DARTMOUTH COLLEGE

Department of Psychological and Brain Sciences

Graduate Course Offerings 2018-2019

All courses are 1 credit unless otherwise noted; PBS graduate students **must** enroll in a total of **3 credits per term** including at least one credit of research.

FALL 2018

PSYC 100. Proseminar (all faculty)
An introduction to the research program of PBS Faculty. Taken by students in their first year.

PSYC 110. Measurement and Statistics I (Wolford)
First section of Graduate level statistics. Taken by students in their second year.

PSYC 167. Pedagogy with Purpose (Clark)
Textbook or primary literature? Multiple-choice, essay or short answer? Lecture, discussion or flipped? PowerPoint posted before class or not at all? These are just a few of the choices that instructors face as they plan and implement their courses. In this class, graduate students will evaluate the literature that informs these choices (among others) and identify principles to carry forward to future teaching opportunities. Open to students who have completed their first year of graduate school.

PSYC 174. Computational Neuroscience: Brain Engineering (Granger)
Brain circuits are circuits. Just as we can write down what an iphone or a computer does, so we can derive candidate operations and algorithms that brain circuits may be carrying out. Evidence suggests that brains are non-standard engineering devices: they have unusually low-precision synaptic connections, operating at speeds that are ridiculously slower than electronic circuits; yet brains are so good at some tasks, from face and voice recognition to language understanding, that the field of computer science now often imitates brains in order to rival their performance. We will read papers relevant to disparate approaches to brain modeling, and discuss predominantly brain circuit approaches. The aim of the course will be to enhance understanding of the current literature and enable critical readings of it. Qualified undergraduates may take the course by permission of instructor.

PSYC 179. Seminar in Special Topics: The Social Brain Hypothesis (Haxby)
This seminar will examine the social brain hypothesis, which has two forms. In the first version, the hypothesis proposes that the human brain is a social brain, optimized for processing information that is relevant for social cognition and interaction. The second social brain hypothesis proposes that a specific set of brain structures is “the social brain” that is responsible for social information processing.

WINTER 2019

PSYC 111. Measurement and Statistics II (Wolford)
Second term of Graduate level statistics. Typically taken by PBS students in their second year.

PSYC 161. Introduction to Programming for Psychologists & Neuroscientists (Halchenko)
Neuroimaging, computational neuroscience and other fields of brain research directions are becoming more and more data driven and employing sophisticated computational methods and paradigms, such as distributed and cloud computing. That is why it becomes critical for new researchers to develop at least basic skills in programming, software engineering, code and data management. This course intends to provide wide in scope and introductory in depth coverage of many important topics in programming, software engineering and some data structures and algorithms to streamline students current and future research projects. It will be practice and interaction oriented in its format: lectures will be interleaved within practice hands-on sessions. Although some topics and home exercises will involve using established data analysis frameworks, primary accent will be made on getting a good grasp of good coding and software developing practices: collaboration, testing, code review, etc. Thus, this course is intended to serve as a prerequisite to possible follow-up course(s) which would concentrate on in-depth learning of specific neuroimaging (and/or computational neuroscience) frameworks (from stimuli delivery to advanced analysis pipelines).

PSYC 179. Seminar in Special Topics: Computational Models of Cognition (Soltani)
This course will explore various computational models used for studying cognition. This includes models of attention, decision making, reward-based and reinforcement learning, and working memory. The course will focus on both descriptive and mechanistic models and how these models are used to explain behavior, interpret neural activity, and reveal underlying neural mechanisms. We will emphasize circuit-level models that can provide testable predictions for future experiments in humans and other animals. Overall, the purpose is to introduce students to a broad class of recent computational models of cognitive processes.

SPRING 2019

PSYC 126. Systems/Behavioral Neuroscience (Taube)
The goal of this course is to understand behavior as a product of the brain's neural activity. As we progress through the course you will see that scientists know a great deal about simple processes such as reflexes, sensory sensations, and simple motor movements, but we know much less about higher cognitive processes such as learning, memory, and emotional feelings. But ultimately, even these "higher order processes" must be understood in terms of their underlying neural mechanisms. The course focuses on discussing three major systems within the brain – each of which is important for our underlying behavior. These systems are sensory, motor, and limbic. Some emphasis will be placed on how the brain is organized from an anatomical perspective and the connections between different brain structures. This emphasis will complement the first four laboratories where you will have a hands-on experience in examining a sheep's brain. In the second half of the course you will test animals in a spatial learning task and observe some of the techniques used by neuroscientists to study the brain.

The course is taught in conjunction with Psych 65. In addition to the undergraduate portion described above, the graduate students will meet once per week to discuss the covered topics in further depth. During the first month of the course we will also cover the basis of membrane potentials and synaptic transmission.

Note that PSYC 126 graduate students will attend PSYC 65 in the 10 hour (10:10-11:15am on Monday, Wednesday, and Friday) and an additional meeting once per week.

PSYC 128. Cognitive Neuroscience (Tse)
Psych 128 will comprise the Cognitive Neuroscience core for PBS graduate students, though advanced undergraduates and graduate students in other departments may, with the permission of the professor, also take this course. This course will focus on providing an overview of the big questions and topics that drive the field of Cognitive Neuroscience, with a particular emphasis on the neural activity and neural circuits that underlie major functional systems such as attention, emotion, cognition, and perception. As such, the course will not focus on standard data collection methods such as fMRI or EEG, and will also not focus on data analysis methods. We will work our way through the latest edition of Gazzaniga's book "Cognitive Neuroscience: The Biology of the Mind (Fifth Edition)" chapter by chapter. This will provide a framework for discussion and expansion into related articles. Participating students will be expected to present chapters, and to participate in extensive discussions of ideas about the neural basis of mind in all its aspects.

PSYC 179: Data Mining (Bharucha)
This course will no longer be offered in 2018-19.

RESEARCH AND TEACHING COURSES

These courses are offered every term.

PSYC 115. Supervised Teaching (1 credit): Taken while performing a TA.

PSYC 117. Specialist Requirement (1 credit): Taken while doing specialist reading and written exam, usually not awarded a grade until completed (so 'ON' appears in the grade column until exam is completed).

PSYC 118. **Research Presentation (1 credit):** For students who entered the program before 2015, taken while doing specialist grant proposal and defense; usually not awarded a grade until completed (so 'ON' appears in the grade column until exam is completed). For students who entered the program in 2015 or later, taken in the spring term of second year while completing the second year research presentation.

PSYC 188 (1 credit), 288 (2 credits), 388 (3 credits). Graduate Research: All active students must take at least one research credit every term.

HOW TO CHOOSE THE CORRECT NUMBER OF RESEARCH COURSE CREDITS

Remember that you must be enrolled for 3 total credits per term to be considered 'active'. If you are not sure about courses, check with Julia Abraham.

If you are enrolling in full time research (i.e. not taking any seminars, teaching assistantships, or specialist reading courses), enroll in PSYC 388 (3 credits). If you are enrolling in 1 seminar course as well as conducting research, enroll in PSYC 288 (2 credits). If you are enrolling in 2 courses as well as doing research, enroll in PSYC 188 (1 credit). You should be enrolled in at least 1 credit of research every term.

Example 1: you are a first year student taking the proseminar and doing research: you will sign up for PSYC 100 and PSYC 288.

Example 2: you are TA'ing a course, taking a Special Topics Seminar, and doing research: you will sign up for PSYC 115, PSYC 179, and PSYC 188.

Example 3: you are taking no courses, you are not TA'ing, and you are not working on your specialist requirement; you are only participating in research for the term: you will sign up only for PSYC 388.

COURSES OFFERED BY OTHER DEPARTMENTS AND PROGRAMS

The following is list of courses that have been offered in the past by other departments or programs and are already approved for PBS graduate curriculum credit. Please refer to the current ORC to find out if/when they are being offered. If there is a course other than those listed below which you would like to take for PBS grad program credit, contact the Chair of the Graduate Committee to request approval before taking the course.

COSC 104. Artificial Intelligence
This course is a graduate-level survey of artificial intelligence. It covers the basic principles underlying artificial intelligence (search methods, knowledge representation and 'expert systems,' planning, learning, etc.) and examples of particular artificial intelligence applications areas (natural language understanding, vision, robotics).

PEMM 124. Ethical Conduct of Research
There will be approximately four one-and-a-half hour small group discussion sessions and four one hour lectures with the times to be arranged. Topics will include: mentoring, data collection, academic integrity, ethical use of human subjects and laboratory animals, authorship, sponsored research and intellectual property.

PEMM 129. Molecular Pharmacology
This course aims to provide a solid introduction into modern pharmacology, focusing on more mechanistic aspects of therapeutics. Topics will include: basic concepts in pharmacology, systems-level pharmacology and emerging therapies. The course will meet 4 hours per week.

PEMM 131. Current Approaches in Experimental Therapeutics
This course will present a survey of current methods and approaches in pharmacologic, molecular and experimental therapeutic research. Topics will include pharmacogenomics, pharmacokinetics, functional genomics, in vivo imaging, global gene expression, proteomics, gene targeting, gene therapy and drug screening and delivery. The class will be in lecture format with student discussion and participation. The class will meet for 3 hours each week.

PEMM 211. Neurobiology of Disease
This course will introduce students to the cellular and molecular processes that are pathologically altered in a variety of neurological diseases. Students will also learn by reading and presenting seminal papers on neurological disease topics how neuroscientists research the causes and potential treatments of the disease. The course will be team taught by experts from the neuroscience faculty who will give a one hour didactic lecture in the first session of the week. Then, in a 2 hour session later in that week, students will present and critique scientific papers on the topic chosen by the faculty for that week.

PEMM 212. Neurobiology of Disease.
The course is an intermediate/advanced course in neuroscience - from the molecular level on up through the cognitive and clinical levels. The course will be taught by medical school faculty and is intended for those students who have completed the medical neuroscience

course. Attached is the tentative syllabus. The course involves a combination of lecture/tutorials and reading/discussing journal articles.

PEMM 271. Advanced Biomedical Sciences

This course emphasizes the integration of molecular, cellular, and systems level information and the experimental approaches used to understand physiology and pathophysiology. It is designed to provide graduate students with a more sophisticated understanding of the major systems of an organism and how they act and interact in order for an individual to adapt and survive in the face of changing environmental resources and challenges. The course is organized into week-long, "stand alone" modules that cover integrative, translational topics in immunology, cardiovascular physiology, endocrinology, and neurobiology (eg. influenza, congestive heart failure, sleep disorders, drug addiction, space physiology). Course meetings are a mixture of lectures and in-class discussions led by the participating faculty, as well as laboratory exercises and demonstrations, including human brain dissections, visits to clinical laboratories and diagnostic centers, and "hands on" opportunities with state-of-the-art electrophysiological and cardiovascular techniques. Course activities are supplemented by primary research articles, reviews, and other on-line materials.