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.080.119. Introduction to Neuroplasticity and Neurology. 3 Credits.
Recent scientific evidence shows that our brain has a great deal of malleability at any age and that our lifestyle choices play an important role in shrinking or growing different parts of our brain. Factors such as poor sleep, obesity, anxiety, and poor diet lead to accumulating shrinkage in the brain while even three months of exercise, brain training, meditation, and optimal sleep can grow the brain. You can learn to apply these new discoveries into your day-to-day life in order to improve your memory, attention, organizational skills, and overall brain vitality. Much of your learning in this course will happen during classes. Each lecture is followed by a 10-minute engaging and fun discussion session to make sure you have grasped the main concepts for that presentation.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)

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 Foundational Abilities: Science and Data (FA2)

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 Foundational Abilities: Science and Data (FA2)

AS.080.234. How to Give a Scientific Talk. 3 Credits.
The goal of this course is to teach participants how to give clear and concise scientific talks. Students will have to have at least 1 year of research experience in a neuroscience-related lab. Each student will give presentations on their own data as well as on published literature.
Distribution Area: Natural Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2)

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.
Prerequisite(s): AS.080.306 OR AS.200.141
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.200.141 OR AS.050.105 OR AS.080.306 OR instructor permission.
Distribution Area: Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.080.306
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.200.141 OR AS.080.306 OR (AS.020.312 AND AS.020.306) or instructor permission.
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.050.203 OR AS.200.141 OR AS.080.105 OR AS.050.105 or instructor permission.
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.080.305
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.080.306 OR AS.200.141 OR AS.020.312
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

AS.080.309. Neuroaesthetics: How the Arts and Aesthetic Experiences Advance Health, Wellbeing, and Learning. 3 Credits.
This course will provide an overview of neuroaesthetics: the study of how the arts and aesthetic experiences measurably change the body, brain, and behavior and how this knowledge is translated into specific practices that advance health and wellbeing. The course will provide students with the foundations and theories of neuroaesthetics including the history of neuroaesthetics, the basic neurobiology of the senses, neuroanatomy and mechanisms of brain structure involved in the arts and aesthetics. The course will also take a deep dive into the book, Your Brain on Art, highlighting interactive case studies, immersive creative activities, and discussions with experts from the field.
Prerequisite(s): AS.080.306 OR AS.200.141
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): (AS.020.305 AND AS.020.306) OR AS.080.306
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.080.306
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)
Writing Intensive

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.
Prerequisite(s): AS.080.306 or Instructor Permission.
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.080.306 OR AS.200.141. Familiarity with programing in Matlab will be helpful but not necessary.
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

AS.080.323. Advances in Neuroplasticity and Its Applications in Neurology. 3 Credits.
This course provides a review of the latest discoveries in the field of neuroplasticity and how they can be incorporated in brain rehabilitation interventions for patients with memory loss, concussion, stroke, and ADHD. The course includes information about basic neuroanatomy, epigenetics, two-way interactions between the brain and individual body parts, brain glymphatic system, anxiety, pleasure, love, sex, addiction, migraine, and the use of technology for improving cognitive capacity. Students also learn about the role of sleep, exercise, diet, stress, and cognitive stimulation in shrinking and growing the brain, and how they can use these concepts to improve their own memory, processing speed, and overall brain performance.
Prerequisite(s): AS.080.306 OR AS.200.141
Distribution Area: Natural Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2)
Writing Intensive

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.
Prerequisite(s): AS.080.306
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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. Note, this course can NOT be substituted for, or take the place of, the Neuroscience Lab core course requirement for the Neuroscience or Behavior Biology majors.
Prerequisite(s): AS.200.141 OR AS.200.302 OR AS.080.301 OR AS.080.306 or permission by instructor.
Distribution Area: Natural Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2), Projects and Methods (FA6)

AS.080.329. Current Topics in Peripheral Neuropathies and Nerve Diseases. 3 Credits.
This writing intensive course is designed to teach in depth understanding/critiquing and writing about current papers in peripheral nerves & neuropathies. Students will be assigned 10-12 current papers throughout the course, and will be tasked to write two reports for each paper, one for scientific community and other for general public, with emphasis on writing scientifically accurate summaries/critiques for both the specialists in the field and the general public. Students will be asked to submit drafts of their writings and get feedbacks on weekly basis.
Distribution Area: Engineering, Natural Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2)
Writing Intensive

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.
Prerequisite(s): AS.080.306 or Instructor Approval
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.080.306
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

AS.080.337. Drug Discovery Research for Neurological Disorders. 3 Credits.
This course examines how drugs to treat neurological disorders are discovered and developed by covering various topics related to drug discovery research including in vitro pharmacology, medicinal chemistry, pharmacokinetics, and animal pharmacology. Particular emphasis will be given to the operational aspects and challenges unique to nervous system drug discovery research. Students will gain a broad and practical knowledge of what it takes to develop a new drug to treat patients with neurological and/or psychiatric conditions.
Prerequisite(s): AS.200.141 OR (AS.080.305 AND AS.080.306)
Distribution Area: Engineering, Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.200.141 OR AS.080.306
Distribution Area: Natural Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2), Projects and Methods (FA6)
Writing Intensive

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.
Prerequisite(s): AS.080.306
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

AS.080.349. Neural Oscillations, Cognition and Disease. 3 Credits.
Neural oscillations are a ubiquitous finding in the brain during both waking behavior and during sleep and play important roles in supporting cognition. In particular, neural oscillations in the theta, alpha, beta, and gamma frequency have been linked to attention, memory, and executive function. Critically, changes in neural oscillations are related to neurodevelopmental disorders such as attention deficit/hyperactivity disorder, autism spectrum disorder, and learning disabilities. Changes in oscillations have also been associated with mood disorders, schizophrenia, and neurodegenerative disorders like Alzheimer's and Parkinson's disease. In this class we will explore through a combination of lectures and seminar-based discussion how we typically measure neural oscillations, theories exploring how brain oscillations support cognitive processing, and how different disease states change brain oscillations and what those changes may mean for cognitive processing.
Prerequisite(s): AS.200.141 OR AS.050.203 OR AS.080.306
Distribution Area: Natural Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2), Projects and Methods (FA6)
Writing Intensive

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.
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

AS.080.360. Diseases & Disorders of the Nervous System. 3 Credits.
This class will use lectures, readings and filmed clinical examinations to present an overview of the causes and treatments of diseases and disorders of the nervous system. We will begin with diseases of the peripheral nervous system and proceed in steps to examine the pathophysiology of a variety of neurological and psychiatric disorders that impact the central nervous system.
Prerequisite(s): (AS.020.305 AND AS.020.306) OR AS.080.306 or instructor permission.
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.080.305 OR AS.020.312 or permission of instructor.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)
Writing Intensive

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.
Prerequisite(s): AS.080.306 OR AS.050.203
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

AS.080.401. Experiential Learning: KEEN (Kids Enjoying Exercise Now). 1 Credit.
In this experiential learning, we partner with KEEN (Kids Enjoy Exercise Now), a nonprofit organization. Students will work with children and young adults who have a variety of neurological disabilities, including autism, cerebral palsy and Down syndrome through exercise and recreational activities. Students will receive initial training at the mandatory orientation and then select 4 required sessions to attend. Sessions are held on selected Sundays during the semester at a KEEN center in Maryland. Student "coaches" will receive a profile for the KEEN athlete that they will pair up with during a session. Students MUST attend a mandatory orientation and a mandatory exit session via Zoom (see section web notes for days/times). Students are required to complete the Training on the Safety of Children in University Programs, as well as register to volunteer via the KEEN website, instructions to follow. Students are required to submit a written description of their experiences and to discuss their experiences at the exit session. Transportation will be via student carpools using personal vehicles or Hop Vans. S/U Grading Only
AS Foundational Abilities: Citizens and Society (FA4)

AS.080.402. Experiential Learning: Making Neuroscience Fun: Focus on Brain (Mental) Health. 1 Credit.
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 brain (mental) health and relaying the information in an age-appropriate manner. In order to participate, JHU students must be available for a 2 ½ hour block of time – 1:30-4:00 pm - at least one day per week (Tuesday, Wednesday or Thursday). Students MUST attend a mandatory orientation and a mandatory exit session held on Zoom, day/time TBD. Transportation to the schools will be via the Hopkins Shuttle. S/U Grading Only
AS Foundational Abilities: Citizens and Society (FA4)

AS.080.404. Experiential Learning: Helping an Aging Community: Social and Cognitive Support for Seniors. 1 Credit.
This experiential learning opportunity provides a hands-on experience, working side-by-side with elderly individuals at 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. Students MUST attend a mandatory orientation and a mandatory exit session (see Section Web Notes for dates/times). Students are required to provide a written description of their experiences and to discuss their experiences at the exit session. Time Commitment: a minimum of five (1-2 hours) visits during the semester. Visits must be planned out with the Roland Park Place's staff by the 2nd week of the semester and must be documented on the Google Doc, to be sent out after the orientation. Students will be sent an application packet, which must be filled out and returned prior to the start of the semester. Students must provide updated medical immunization records to include - flu shot, COVID-19 and PPD (tuberculosis). Background check required. Transportation will be provided by the JHMI shuttle. S/U Grading Only
AS Foundational Abilities: Citizens and Society (FA4)

AS.080.411. Advanced Seminar: Neuroscience I. 3 Credits.
For students in the first semester of the BS/MS Program. Instructor permission required.
Distribution Area: Natural Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2)

AS.080.412. Advanced Seminar: Neuroscience II. 3 Credits.
For students in the 2nd semester of the BS/MS Program. Permission Required.
Distribution Area: Natural Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2)

AS.080.413. Advanced Seminar: Neuroscience III. 3 Credits.
For students in the 3rd semester of the BS/MS Program. Permission Required.
Distribution Area: Natural Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2)

AS.080.499. Scientific Communication and Mentoring. 1.5 Credits.
cientific communication is crucial to encouraging engagement with the public and advancing science. This course is divided into two components, scientific communication and mentoring. The scientific communications part of the course consists of a research orientation session held at the beginning of the semester and an exit session held at the end of the semester. Students will learn the skills necessary to communicate complex scientific concepts to a broad non-science audience. The mentoring part of the course will consist of group discussions about topics related to career planning and life design. Students need to complete two semesters of Scientific Communication and Mentoring. Students are strongly encouraged to only take this course when they are either actively involved in research or have completed at least three credits of research. Freshmen with permission. SEE SPECIAL NOTES SECTION FOR MANDATORY MEETINGS DAYS/TIMES
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2)

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.
Prerequisite(s): 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.050.311, or obtain instructor's permission.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)

AS.080.511. Independent Study. 1 - 3 Credits.
This course is reserved for students involved in research projects that may not be covered by the typical neuroscience research course options. Students must consult with the Director of Undergraduate Studies, Dr. Trageser prior to registration.
Prerequisite(s): You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration, Online Forms.
AS Foundational Abilities: Science and Data (FA2)

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/).
Prerequisite(s): You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration, Online Forms.
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

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/).
Prerequisite(s): You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration, Online Forms.
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

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/).
Prerequisite(s): You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration, Online Forms.
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

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/).
Prerequisite(s): You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration, Online Forms.
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

AS.080.555. Neuroscience DUS Approved Research. 1 - 3 Credits.
This course is reserved for students involved in research projects that may not be covered by the typical neuroscience research course options. Students must consult with the Director of Undergraduate Studies, Dr. Trageser prior to registration.
Prerequisite(s): You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration, Online Forms.
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

AS.080.582. Neuroscience: Internship. 1 Credit.
This course is reserved for students involved in research projects that may not be covered by the typical neuroscience research course options. Students must consult with the Director of Undergraduate Studies, Dr. Trageser prior to registration.
Prerequisite(s): You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration, Online Forms.
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

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/).
Prerequisite(s): You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration, Online Forms.
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

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/).
Prerequisite(s): You must request Independent Academic Work using the Independent Academic Work form found in Student Self-Service: Registration, Online Forms.
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

AS.080.599. Honors Thesis Seminar. 1 Credit.
The Honors Thesis Seminar will meet for 1.5 hours weekly to assist with the Honors Thesis Program requirements. Specifically, students will learn and practice how to write a Thesis via lectures, workshop activities, and peer review. The Honors Thesis Seminar class will also provide Honors Thesis students tips on putting together poster presentations and their Thesis defense talk.
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2), Projects and Methods (FA6)

AS.080.601. Neuroeconomics -Graduate Level. 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. Only graduate students can register for this course. Instructor signature is required.

AS.080.620. Theoretical and Computational Neuroscience. 3 Credits.
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. 1 Credit.
The Bodian Seminar is an interdisciplinary colloquium for discussion of current research into the neural basis of cognition and behavior. Leading researchers, generally from outside the University, are invited to give lectures. About 10-14 lectures are scheduled per semester (see https://krieger.jhu.edu/mbi/events/). 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. Students who register for this course are encouraged to read at least one of these papers, to improve the learning experience of attending the seminar. Most talks will be recorded for asynchronous viewing if students are unable to attend in person. Grade (P/F, S/U) is based on having viewed each presentation (in person or recorded) and submission (by email to the instructor) of a hypothetical question to the speaker.

AS.080.631. Bodian Seminar Series. 1 Credit.
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 8 lectures are scheduled per semester (see https://krieger.jhu.edu/mbi/events/). 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. Students who register for this course are encouraged to read at least one of these papers and to prepare a possible question for each speaker (not collected or graded but simply to improve the learning experience of attending the seminar). Grade (P/F, S/U) is based on attendance, taken by in-person signup sheet or Zoom log.

AS.080.660. Commencement Project. 1 Credit.
This course is for BS/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 BS/MS student only and students should only register for this course in their last semester in the program.

AS.080.849. Teaching Practicum. 3 Credits.
Permission required. Graduate students only.

AS.080.850. Mentored Research: Neuroscience I. 9 Credits.
For students in the BS/MS Program first semester. Permission required.

AS.080.851. Mentored Research: Neuroscience. 6 Credits.
Permission Required. For students in the BS/MS Program.

AS.080.852. Mentored Research: Neuroscience II. 9 Credits.
For students in the BS/MS Program second semester. Permission required.

ME.440.696. Research Elective in Neuroscience.

ME.440.699. Neuroscience Elective.

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.440.711. 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.440.715. 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.
This course provides a comprehensive introduction to cellular and molecular neurobiology. Areas covered by the basic science faculty include the following: Neural development (cell specification, 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), Cellular basis of neurological and psychiatric disorders.

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.440.728. 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.440.730. 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.440.731. How to Give a Scientific Talk. 1 Credit.
Clear communication is always important. For academia, this does not only include scientific publications, but also the ability to deliver clear, concise (and hopefully engaging) scientific talks. This course is explicitly for students who have at least one year of research experience in a neuroscience-related lab, and a data set or project of their own that they can present. The goal of the course is to set you up for your future academic career. Note that this class will be a shared class for undergraduates and graduate students from the neuroscience department. We will discuss the building blocks of how to give a good talk, and then practice these skills by giving a short (interview style) presentation without slides, as well as 2 longer presentations with slides. One of the most crucial aspects of this course is the feedback provided after each talk – most of which is expected to come from the students. The quality of the class, and how much everyone ultimately benefits from it, therefore depends on everyone's active participation. To make that easier, the actual talk delivery will not be graded. The grade instead is based on your abstracts (one per talk), the preparation for each talk, as well as your level of participation. This class should be a great opportunity not just to learn how deliver a talk, but also learn about some of the cool science going on at Hopkins! Because participation is an important part of the class, attendance at every session is required. Enrollment restricted to Year 2 and above students.

ME.440.800. Neuroscience Research. 1 - 18 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. 1 Credit.
TBD

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

ME.440.808. Physiology of Visual and Olfactory Transductions. 1.5 Credits.

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). 1 - 18 Credits.
Laboratory Research

ME.440.817. Psychedelics.
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.

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.

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.
AS Foundational Abilities: Science and Data (FA2)

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.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2)

AS.050.239. 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. Also offered as AS.050.639.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2), Ethics and Foundations (FA5)

AS.050.312. Cognitive Neuroimaging Methods in High-Level Vision. 3 Credits.
This course is an advanced seminar and research practicum course. It will provide the opportunity to learn about fMRI methods used in the field of vision science and for students to have hands-on experience to develop, design and analyze a research study on topics in the cognitive neuroscience field of high-level vision. In the first part of the course students will read recent fMRI journal papers and learn about common fMRI designs and analysis methods; in the second part of the course students will conduct a research study to address a research question developed from readings. Students are expected to write a paper in a short journal article format at the end of the course and to present their results in front of the class. Research topics will vary but with special focus on topics in high-level visual processing.
Prerequisite(s): AS.050.105 OR AS.050.116 OR AS.050.203 OR AS.050.315 OR AS.050.332 OR AS.200.110
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2), Projects and Methods (FA6)

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).
Prerequisite(s): 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.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2)

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.
Recommended Course Background: at least one course at the 300-level or higher in cognitive science, computer science, neuroscience, philosophy, or psychology.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Writing and Communication (FA1), Science and Data (FA2), Ethics and Foundations (FA5)
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.
Prerequisite(s): AS.050.101 OR AS.050.339 OR AS.200.132 OR AS.050.105 OR Instructor's Permission.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2), Ethics and Foundations (FA5)

AS.050.626. Foundations of Cognitive Science. 3 Credits.
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. Also offered as AS.050.326.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
Writing Intensive

AS.050.639. 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. Also offered as AS.050.239.

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.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Prerequisite(s): AS.080.306 or instructor permission
Distribution Area: Natural Sciences
AS Foundational Abilities: Science and Data (FA2)

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 Python. 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.
Distribution Area: Quantitative and Mathematical Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)

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.
Distribution Area: Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)

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 Behavioral Biology and Neuroscience. Course Recommendations: Introductory or advanced courses in biology and an introductory course in neuroscience (e.g. Foundations of Brain Behavior and Cognition) are highly recommended for success in this course.
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)

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
Prerequisite(s): AS.080.305
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)

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 states. 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.
Prerequisite(s): AS.200.141 OR AS.080.306 OR (AS.020.306 AND AS.020.312)
Distribution Area: Natural Sciences, Social and Behavioral Sciences
AS Foundational Abilities: Science and Data (FA2)

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