An interdepartmental program

Neuroscience

Courses of Study:
Major (BA/BS)
Master of Science
Doctor of Philosophy

Objectives

Undergraduate Major
The major in neuroscience is designed to provide an interdisciplinary program of study of the neural mechanisms involved in the control of human or animal behavior. The major combines a strong foundation in basic science with more specialized courses in biology and psychology. This program is especially appropriate for students wishing to pursue further study in medicine, experimental psychology, or neuroscience.

Graduate Program in Neuroscience
The graduate program in neuroscience, leading to the MS and PhD degrees, is designed to equip students with the advanced knowledge and training necessary to conduct research in this interdisciplinary field. The program comprises three broadly defined areas: behavioral neuroscience involves work with humans in neuropsychology, experimental cognitive neuroscience and sensory psychophysics, and animal behavior and electrophysiology; cellular and molecular neuroscience provides training in electrophysiology, molecular biology, biophysics, and biochemistry appropriate to neurobiology; and computational and integrative neuroscience trains students in the use of experimental and theoretical methods for the analysis of brain function. A typical program for the PhD student will consist of laboratory rotations and dissertation research as well as formal courses. Students pursuing the MS degree typically take graduate-level courses and do either laboratory research or an in-depth library-based thesis.

How to Become a Major

The neuroscience major requires a strong science course load. There is a meeting each fall at which interested students can discuss the major with neuroscience faculty. Students can schedule an appointment with the undergraduate advising head for further information or to enroll in the major. The requirements are listed below and include many options. It is recommended that each major meet with his or her adviser to determine which options best satisfy each student's needs. Because of the number of basic science requirements, it is recommended that students begin enrolling in these courses early, especially those listed as prerequisites for advanced courses in the major. Students interested in senior research should contact prospective mentors by the spring of their junior year.

How to Be Admitted to the Graduate Program

The general requirements for admission to the Graduate School, given in an earlier section of this *Bulletin*, apply here. Applicants for admission to the neuroscience program are also required to take the Graduate Record Examination. The student's undergraduate curriculum should include related fundamental science courses.

Students currently enrolled in other programs at Brandeis may elect to switch over to obtain a neuroscience PhD if they have already met or will meet the degree requirements for the neuroscience degree.

Faculty

John Lisman, Chair
(Biology; Volen National Center for Complex Systems)

Jeffrey Agar
(Chemistry; Rosenstiel Center; Volen National Center for Complex Systems)

Susan Birren, Undergraduate Advising Head
(Biology; National Center for Behavioral Genomics; Volen National Center for Complex Systems)

Paul DiZio
(Psychology; Volen National Center for Complex Systems)

Irving Epstein
(Chemistry; Volen National Center for Complex Systems)

József Fiser
(Psychology; Volen National Center for Complex Systems)

Paul Garrity
(Biology; National Center for Behavioral Genomics; Volen National Center for Complex Systems)

Leslie Griffith, Graduate Advising Head
(Biology; National Center for Behavioral Genomics; Volen National Center for Complex Systems)

Donald Katz
(Psychology; Volen National Center for Complex Systems)

James Lackner
(Psychology; Volen National Center for Complex Systems)

Eve Marder
(Biology; Volen National Center for Complex Systems)

Christopher Miller (on leave 2008–2009)
(Biochemistry; Volen National Center for Complex Systems)

Paul Miller
(Biology; Volen National Center for Complex Systems)

Sacha Nelson
(Biology; National Center for Behavioral Genomics; Volen National Center for Complex Systems)

Daniel Oprian
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Joan Press
(Biology; Rosenstiel Center; Senior Honors Coordinator)

Michael Rosbash
(Biology; National Center for Behavioral Genomics)

Robert Sekuler
(Psychology; Volen National Center for Complex Systems)

Piali Sengupta
(Biology; National Center for Behavioral Genomics; Volen National Center for Complex Systems)

Gina Turrigiano
(Biology; National Center for Behavioral Genomics; Volen National Center for Complex Systems)

Arthur Wingfield
(Psychology; Director, Volen National Center for Complex Systems)

Requirements for the Major

A. All students will be required to take the core course in neurobiology, NBIO 140b (Principles of Neuroscience) and at least one core course in quantitative methods: BIOL 51a (Biostatistics), NBIO 136b (Computational Neuroscience), NPHY 115a (Dynamical Systems, Chaos, and Fractals), NPSY 137b (Cognitive Modeling), PSYC 51a (Statistics), PSYC 210a (Advanced Psychological Statistics), QBIO 110a (Numerical Modeling of Biological Systems), or PHYS 105a (Biological Physics). A course taken to satisfy the quantitative method requirement cannot also count as an elective course.

Students must choose one of the two tracks described below—Option I, leading to a BA in neuroscience, or Option II, leading to a BS in neuroscience.

Among courses offered to fulfill the requirements of this concentration, no course may be taken pass/fail and no more than one grade of D in a semester course will be allowed.

Option I: The BA Degree in Neuroscience
The standard neuroscience option is designed to provide students with a general background in neuroscience. In addition to the courses required of all candidates (listed above), students must take six semester courses from the courses listed below under neuroscience electives—at least two courses must be selected from Group 1 and two from Group 2. Students must also take at least nine semester courses from the basic science electives.

Neuroscience Electives
Group 1: NBIO 136b (Computational Neuroscience), 143b (Developmental Neurobiology), 145b (Systems Neuroscience), 146a (Neurobiology of Disease), 147a (Neurogenetics), 148b (Cellular Neuroscience), 150a (Autism and Human Developmental Disorders), BIOL 149b (Molecular Pharmacology), NPHY 115a (Dynamical Systems, Chaos, and Fractals), QBIO 110a (Numerical Modeling and Biological System), QBIO 120b (Quantitative Biology Instrumentation Laboratory).

Group 2: NPSY 11b (Introduction to Behavioral Neuroscience), 12a (Sensory Processes), 16a (Motor Control), 22b (Introduction to Cognitive Neuroscience), 120b (Man in Space), 125a (Advanced Topics in Perception and Adaptation), 128b (Motor Control, Orientation, and Adaptation), 137b (Cognitive Modeling), 154a (Human Memory), 159a (Advanced Topics in Episodic Memory), 168b (Electrophysiology of Human Memory), 174b (Visual Cognition), 175b (The Neuroscience of Vision), 196b (Advanced Topics in Cognition), 197a (Advanced Topics in Behavioral Neuroscience), 199a (Human Neuropsychology).

Group 3: BCHM 100a (Introductory Biochemistry), 101a (Advanced Biochemistry: Enzyme Mechanisms), BIOL 22a (Genetics and Molecular Biology), 22b (Cell Structure and Function), 42a (Physiology), 50b (Biology of Behavior), 103b (Mechanisms of Cell Functions), 105b (Molecular Biology), 111a (Developmental Biology).

A student who has completed two courses in both Groups 1 and 2 may petition to substitute NEUR 98a,b (Readings in Neuroscience), or NEUR 99a and b (Senior Research) for one of the remaining two courses. Students must enroll in all laboratories that accompany electives used to satisfy these requirements.

Basic Science Electives
The basic science electives include all courses numbered 10 and above in chemistry, computer science, mathematics, and physics. Courses numbered below 10 may not be included in this group. Laboratory courses are counted as one-half of a regular semester course.

Double–Counting Electives
BIOL 22a and BIOL 22b may count toward either Group 3 electives or basic science electives, but not both.

Option II: The BS Degree in Neuroscience
The BS program is an intensive neuroscience option designed to provide students with a strong background in neuroscience and associated areas. In addition to the courses required of all candidates (listed above), students must take seven semester courses from those listed above in neuroscience electives, with at least two courses selected from Group 1 and two from Group 2. Candidates for the BS must also take at least ten semester courses from the offerings given above in basic science electives. Courses numbered below 10 may not be included in this group.

B. Senior Research and Honors Program
Seniors can receive credit for senior research in neuroscience by petitioning the program committee during the fall of their senior year. Candidates must enroll in NEUR 99a and 99b or 99e to carry out a senior research project and submit a thesis. Candidates interested in honors must state this in their petition and also present an oral defense of their thesis.

Combined BS/MS Program

Candidates for honors in neuroscience may be admitted to a special four-year BS/MS program upon recommendation of the neuroscience program and approval by the Graduate School. Application to the Graduate School must be made by May 1 preceding the senior year. Applications should include a proposed course of study specifying how the degree requirements will be met, a transcript, a letter of recommendation from the research sponsor, and a brief description of the proposed research project. To qualify for the BS/MS degree in neuroscience, students must complete a total of thirty-eight courses. These courses must include those needed to satisfy the requirements for the BS degree, as indicated above, plus three additional electives chosen from the neuroscience electives listed above. Of the ten electives required for the BS/MS degree, at least six must be at the graduate level (and completed with a grade of B– or above). In addition, a substantial research contribution is required and students must submit a research thesis to the neuroscience graduate committee for review. A thesis submitted for the master's degree may also be submitted for honors in neuroscience.

Special Notes Relating to Undergraduates

It is the policy of the neuroscience program to allow Advanced Placement exams to count for no more than two general science requirements for the neuroscience major. Please refer to the Advanced Placement chart for test score requirements. We recommend students who anticipate pursuing graduate work in neuroscience take additional math courses such as linear algebra or calculus of several variables.

Requirements for the Degree of Master of Science

Graduate students will be eligible for an MS in neuroscience if they complete six graduate–level courses in neuroscience. The six courses must include NBIO 140b and one laboratory or research-based course, with the balance of courses to be agreed upon with the neuroscience advising head. A grade of B– or better must be obtained in each course. The laboratory research based course should be chosen in consultation with the neuroscience advising head from NEUR 298a/b, NEUR 299a/b, NEUR 300d or BIOL 155a and is typically taken in the spring. All students are required to take CONT 300b (Ethical Practice in Health-Related Sciences), usually offered in the spring. All students should enroll in NBIO 306d (Topics in Neurobiology).

Residence Requirement
The minimum residence requirement for the MS degree is one year.

Requirements for the Degree of Doctor of Philosophy

Program of Study
NBIO 140b (Principles of Neuroscience) is required, along with at least five additional graduate-level courses relevant to the student's area of interest. First- and second-year students shall enroll in NBIO 250d (Neuroscience Proseminar) and all students should enroll in NBIO 306d (Topics in Neurobiology). All students are required to take CONT 300b (Ethical Practice in Health-Related Sciences), typically in the spring of their first year.

The suggested schedule of course work for the first two years is the following:

First Year
Fall: NBIO 140b, NBIO 148b, NBIO 250d, NEUR 300d, and NBIO 306d.
Spring: CONT 300b, NBIO 145b, NBIO 146a, NBIO 250d, NEUR 300d, NBIO 306d, and one course selected from the neuroscience electives.

Second Year
Fall: NBIO 250d, NBIO 306d, and one course selected from the neuroscience electives.
Spring: NBIO 250d, NBIO 306d, and one course selected from the neuroscience electives.

Qualifying Examinations
This consists of two written propositions with accompanying oral exams. One of these shall be in the field of neuroscience, but not directly related to the student's thesis work (end of first year), and the other takes the form of a formal thesis proposal (beginning of the third year).

Teaching Requirement
As part of their PhD training, students act as teaching fellows for two semesters, typically in their second year.

Residence Requirement
The minimum residence requirement is three years.

Dissertation and Final Oral Examination
A thesis in the field of neuroscience is required for the PhD, normally carried out in the laboratory of one of the members of the neuroscience training faculty. After submission of the dissertation, the candidate gives a public seminar to the university community and then defends the work and its significance in an examination before a thesis committee.

Requirements for the Degree of Doctor of Philosophy in Neuroscience with Specialization in Quantitative Biology

Program of Study
Students wishing to obtain the specialization must first gain approval of the graduate program chair. This should be done as early as possible, ideally during the first year of graduate studies. In order to receive the PhD in neuroscience with additional specialization in quantitative biology, candidates must complete (a) the requirements for the PhD described above and (b) the course requirements for the quantitative biology specialization that are described in the quantitative biology section of this *Bulletin*.

Any alteration to the quantitative biology course requirements must be approved by the graduate program chair and by the quantitative biology program faculty advisory committee.

Courses of Instruction

(1–99) Primarily for Undergraduate Students

NPSY 11b Introduction to Behavioral Neuroscience
[sn ss]
Prerequisite: PSYC 1a or MATH 10a or permission of the instructor.
Data and theories regarding current conceptions of brain-behavior relationships. Begins with an introduction to neural systems as classically defined (sensory, association, motor, autonomic), and moves on to examination of the biological underpinnings of various behaviors, from those relating to basic drives (reproduction, feeding) to those with a cognitive flavor. Throughout, the accent is on interactions between organisms and environment (learning). Usually offered every year.
Mr. Katz

NPSY 12a Sensory Processes
[sn ss]
Prerequisite: Sophomore standing or MATH 10a or permission of the instructor.
Examines the human senses, emphasizing sight and hearing, studied from standpoints of anatomy, physiology, and psychophysics. Insights from the study of special observers, including developmentally immature humans, members of nonhuman species, and people with abnormal sensory systems. Usually offered every year.
Mr. Sekuler

NPSY 16a Motor Control
[sn ss]
Prerequisites: PSYC 1a and MATH 10a, or permission of the instructor.
Surveys control of vertebrate posture and movement from various perspectives including muscle properties, reflex organization, central pattern generation, spatial representations, learning, and development. Emphasizes research in physiology, psychology, biomechanics, and computational theory. Usually offered every second year.
Mr. DiZio

NPSY 22b Introduction to Cognitive Neuroscience
[sn ss]
Prerequisites: PSYC 1a or MATH 10a and sophomore standing in psychology or neuroscience.
Cognitive factors in perception, attention, memory and learning, motor control, plasticity and planning, and experience-driven neural plasticity. Experimental and neuroimaging approaches are emphasized. Usually offered every year.
Mr. Sekuler and Staff

NEUR 90a Field Study: Neuroscience
Four semester course credits, of which a maximum of two may count toward the major.
Students proposing to take this course are expected to work out a detailed plan of study for one semester with the help of department faculty members. This plan is to be submitted to the department for its consideration before the end of the semester preceding the one in which NEUR 90a would be taken. Approval depends on the department's resources for supporting the student's plan as well as on the student's competence and the excellence of the plan itself. Usually offered every year.
Staff

NEUR 98a Readings in Neuroscience
Usually offered every year.
Staff

NEUR 98b Readings in Neuroscience
Usually offered every year.
Staff

NEUR 99a Neuroscience Senior Research
The first semester of a two-semester course involving the student in an independent research project conducted under the supervision of a staff member and serving as an intensive introduction to specific methods of neuroscience research. Students should register for NEUR 99b for the second semester of research in the spring. In cases where students are able to do unusually long, intensive work in the laboratory, they may request a third course credit during the petition process; if this request is approved by the senior honors coordinator, students should register for NEUR 99a (fall) followed by NEUR 99e (spring). The combined enrollments for senior research may not exceed three semester course credits. To fulfill the NEUR 99 requirements, students must (1) submit to their research sponsor, at the conclusion of their first NEUR 99 semester, a paper that reviews the literature pertinent to their field of research, and (2) submit to their research sponsor, at the conclusion of their second NEUR 99 semester, a senior thesis that includes an abstract, an introduction, a review of materials and methods, results, discussion, and references. Usually offered every year.
Staff

NEUR 99b Neuroscience Senior Research
A continuation of NEUR 99a. See NEUR 99a for course description.
Staff

NEUR 99e Senior Research
See NEUR 99a for course description.
Usually offered every year.
Staff

(100–199) For Both Undergraduate and Graduate Students

NPHY 115a Dynamical Systems, Chaos, and Fractals
[sn]
Prerequisites: PHYS 10a or 15a, or instructor's permission for approved equivalents.
Advanced introduction to the theory of nonlinear dynamical systems, bifurcations, chaotic behaviors, and fractal patterns. Concepts and analysis are illustrated by examples from physics, chemistry, and biology. The course will be complemented by a significant number of computer labs. Usually offered every second year.
Staff

NPSY 120b Man in Space
[sn ss]
Prerequisite: PHYS 10a and PSYC 52a.
Topics include how orbital flight is achieved, spacecraft life support systems, circulatory dynamics, sensory-motor control and vestibular function in free fall, the physiological and psychological adaptations necessary in space flight, and how astronauts must readapt on return to Earth. Usually offered every year.
Mr. Lackner

NPSY 125a Advanced Topics in Perception and Adaptation
[sn ss]
Prerequisites: MATH 10b, NBIO 140b, and PHYS 10a.
Covers current issues and theories in vision, vestibular function, proprioception, and adaptation to unusual force environments from psychological and biological perspectives. Usually offered every third year.
Mr. Lackner

NPSY 128b Motor Control, Orientation, and Adaptation
[ss sn]
Prerequisite: NBIO 140b.
A seminar critically reviewing and discussing current research about spatially adapted animal movement. The analysis focuses on behavioral properties, biophysics, and neural substrates. Topics include sensorimotor transformations, learning, memory, context specificity, and sensorimotor adaptation. Usually offered every second year.
Mr. DiZio

NBIO 136b Computational Neuroscience
[sn]
Prerequisite: MATH 10a or PHYS 10a or approved equivalents.
An introduction to concepts and methods in computer modeling of neural systems. Topics include the basic biophysics of ion conduction, single and multicompartment neuron models, information representation and processing in the visual system, and models of synaptic plasticity, working memory, and decision making. Usually offered every second year.
Mr. Miller

NPSY 137b Cognitive Modeling
[sn ss]
Prerequisites: MATH 10b and PSYC 51a or NBIO 136b, or permission of the instructor.
A general introduction to the construction and simulation of mathematical models of human cognitive processes. The major emphasis will be on models of human learning and memory. Students will be expected to have some background in computer programming. Usually offered every second year.
Mr. Fiser

NBIO 140b Principles of Neuroscience
[sn]
Prerequisite: BIOL 22b or permission of the instructor.
Examines the basic principles of neuroscience. Topics include resting potentials, action potentials, synaptic transmission, sensory systems, motor systems, learning, neural circuits underlying behavior, neurological diseases, and mental illness. Usually offered every year.
Mr. Lisman

NBIO 143b Developmental Neurobiology
[sn]
Prerequisite: BIOL 22b or permission of the instructor.
Discusses the mechanisms used in the development of the nervous system. Topics include determination of neuronal cell fates, neuronal differentiation and pattern formation, neuron survival and growth, and mechanisms responsible for generation of connectivity in the nervous system. Usually offered every second year.
Ms. Paradis and Ms. Sengupta

NBIO 145b Systems Neuroscience
[sn]
Prerequisite: NBIO 140b.
A fundamental question in neuroscience is how our brains extract and compute features and functions—such as direction of motion from visual stimuli—and how experience allows the microcircuits within our brains to become better tuned to such features. Understanding these processes requires insight into the cellular and network mechanisms that give rise to them. We will begin by examining the classical literature, and then we will move on to recent advances in understanding the cellular and network properties of brain microcircuits. The course emphasizes reading from original papers, and extensive class discussion. Usually offered every year.
Ms. Turrigiano

NBIO 146a The Neurobiology of Human Disease
[sn]
Prerequisite: NBIO 140b.
A lecture- and literature-based overview of the neurobiological underpinnings of neurological and psychiatric disorders including autism, mental retardation, schizophrenia, bipolar disorder, Alzheimer's disease, Parkinson's disease, and other neurodevelopmental and neurodegenerative disorders. Usually offered every second year.
Mr. Nelson

NBIO 147a Neurogenetics
[sn]
Prerequisites: BIOL 18a and BIOL 22a.
Topics inlcude development and function of the nervous system and responses of excitable cells studied in neurological and behavioral mutants. Characterization and manipulation of genes, defined by these mutations and using molecular biological tools. Organisms: roundworms, fruit flies, fish, mammals. Neurobiological areas: embryonic neural development, nerve cell differentiation and pattern formation, membrane excitability, responses to sensory stimuli, biological rhythms, and reproductive behavior. Usually offered every third year.
Ms. Paradis and Ms. Sengupta

NBIO 148b Cellular Neuroscience
[sn]
Prerequisite: NBIO 140b or permission of the instructor. May be taken concurrently with NBIO 140b.
Focuses on cellular and molecular mechanisms of excitability and synaptic plasticity. Students examine classic experiments on action potentials and synaptic transmission and the original research literature dealing with the cellular mechanisms of developmental and learning–related plasticity. Usually offered every year.
Mr. Nelson

NBIO 150a Autism and Human Developmental Disorders
[sn]
Prerequisite: BIOL 22b.
Autism and other developmental disorders are characterized by abnormal brain development resulting in cognitive and behavioral deficits. Takes an integrative approach to investigate the biological, behavioral, medical, and social aspects of human developmental disorders. Usually offered every second year.
Ms. Birren

NPSY 154a Human Memory
[sn ss]
Prerequisite: NPSY 22b.
Presents a systematic analysis of current memory research and theory with an emphasis on visual learning experiments and neural network models. Usually offered every third year.
Staff

NPSY 159a Advanced Topics in Episodic Memory
[sn ss]
Prerequisites: NBIO 140b or NPSY 154a and permission of the instructor.
Deals with current topics in the study of episodic memory. Discussions and readings on topics such as memory for temporal order, category learning, associative symmetry, item versus associative recognition, theories of search in free recall, and the memory systems controversy. Usually offered every second year.
Staff

NPSY 168b Electrophysiology of Human Memory
[sn ss]
Prerequisites: PSYC 51a, NBIO 140b, and NPSY 22b.
Laboratory course covering experimental methods and data analysis of electroencephalographic recordings during memory tasks. Projects involve data collection using a 128-channel EEG system. Topics cover time- and frequency-based methods as well as source modeling. Usually offered every year.
Staff

NPSY 174b Visual Cognition
[sn ss]
Prerequisite: NPSY 12a or permission of the instructor.
Higher-order processes in vision. Visual impact of cognitive and other top-down influences, including attention, expectation, plasticity, and learning. Focus on visual recognition, contour formation, segmentation, temporal binding, and face and object perception. Usually offered every second year.
Mr. Sekuler or Mr. Fiser

NPSY 175b The Neuroscience of Vision
[sn ss]
Prerequisite: NPSY 12a or permission of the instructor.
Examines the neural basis of human vision from several complementary perspectives. Relates visual capacities of human observers to the structure and function of the visual system. Considers computational and functional neuroimaging approaches to vision. Usually offered every second year.
Mr. Sekuler

NPSY 196b Advanced Topics in Cognition
[sn ss]
Prerequisite: PSYC 1a and one of the following: NPSY 12a, PSYC 13b, or NPSY 22b.
This seminar covers current issues and research in memory, speech perception, and processing resource limitations. Emphasis will be placed on the current literature in the field. Usually offered every second year.
Mr. Wingfield

NPSY 197a Advanced Topics in Behavioral Neuroscience
[sn ss]
Prerequisites: NPSY 11b and NBIO 140b or permission of the instructor.
Covers current research and issues pertaining to the neurobiology of perception (focusing mainly but not exclusively on perception of chemosensory signals) as well as the neurobiology of simple learning. Usually offered every year.
Mr. Katz

NPSY 199a Human Neuropsychology
[sn ss]
Prerequisite: NPSY 22b or NBIO 140b or permission of the instructor.
Designed as an introduction to human neuropsychology. Topics include cerebral dominance, neuroanatomical mapping, and localization of function, with special reference to language, memory, and related cognitive function. Usually offered every year.
Mr. Wingfield

(200 and above) Primarily for Graduate Students

NPSY 207b Seminar in Perception
Prerequisites: MATH 10b, NBIO 140b, and PHYS 10a.
Examines the various aspects of visual, vestibular, motor, and proprioceptive information by which objects and events in three-dimensional space are perceived by human observers. Current research in psychology and artificial intelligence is considered. Usually offered every second year.
Mr. Lackner

NBIO 250d Neuroscience Proseminar
Limited to first- and second-year neuroscience PhD students.
Required seminar for first- and second-year graduate students in the neuroscience PhD program. Discusses relevant papers from the current literature with an emphasis on increasing oral presentation skills, experimental design, and proposal writing. Usually offered every year.
Mr. Fiser

NEUR 298a Readings in Neuroscience
Usually offered every year.
Staff

NEUR 298b Readings in Neuroscience
Usually offered every year.
Staff

NEUR 299a Master's Research Project
Usually offered every year.
Staff

NEUR 299b Master's Research Project
Usually offered every year.
Staff

NEUR 300d Laboratory Rotations
Staff

NBIO 306d Topics in Neurobiology
Usually offered every year.
Mr. Katz

NBIO 340d Systems/Computational Neuroscience Journal Club
Usually offered every year.
Mr. Miller

NEUR 401d Dissertation Research
Independent research for the PhD degree. Specific sections for individual faculty members as requested.
Staff

Required First-Year Graduate Health-Related Science Programs Course

CONT 300b Ethical Practice in Health-Related Sciences
Required of all first-year graduate students in health-related science programs. Not for credit.
Ethics is an essential aspect of scientific research. This course, taught by university faculty from several graduate disciplines, covers major ethical issues germane to the broader scientific enterprise, including areas or applications from a number of fields of study. Lectures and relevant case studies are complemented by public lectures during the course. Usually offered every year.
Staff

Cross–Listed Courses

PSYC 13b
Perception

QBIO 110a
Numerical Modeling of Biological Systems

QBIO 120b
Quantitative Biology Instrumentation Laboratory

BIOL 149b
Molecular Pharmacology

An interdepartmental program

Peace, Conflict, and Coexistence Studies

Courses of Study:
Minor

Objectives

Since the end of World War II, peace, conflict, and coexistence studies has emerged as an interdisciplinary area of inquiry drawing on social science, the humanities, the creative arts, and science in efforts to understand reasons for war and possible ways of resolving conflicts without resorting to violence. In the last few years, for many people the primary focus of inquiry is shifting from the Cold War and the nuclear threat to conflict resolution in small and large contexts. Along with the larger goal of ending war altogether, the Brandeis program reflects this tendency.

This is a time to examine the many meanings of "security," to investigate the nature of power and political participation, and to develop ideas and ways of addressing conflicts that honor the integrity of all parties involved. This is a time, in other words, to learn alternatives to violence and a time to learn the ways of disarmament and ending of war.

How to Become a Minor

Students who wish to take peace, conflict, and coexistence studies (PAX) as a minor in addition to their major can construct an individually tailored minor in consultation with the PAX program advisers.

Committee

Gordon Fellman, Chair
(on leave 2008–2009)
(Sociology)

Steven Burg
(Politics)

Cynthia Cohen
(International Center for Ethics, Justice, and Public Life)

David Cunningham
(Sociology)

Judith Eissenberg
(Music)

Reuven Kimelman
(Near Eastern and Judaic Studies)

Richard Parmentier (on leave fall 2008)
(Anthropology)

Andreas Teuber
(Philosophy)

Daniel Terris
(American Studies)

Requirements for the Minor

Students are to take six required courses, configured this way:

A. Two core requirements (comprehensive course or project).

1. SOC 119a (War and Possibilities of Peace).

2. Either PAX 89a or PAX 92a (Internship in Peace, Conflict, and Coexistence Studies) or a senior honors thesis.

The internship consists of at least ten hours a week in a social-change organization in the greater Boston area, elsewhere in the United States, or if the student is abroad, an appropriate equivalent. The intern is supervised by a PAX professor or staff person, keeps a daily journal, presents and does the reading of a bibliography on the topic of the internship and its larger framework, and writes a paper of fifteen to twenty pages at the end of the internship. The student is expected to meet weekly or biweekly with the supervisor and to e-mail weekly or biweekly if doing the work away from Brandeis. Internships are organized around, but not limited to, those we find through the Hiatt Career Center.

Internships in the sociology department (SOC 92a and SOC 89a) with a PAX focus will be evaluated for credit toward the PAX minor on a case-by-case basis.

The senior thesis is undertaken in the student's major, on a topic central to peace, conflict, and coexistence studies. With the department's permission, a member of the PAX faculty committee will serve on and represent the PAX program on the thesis committee.

B. Two or more core electives: at least two courses (and up to four) from this list. Core electives must be taken in at least two different departments.

Core electives include courses that offer critical analyses of violence and nonviolence and that consider information, ideas, and examples of productive ways of resisting violence and working toward peace and justice (what in the peace studies field is called "positive peace," as distinct from "negative peace," which is the absence of war but not of conditions that appear to lead to war). These courses offer perspectives on major institutions and possible alternatives, explore some strategies for change, and encourage students to envision and work toward a world based more on positive peace than on negative peace or war.

C. Maximum of two related electives: No more than two courses from this list can count to meet requirements for the minor, and they must be taken in different departments.

These courses relate directly or indirectly to international, domestic, organizational, intergroup, interpersonal, or personal conflict and also include consideration of perspectives that promote understanding, reconciliation, and transformation. They need not focus on violence and nonviolence, positive peace, or encouraging students to envision positive peace. Students may apply courses from the "core electives" list that they have not taken to fulfill core requirements to this requirement.

D. Students are urged to take at least one course from a school other than social science to fulfill their PAX requirements.

E. Students may petition the PAX committee for special consideration of courses not listed here that the student wishes to propose as appropriate for her/his PAX minor.

Courses of Instruction

PAX 89a Internship in Peace, Conflict, and Coexistence Studies
Prerequisite: Students must complete an eight- to ten-week full-time internship during the summer before the semester in which the student plans to enroll in this course.
Weekly seminar for students who have undertaken a summer internship related to peace, conflict, coexistence, and related international issues. Examples of internship sites include arts organizations, international courts and tribunals, human rights organizations, and democracy organizations. Students write extensively about their internship experience in the context of previous academic work that they have done in PAX, politics, anthropology and other disciplines. Usually offered every semester.
Mr. Fellman

PAX 92a Internship in Peace, Conflict, and Coexistence Studies
Usually offered every year.
Staff

PAX 120b Inner Peace and Outer Peace
[ss]
Examines the relationship between inner state and effective peacemaking at levels ranging from the self within itself to interpersonal, intergroup, and international relations. Addresses concerns about structural change and the relationship between inner state, peace building, and justice seeking. Usually offered every year.
Staff

Core Courses

PAX 92a
Internship in Peace, Conflict, and Coexistence Studies

SOC 119a
War and Possibilities of Peace

Core Elective Courses

ANTH 137b
Gender and the Sacred in Asia

ANTH 159a
Museums and Public Memory

COEX 250a
The Arts of Building Peace

ENG 128a
Alternative Worlds: Modern Utopian Texts

ENVS 15a
Reason to Hope: Managing the Global Commons for Peace

HSSP 102a
Global Perspectives on Health

LGLS 125b
International Law and Organizations

LGLS 130a
Conflict Analysis and Intervention

PAX 120b
Inner Peace and Outer Peace

PHIL 19a
Human Rights

PHIL 111a
What Is Justice?

POL 127a
Ending Deadly Conflict

POL 127b
Seminar: Managing Ethnic Conflict

POL 128a
The Politics of Revolution: State Violence and Popular Insurgency in the Third World

POL 163a
Seminar: Human Rights and International Relations

SOC 112b
Social Class and Social Change

SOC 153a
The Sociology of Empowerment

WMGS 5a
Women and Gender in Culture and Society

Related Elective Courses

AAAS 60a
Economics of Third World Hunger

AAAS 80a
Economy and Society in Africa

AAAS 85a
Survey of Southern African History

AAAS 123a
Third World Ideologies

AAAS 126b
Political Economy of the Third World

AMST 175a
Violence (and Nonviolence) in American Culture

ANTH 129b
Global, Transnational, and Diasporic Communities

ANTH 136a
Kingdoms, Empires, and City-States: State Formation in Comparative Perspective

ANTH 139b
Language, Ethnicity, and Nationalism

ANTH 156a
Power and Violence: The Anthropology of Political Systems

BIOL 17b
Conservation Biology

BISC 2a
Human Reproduction, Population Explosion, Global Consequences

BUS 70a
Business in the Global Economy

COML 130a
Poetic Voices of Protest

COML 165a
Reading, Writing, and Teaching across Cultures

ECON 57a
Environmental Economics

ECON 175a
Introduction to the Economics of Development

ED 158b
Looking with the Learner: Practice and Inquiry

ED 159b
Philosophy of Education

ENG 17a
The Alternative Press in the United States: 1910–2000

ENVS 17b
Global Warming and Nuclear Winter

FREN 137a
The Twentieth and Twenty-First Centuries: Plague, War, and Human Power

HIST 139b
Fascism East and West

HIST 186b
War in Vietnam

LGLS 120a
Sex Discrimination and the Law

LGLS 124b
International Law and Development

NEJS 137a
The Destruction of European Jewry

NEJS 189a
The Arab-Israeli Conflict

NEJS 190a
Describing Cruelty

NEJS 192a
War and Peace in Israeli Thought and Praxis

PHIL 20a
Social and Political Philosophy: Democracy and Disobedience

POL 15a
Introduction to International Relations

POL 144a
Latin American Politics I

POL 144b
Latin American Politics II

POL 178a
The Rise of East Asia and the Pacific in the Global Political Economy

PSYC 135b
Seminar in Social Cognition

SOC 157a
Sociology of the Israeli-Palestinian Confrontation