

# NEUROSCIENCE (NSCI)

## **NSCI 141a / PSYC 141a, The Criminal Mind** Arielle Baskin-Sommers

Theoretical and empirical study of the development of criminal behavior, including constitutional, social, and neurobiological elements. Personality and psychopathological factors associated with criminal behavior; theoretical and psychobiological explanations of crime; the biological/environment interaction; the impact of psychobiological models for policy and intervention. SC

## **NSCI 160a / PSYC 160a, The Human Brain** Gregory McCarthy

Introduction to the neural bases of human psychological function, including social, cognitive, and affective processing. Preparation for more advanced courses in cognitive and social neuroscience. Topics include memory, reward processing, neuroeconomics, individual differences, emotion, social inferences, and clinical disorders. Neuroanatomy, neurophysiology, and neuropharmacology are also introduced. SC

## **NSCI 320a / MCDB 320a, Neurobiology** Haig Keshishian and Paul Forscher

The excitability of the nerve cell membrane as a starting point for the study of molecular, cellular, and systems-level mechanisms underlying the generation and control of behavior. At least 1 semester of college chemistry is strongly recommended. SC o Course cr

## **NSCI 321La / MCDB 321La, Laboratory for Neurobiology** Haig Keshishian

Introduction to the neurosciences. Projects include the study of neuronal excitability, sensory transduction, CNS function, synaptic physiology, and neuroanatomy. Concurrently with or after MCDB 320. SC ½ Course cr

## **NSCI 324a / BENG 230a / MB&B 330a / MCDB 330a, Modeling Biological Systems I**

Thierry Emonet and Kathryn Miller-Jensen

Biological systems make sophisticated decisions at many levels. This course explores the molecular and computational underpinnings of how these decisions are made, with a focus on modeling static and dynamic processes in example biological systems. This course is aimed at biology students and teaches the analytic and computational methods needed to model genetic networks and protein signaling pathways. Students present and discuss original papers in class. They learn to model using MatLab in a series of in-class hackathons that illustrate the biological examples discussed in the lectures. Biological systems and processes that are modeled include: (i) gene expression, including the kinetics of RNA and protein synthesis and degradation; (ii) activators and repressors; (iii) the lysogeny/lysis switch of lambda phage; (iv) network motifs and how they shape response dynamics; (v) cell signaling, MAP kinase networks and cell fate decisions; and (vi) noise in gene expression. Prerequisites: MATH 115 or 116. BIOL 101-104, or with permission of instructors. This course also benefits students who have taken more advanced biology courses (e.g. MCDB 200, MCDB 310, MB&B 300/301). QR, SC o Course cr

## **NSCI 325b / BENG 465b / MB&B 361b / MCDB 361b, Modeling Biological Systems II**

Thierry Emonet

Advanced topics related to dynamical processes in biological systems. Processes by which cells compute, count, tell time, oscillate, and generate spatial patterns. Time-dependent dynamics in regulatory, signal-transduction, and neuronal networks;

fluctuations, growth, and form. Comparisons between models and experimental data. Dynamical models applied to neurons, neural systems, and cellular biophysical processes. Use of MATLAB to create models. Prerequisite: MCDB 330 or equivalent, or a 200-level biology course, or with permission of instructor. QR

**NSCI 329a / MCDB 329a, Sensory Neuroscience Through Illusions** Damon Clark and Michael O'Donnell

Animals use sensory systems to obtain and process information about the environment around them. Sensory illusions occur when our sensory systems provide us with surprising or unexpected percepts of the world. The goal of this course is to introduce students to sensory neuroscience at the levels of sensor physiology and of the neural circuits that process information from sensors. The course is centered around sensory illusions, which are special cases of sensory processing that can be especially illustrative, as well as delightful. These special cases are used to learn about the general principles that organize sensation across modalities and species. Prerequisites: BIOL 101-104; NSCI 160 or NSCI 320 or permission of instructor. SC

**\* NSCI 444a / PSYC 442a, Topics in Clinical Neuroscience** Tyrone Cannon

This course is an advanced seminar examining the biological bases of psychopathology. We cover research, theory, and controversies regarding the roles of genetics, neurotransmitter systems, brain development and function, and other biological influences in the major classes of mental disorders, including anxiety disorders, depression, schizophrenia, bipolar disorder, obsessive compulsive disorder, substance use disorders, eating disorders, and autism. Prominent theories emanating from cognitive, behavioral, and interpersonal approaches to psychopathology are examined in the context of multilevel models of behavior, and the interplay of biological and psychological factors are a central theme throughout. Prerequisite: PSYC 160 SO

**\* NSCI 449a / PSYC 449a, Neuroscience of Social Interaction** Steve Chang

This seminar covers influential studies that inform how the brain enables complex social interactions from the perspectives of neural mechanisms. Students thoroughly read selected original research papers in the field of social neuroscience across several animal species and multiple modern neuroscience methodologies. In class, the instructor and students work together to discuss these studies in depth. Focused topics include neural mechanisms behind brain-to-brain coupling, empathy, prosocial decision-making, oxytocin effects, and social dysfunction. Prerequisite: PSYC 160 or permission from the instructor. SC

**\* NSCI 470a, Independent Research** Damon Clark and Steve Chang

Research project under faculty supervision taken Pass/Fail; does not count toward the major, but does count toward graduation requirements. Students are expected to spend approximately ten hours per week in the laboratory. A final research report and/or presentation is required by end of term. Students who take this course more than once must reapply each term. To register, students must submit a form and written plan of study with bibliography, approved by the faculty research adviser and DUS, by the end of the first week of class. More detailed guidelines and forms can be obtained from <http://neuroscience.yale.edu>.

**\* NSCI 480a, Senior Non-empirical Research** Damon Clark and Steve Chang

Research survey under faculty supervision fulfills the senior requirement for the B.A. degree and awards a letter grade. For NSCI seniors only (and second term juniors with

DUS permission). Students are expected to conduct a literature review, to complete written assignments, and to present their research once in either the fall or spring term. Students are encouraged to pursue the same research project for two terms. The final research paper is due in the hands of the sponsoring faculty member, with a copy submitted to the department, by the stated deadline near the end of the term. To register, students submit a form and written plan of study with bibliography, approved by the faculty research adviser and DUS, by the end of the first week of classes. More detailed guidelines and forms can be obtained from <http://neuroscience.yale.edu>.

**\* NSCI 490a, Senior Empirical Research** Damon Clark and Steve Chang  
Laboratory or independent empirical research project under faculty supervision to fulfill the senior requirement for the B.S. degree. For NSCI seniors only (and second term juniors with DUS permission); this course awards a letter grade. Students are expected to spend at least ten hours per week in the laboratory, to complete written assignments, and to present their research once in either the fall or the spring term. Written assignments include a short research proposal summary due at the beginning of the term and a full research report due at the end of the term. Students are encouraged to pursue the same research project for two terms, in which case, the first term research report and the second term proposal summary may be combined into a full research proposal due at the end of the first term. Final papers are due by the stated deadline. Students should reserve a research laboratory during the term preceding the research. To register, students must submit a form and written plan of study with bibliography, approved by the faculty research adviser and DUS, by the end of the first week of classes. More detailed guidelines and forms can be obtained from <http://neuroscience.yale.edu>.