AS.080 (NEUROSCIENCE)

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.

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 interdisciplinary 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 its 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 programming 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.

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.
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

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

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.

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.

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.