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510. (PHRM510) Neurotransmitter Signaling & Pharmacology. (J) Steve Thomas, Teresa Reyes, Chris Pierce.

This course will provide in-depth information on neurotransmitters and their associated signaling systems. Emphasis will be placed on the wealth of new molecular information that has been gathered to examine how neurons function and communicate. Students will develop skills to appreciate, present and critically evaluate the current literature in neurotransmitter signaling and neuropharmacology.

521. (BE 521) Brain Computer Interface. Prerequisite(s): BE 301 (Signals and Systems) or equivalent, computer programming experience, preferably MATLAB (e.g., as used in BE labs, BE 209/210/310). Some basic neuroscience background (e.g. BIOL 215, BE 305, BE 520, NGG core course), or independent study in neuroscience, is required. This requirement may be waived based upon practical experience on a case by case basis by the instructor.

This course is geared to advanced undergraduate and graduate students interested in understanding the basics of implantable neuro-devices, their design, practical implementation, approval, and use. Reading will cover the basics of neuro signals, recording, analysis, classification, modulation, and fundamental principles of Brain-Machine Interfaces. The course will be based upon twice weekly lectures and "hands on" weekly assignments that teach basic signal recording, feature extraction, classification and practical implementation in clinical systems. Assignments will build incrementally toward constructing a complete, functional BMI system. Fundamental concepts in neurosignals, hardware and software will be reinforced by practical examplesand in-depth study. Guest lecturers and demonstrations will supplement regular lectures.

SM 534. (CAMB534) Sem Current Genetics Research. (B)

This is an advanced seminar course emphasizing genetic research in model organisms and how it informs modern medicine. Each week a student will present background on a specific human disease. This is followed by an intense discussion by the entire class of 2 recent papers in which model organisms have been used to address the disease mechanism and/or treatment. As a final assignment, students will have the opportunity to write, edit, and publish a "News & Views" style article in the journal "Disease Models and Mechanisms".

572. Electrical Language of Cells. (A) Toshinori Hoshi, Doug Coulter.

This course introduces students to high-speed electro-chemical signaling mec hanisms that occur in nerve and other excitable cells during normal activity. Topics considered in substantial detail include: a) a basic description of the passive and active membrane electrical properties; b)the molecular architecture and functional role of ion channels in cell signaling; c)the role of the calcium ion as an umbiquitous chemical mesenger, with applications to neuro-secretion; d)excitatory and inhibitory transmission in the central nervous sytem; e) sensory transduction, as illustrated by the visual, olfactory, and autitory pathways. The course assumes a standard background in cell biology, as well as basic concepts from college physics and college calculus.

573. (PSYC609) Systems Neuroscience. (B) Yale Cohen, Diego Contreras.

This course provides an introduction to what is known about how neuronal circuits solve problems for the organism and to current resarch approaches to this question. Topics include: vision, audition, olfaction, motor systems, plasticity, and oscillations. In addition, the course aims to provide an overview of the structure of the central nervous system. A number of fundamental concepts are also discussed across topics, such as: lateral inhibition, integration, filterting, frames of reference, error signals, adaptation. The course format consists of lectures, discussions, readings of primary literature, supplemented by textbook chapters and review articles.

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575. (BIOL442, PSYC421) Neurobiology of Learning and Memory. (I) Ted Abel, Isabel Muzzio.

This course focuses on the current state of our knowledge about the neurological basis of learning and memory. A combination of lectures and discussions will explore the molecular and cellular basis of learning in invertebrates and vertebrates from a behavioral and neural perspective.This course is intended for upper level undergraduate and graduate students.

578. (BIOL488) Advance Topics in Behavioral Genetics. (J) Ted Abel, Maja Bucan, Robert Schultz.

This course focuses on the use of genetic techniques to study the molecular and cellular bases of behavior. Particular emphasis will be given to the role of genetic approaches in understanding the biological processes underlying learning, memory storage, circadian rhythms, and drug abuse. Reverse genetic approaches utilizing gene knockout and transgenic technology, as well as forward genetic approaches using mutagenesis and quantitative genetic techniques, will be discussed.

582. (PHRM540, PSYC605) Behavioral Neuropharmacology. (J)

SM 583. (PSYC745) Seminar FMRI Data Analysis. (C) Seminar FMRI Data Analysis..

Seminar FMRI Data Analysis.

584. Neurobiology of Sleep and Circadian Rhythms. (H) Allan Pack, David Raizen.

The objectives of this course are: to discuss and evaluate mechanisms controlling sleep and circadian rhythms; to survey novel approaches to investigations in these areas; indicate the clinical relevance of these ideas where possible. About half the course consists of core lectures on basic rhythms, sleep, and their neural substrates. The rest of the lectures are devoted to special topics which change from year to year.

598. Advanced Systems Neuroscience. (I) Marc Schmidt, Long Ding.Prerequisite(s): Core III or Permission of course director.

How do we perceive the external world with different senses? How do we use our knowledge of the world to make decisions that benefit us? How do we transform these decisions into actions? How do we improve the execution of the actions themselves? Most importantly, from a neuroscience perspective, how does our brain do it? These are some of the fundamental questions in neuroscience. The Advanced Systems Neuroscience course explores these questions with two focuses: 1) what are our current best guesses? 2) what are the strategies/techniques used in systems neuroscience that have proven successful in improving our guesses? The course will follow a general sensory-decisionmaking motor theme, with lectures, presentations of research articles by students and presentations of experiment proposals by students. Lectures by faculty members will review leading hypotheses in particular topics and illustrate key experiments/results that support those hypotheses; paper presentations by students will facilitate more detailed understanding of how studies were constructed and how results were obtained and interpreted; experiment proposals by students (with faculty mentors) will serve as exercisesfor the students to develop critical skills in designing experiments and writing proposals.

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587. Neurobiology of Disease. (J) Marc Dichter.Prerequisite(s): Working knowledge of biology and chemistry. Corequisite(s): Permission of course director.

This course is designed to familiarize neuroscientists with basic information about a number of important neurological and psychiatric disease, focusing on a relatively brief clinical description of the condition and a more in depth discussion of what is currently understood about the basic pathobiology of the disorder.

The course is divided into two parts: on Tuesday afternoons there will be a formal didactic teaching session. The first part of each lecture (1/2 hour to 1 hour) will be devoted to a discussion of the disease in question and the second part will consist of one or two student presentations (in lieu of a paper or exam) reviewing in depth one critical neuroscience component of the disease. Each student will work with the course director or an assigned faculty member to develop her/his lecture. On Thursday afternoons, a faculty member will present a research seminar or chalk talk describing the research she or he is conducting in that particular disease. Papers will be provided before the seminar so the students will be familiar with the research. It is expected that having a research seminar given after the introductory lecture will allow the students to become familiar in depth with at least one approach to each disease.

594. (BIBB585, PHYS585, PSYC539) Theoretical and Computational Neuroscience. (B) Vijay Balasubramanian.Prerequisite(s): Previous coursework in physiology and in differential equations and some familiarity with computers, or instructor's permission.

Theoretical studies of neural function from the molecular to the cognitive level. Emphasis on organization and function of neural maps, synaptic plasticity, vision, and recent neural network models of higher brain functions and on neurobiological problems that are well suited to computational study.

597. (CAMB597) Neural Development, Regeneration and Repair. (A) Greg Bashaw, Michael Granato.

The goal of this course is to examine the principles underlying nervous system development and to appreciate how understanding the molecular mechanisms that govern development can be used to inform approaches to promote regeneration and repair. This is not a survey course. Rather, the course will focus on selected topics, for which we will discuss the genetic, molecular and cellular strategies employed to study these problems in different model organisms. Emphasis is on how to interpret and critically evaluate experimental data. Each class is 1.5 hours in length. During the first hour, an assigned paper will be discussed in detail. During the last 20-30 minutes, faculty will introduce methods, concepts, background and information pertinent to the paper that will be discussed at the following meeting. Topics for Spring 2014 will include: 1) Neural specification, diversification and the use of Stem Cells for neural replacement and repair, 2) Axon guidance at the midline and regenerationin spinal cord, 3) Neuronal tiling, self-avoidance and Wallerian degeneration, 4) Development of olfactory circuits and 5) Synapse formation, positioning and synaptic partner choice. There are no exams, but each student will submit two short (two page) research proposals related to the topics presented.

SM 600. Topics in Neurobiology of Disease 001: Neurodegenerative Diseases.

615. (BMB 518, CAMB615) Protein Conformation Diseases. (I) Yair Argon, Harry Ischiropoulos.

Protein misfolding and aggregation has been associated with over 40 human diseases, including Alzheimer's disease, Parkinsons disease, amytrophic lateralsclerosis, prion diseases, alpha (1)-antitrypsin deficiency, inclusion body myopathy, and systemic amyloidoses. This course will include lectures, directedreadings and student presentations, to cover seminal and current papers on the cell biology of conformational diseases including topics such as protein folding and misfolding, protein degradation pathways, effects of protein aggregation on cell function, model systems to study protein aggregation and novel approaches to prevent protein aggregation.

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618. Recovery After Neural Injury. (K) Akiva Cohen.

The human nervous system is subject to several types of injury, (traumatic, ischemic, epileptic, demyelinating and/or inflamatory) that cause serious functional deficits. The mechanisms used by the central and peripheral nervous systems for functional recovery from these injuries will be described in this course. The molecular and cellular pathobiology of CNS injury will be reviewed and methods to enhance functional recovery will be discussed in detail. These include the limitation of secondary neuronal damage by pharmacological manipulations (neuroprotection), the promotion of regeneration,and plasticity, the application of bioengineering strategies, and the use of behavioral rehabilitative approaches. Course Format: a combination of lecture, journal club stype student presentations and classroom discussion.

799. Independent Study. (C)

SM 695. Scientific Writing. (B) Alice Chen-Plotkin, Joshua Ian Gold.Prerequisite(s): NGG Pre-candidacy exam students only.

This 7-class course is designed to introduce students to basic scientific writing skills and is timed for second year graduate students preparing for qualifying examinations. Participants will review the general principles of clear, persuasive writing, and will apply these principles to writing for a scientific audience. Particular emphasis will be placed on conveying the significance of your research, outlining the aims, and discussing the results for scientific papers and grant proposals. The course will also provide an overview of the structure and style of research grant proposals and scientific manuscripts. Classes are highly interactive, and the majority of class time will be spent discussing student scientific writing. The goal of the course is to encourage active and open interaction among students. Ideal endpoints include improved self-editing, and development of effective strategies for offering and receiving editorial recommendations among peers.

SM 706. (BIBB473, PSYC473) Neuroeconomics. (C)

990. Master's Thesis. (M)