasticity. 0 Credits.
Experience-dependent changes in cortical synapses and circuits are critical for proper development of the nervous system and for memory storage. This course will focus on recent findings on fundamental mechanisms of plasticity from synapses to circuit level through discussions of recent research papers.

ME.440.817. Psychedelics. 0 Credits.
In this course we will explore the history and uses of psychoactive compounds, the neurobiological basis of their activity, and their potential for healing. Along the way we will attempt to debunk some of the most common myths about this especially controversial class of drugs. Each session, one student will take the lead in discussing the assigned primary research articles (except for 2-3 documentary film sessions, which will take up the whole period). Beyond didactic learning, this graduate level course is designed to hone students' skills in oral presentations, critical thinking, as well as composition and editing of manuscripts.

ME.440.818. Bioenergetics, Neuroplasticity and Brain Health. 1 Credit.
Overindulgent sedentary lifestyles are increasingly common with adverse consequences for trajectories of brain health in current and future generations. This course will review findings from studies of humans and animals that are elucidating the cellular and molecular mechanisms by which energy intake and exercise affect structural and functional neuroplasticity. This topic will be considered from a bioenergetic perspective with emphases on brain evolution, developmental neurobiology, adult neuroplasticity and disorders of mood and cognition. The course will consist of a series of introductory lectures, and subsequent class meetings in which hot topics in the field are discussed.

ME.440.819. Rigor, Reproducibility, and Responsibility in Science. 2 Credits.
In this course, students will learn the professional norms and practices central to a successful scientific career. Also, students will learn about what constitutes scientific misconduct and about proper behavior involving issues of authorship and various conflicts of interest. Students will be exposed to rules, regulations, and ethics relating to animal and human experimentation. Further, participants will learn about how to choose a lab, keep proper records, deliver presentations, and seek funding.

ME.440.820. Circuits and Brain Disorders. 2 Credits.
The course is designed to serve as an introduction to neurodegenerative disorders of the nervous system, and is intended to provide a balance of basic neurobiology, clinical presentation, biomarkers, genetics, and therapeutic approaches. One of the goals would be to highlight the distinct circuitry that is most impacted by each disorder. The curriculum includes: (1) one lecture per week and (2) a coordinated journal club once per week.

ME.440.821. Readings in Neuroscience Journal Club. 0 Credits.
Neuroscience training program journal club.

ME.440.822. Computational Principles of Biological Vision. 3 Credits.
This course will present up-to-the-minute synthesis of what are considered the most important insights into how vision, especially object vision, works, at the level of biological information processing. The result will be a coherent, mechanistic account of how the brain transforms images into visual understanding. Also, this course will teach how to critically evaluate current research papers within that framework by incorporating discussions of current papers into the lectures and assignments.

ME.440.823. Grant Writing Skills. 1 Credit.
The course covers topics such as: writing a clear and compelling specifics aims page; writing a concise background section; preliminary data; stating a clear hypothesis; describing how data will be analyzed and how results will be predicted; power analysis and sufficient sample size; problems and alternatives; devising a budget and justification; and using vertebrate and human subjects.

ME.440.824. Cell Physiology of Visual and Olfactory Transductions. 1 Credit.
A reading/student presentation course focusing on visual and olfactory transductions studied by single-cell electrophysiology.

ME.440.825. Quantitative Neurogenomics. 3 Credits.
Modern molecular neuroscience involves an understanding of how the organization and use of the genome contributes to the development, structure, and function of the nervous system. Regulation of the genome and gene expression across different cell types, conditions, and spatial domains can provide insight into the functional organization of the brain and the etiopathology of disease. In this course, students will learn, through a combination of didactic, interactive, and hands-on sessions, the basics of genomic and transcriptional data analysis as applied to current questions in neuroscience. Students will outline and develop workflows and algorithms for both bulk and single-cell analysis of gene expression and genomic data using publicly available datasets. Finally, students will explore methods for spatial analysis of gene expression and how application of newer technologies can enhance understanding of anatomy and connectivity.

Cross Listed Courses

Behavioral Biology

AS.290.400. Comparative Neural Systems and Behavior Research Discussions. 0.5 Credits.
This course is required concurrently with research in the Comparative Neural Systems Research and Behavior lab. During the scheduled meetings we will discuss scientific papers, policies and procedures, research ethics and other information related to activities in the lab. At the end of the semester, students will present their research in groups. This course is only open to students doing research in the Neural Systems and Behavior Lab.

Cognitive Science

AS.050.105. Introduction to Cognitive Neuropsychology. 3 Credits.
When the brain is damaged or fails to develop normally, even the most basic cognitive abilities (such as the ability to understand words, or perceive objects) may be disrupted, often in remarkable ways. This course explores a wide range of cognitive deficits, focusing on what these deficits can tell us about how the normal brain works. Topics include brain anatomy and causes of brain damage, reading and spelling deficits, unilateral spatial neglect, hemispheric disconnection, cortical plasticity, and visual perception of location and orientation. Students read primary sources: journal articles that report deficits and discuss their implications.

AS.050.315. Cognitive Neuropsychology of Visual Perception: The Malfunctioning Visual Brain. 3 Credits.
When we think about our ability to see, we tend to think about our eyes, but in fact vision happens mostly in the brain. This course explores the remarkable perceptual deficits that occur when the visual regions of the brain are damaged or fail to develop normally, focusing on what these perceptual malfunctions tell us about normal visual perception. Topics include visual system anatomy and physiology; functional specialization in the lower visual system as revealed by cerebral achromatopsia (color blindness resulting from brain damage) and akinetopsia (impaired motion perception); cortical plasticity in the visual system; spatial deficits in perception and action; and the implications of high-level visual deficits, including prosopagnosia (impaired face recognition), Charles Bonnet syndrome (complex visual hallucinations in blind areas of the visual field), blindsight (accurate responding to visual stimuli despite apparent inability to see them), and aphantasia (lack of visual imagery).
AS.050.105 OR AS.050.203 OR AS.080.203 OR AS.050.101 OR AS.200.110 OR AS.200.211 or instructor's permission.

AS.050.326. Foundations of Cognitive Science. 3 Credits.
This course explores general issues and methodologies in cognitive science through the reading of classic works (from Plato and Kant through Skinner and Turing) and recent research articles to begin construction of a coherent picture of many seemingly divergent perspectives on the mind/brain. Recent brain-based computational models serve to focus discussion. Also offered as AS.050.626.
Area: Writing Intensive

AS.050.332. Developmental Cognitive Neuroscience. 3 Credits.
In-depth examination of the current literature on cognitive development in the context of developmental cognitive neuroscience. Please see course prerequisites. Meets with AS.050.632.
AS.050.101 OR AS.050.339 OR AS.200.132 OR AS.050.105 OR Instructor's Permission.

AS.050.339. Cognitive Development. 3 Credits.
This is a survey course in developmental psychology designed for individuals with some basic background in psychology or cognitive science, but little or none in development. The course is strongly theoretically oriented, with emphasis on issues of nature, and development psychology as well as relevant empirical evidence. The principle focus will be early development, i.e., from conception through middle childhood. The course is organized topically, covering biological and prenatal development, perceptual and cognitive development, the nature and development of intelligence, and language learning.

AS.050.626. Foundations of Cognitive Science.
Also offered as AS.050.326. This course explores general issues and methodologies in cognitive science through the reading of classic works (from Plato and Kant through Skinner and Turing) and recent research articles to begin construction of a coherent picture of many seemingly divergent perspectives on the mind/brain. Recent brain-based computational models serve to focus discussion.
Area: Writing Intensive

AS.050.639. Cognitive Development.
Also offered as AS.050.339. This is a survey course in developmental psychology designed for individuals with some basic background in psychology or cognitive science, but little or none in development. The course is strongly theoretically oriented, with emphasis on issues of nature, and development psychology as well as relevant empirical evidence. The principle focus will be early development, i.e., from conception through middle childhood. The course is organized topically, covering biological and prenatal development, perceptual and cognitive development, the nature and development of intelligence, and language learning.

First Year Seminars

AS.001.109. FYS: Why'd Your Brain Sign You up for This?. 3 Credits.
This First-Year Seminar will explore the neuroscience of choice. In addition to exploring the neurobiology of choice, we will dabble with philosophical ideas of free will and determinism. We will also touch on questions related to culpability. For example, are people who break the law but suffer from brain damage responsible for their actions? Sound interesting? Well, why stop there? Let's sit back, eat some popcorn and take a look at how popular culture depicts the neuroscience of choice in the movies. Yes, with your help, we can do it all – but will you choose to???

AS.001.115. FYS: Illusions, Delusions, and Other Confusions. 3 Credits.
Most people think the strongest kind of evidence in a criminal case is a confident eyewitness. Most students think re-reading textbook materials or class notes is the best way to prepare for an exam. And all too many people think that measles vaccines cause autism. All three of these ideas are wrong. In this First-Year Seminar, we will explore what modern psychology has uncovered about how our intuitions concerning human nature deceive us, and lead to incorrect ideas such as the ones just mentioned. We will discuss a wide variety of topics including "the attention economy," groupthink, and subliminal perception.

Psychological & Brain Sciences

AS.200.141. Foundations of Brain, Behavior and Cognition. 3 Credits.
A survey of neuropsychology relating the organization of behavior to the integrative action of the nervous system. Cross-listed with Behavioral Biology and Neuroscience.

AS.200.304. Neuroscience of Decision Making. 3 Credits.
This course will survey the neural mechanisms of decision-making. Current experimental research and theory concerning selection, control, and evaluation of actions are examined in humans and animals. Topics will range from simple perceptual judgements to complex social behavior. The course involves a weekly lecture about a specific topic followed by a student presentation of a current research paper. Cross-listed with Neuroscience.
AS.080.305 AND AS.080.306 or instructor permission

AS.200.329. Real World Human Data: Analysis & Visualization. 3 Credits.
Experiments in human cognition typically involve careful manipulation and control of variables in order to answer specific questions about the mind or brain. However, digital devices now provide an ocean of incidental human data: information collected continuously about our behavior and physiological states as we go about our lives. These incidental datasets are often large and noisy, and pose different analysis and visualization challenges from more traditional manipulated experiments. In this course students will learn computational tools and qualitative approaches for exploring, visualizing and interpreting large human data. The course emphasizes computer-based analysis of open-source human behavioral and neuroimaging datasets. Analyses will be conducted in MATLAB. Instructor will grant approval as long as you have previous programming experience (roughly equivalent to material covered in an introductory-level programming course). Self-taught or real-world experience can be applicable in lieu of previous formal classroom instruction.

AS.200.334. Human Memory Psychology. 3 Credits.
This class will survey the behavioral and biological science of human memory. Historical perspectives as well as modern controversies will be discussed. Intersections with other fields such as law, education, medicine, and technology will be highlighted. The course will be a mixture of lectures and group discussions.

AS.200.344. Behavioral Endocrinology. 3 Credits.
This course examines both the evolution and mechanisms of hormonal effects on behavior across animals, including humans. Topics will include the effects of hormones on sexual differentiation, reproductive behavior, parental behavior, stress and social behavior. Additionally, this course emphasizes developing skills in hypothesis testing and critically assessing the scientific literature. Cross-listed with Behvioral Biology and Neuroscience.
(AS.200.141 OR AS.080.306) OR (AS.020.151 AND AS.020.152) or instructor's permission

AS.200.370. Functional Human Neuroanatomy. 3 Credits.
This course examines the general organizing principles of the anatomy of the human central nervous system and how this anatomical organization relates to function, from the level of neural circuits, to systems, to behavior. Students will learn to identify neuroanatomical structures and pathways in dissections and MRI images through computerized exercises. Readings and lectures will emphasize general structure-function relationships and an understanding of the functional roles of particular structures in sensory, motor, and cognitive systems.
Recommended Course Background in addition to pre-requisite AS.080.305: AS.080.306 OR AS.050.203 OR AS.080.250
AS.080.305

AS.200.376. Neuropsychopharmacology. 3 Credits.
Designed to provide information about how drugs affect the brain and behavior. The course focuses on biological concepts underlying structures and functions of the brain that relate to mental disorders. An introduction to neurobiology and brain function is presented as it applies to the interaction of various classes of drugs with the individual neurotransmitter systems in the brain. A brief historic review is followed by a discussion of clinical relevance. Cross-listed with Behavioral Biology and Neuroscience. Enrollment limited to juniors and seniors.
(AS.080.305 AND AS.080.306) OR AS.020.306 AND AS.020.312) OR (AS.200.141 AND AS.020.306)

For current faculty and contact information go to https://krieger.jhu.edu/neuroscience/people/