
 Department of
Philosophy

 Courses of Study:
 Minor
 Major (B.A.)

Objectives

The primary concern of philosophy is to explore ideas that are central to the ways we live and that we commonly use without much reflection, ideas such as truth and justice, the notion of consciousness, and good and evil. In the course of our daily lives we take the ideas of time, language, knowledge, and our own identity for granted. Philosophy seeks to push our understanding of these ideas deeper. It is the systematic study of ideas that is fundamental to all the other disciplines taught at the University—the sciences, social sciences, humanities, and the arts.

The skills philosophy helps to develop—critical thinking, sound reasoning, enlightened use of one's imagination, and the capacity to analyze complex issues—are invaluable in the study of any subject or the pursuit of any vocation. Philosophy is unavoidable: every thoughtful individual is gripped by philosophical questions and is guided by assumptions that the study of philosophy brings explicitly to light and puts into larger perspective.

How to Become a Major

To become a major in philosophy, students must complete nine required courses: five must be taught by faculty of the Department of Philosophy; at least one must be in the history of philosophy; at least one must be in logic; and at least four must be upper-level courses. To be a candidate for honors, seniors must complete an honors thesis. For further information, contact the undergraduate advising head.

Faculty

Eli Hirsch, Chair (fall 2005) and Undergraduate Advising Head

Metaphysics. Epistemology. Medical ethics.

Andreas Teuber, Chair (spring 2006)

Political philosophy. Moral philosophy. Aesthetics. Modern social theory. History of political thought.

Alan Berger

Logic. Philosophy of language. Metaphysics. Philosophy of science. Philosophical logic.

Tracy Edwards, Allen-Berenson Visiting Assistant Professor in Philosophy and Women's Studies

Philosophy of law. Social and political philosophy. Philosophy of race and gender.

Robert Greenberg

Metaphysics. History of philosophy. Kant.

Marion Hourdequin

Philosophy of biology. Ethics. Philosophy of science. Environmental philosophy.

Sarah McGrath

Ethics. Metaphysics. Epistemology. Philosophy of mind. Feminist philosophy. Philosophy of biology. Early modern philosophy. Philosophy of language.

Jerry Samet

Philosophy of mind. Philosophy of psychology and cognitive science. History of philosophy.

Marion Smiley, Honors Advisor

Moral, social, and political philosophy.

Palle Yourgrau

Philosophy of language. Philosophy of mathematics. Philosophy of time. Greek philosophy.

Requirements for the Major

A. All philosophy majors must satisfactorily complete at least nine (9) semester courses from among philosophy and cross-listed courses. The philosophy department approves cross-listed courses for philosophy credit on a semester-by-semester basis, based on the course content and instructor. Please check the current schedule of classes or contact the philosophy undergraduate advising head to make sure that any course you are considering for philosophy credit is cross-listed in the semester you plan to take it.

B. At least five (5) semester courses counted toward the major must be taught by faculty of the philosophy department.

C. At least four (4) courses must be upper-level (99 and above), distributed as follows:

1. At least one (1) must be an upper-level course in Moral, Social, and Political Philosophy (PHIL 110a-116a).

2. At least two (2) must be upper-level courses in Metaphysics & Epistemology (PHIL²135a-147b).

D. At least one (1) course must be in the History of Philosophy (PHIL 161a, 162b, 168a, 170a, 174a, 179a, 180a, 181a).

E. At least one (1) course must be in Logic (PHIL 6a,106b).

F. A maximum of one (1) semester of 98a,b or 99d can be counted towards the major (5PE94A does not count).

G. No course with a grade below a C will count toward meeting the requirement of nine courses for the major; students may petition the department for waiver of this rule for a maximum of one course.

H. No course taken pass/fail may count toward requirements for the major.

I. With the approval of the department undergraduate advising head, transfer students and those taking a year's study abroad may apply up to four (4) semester courses taught elsewhere toward fulfilling the requirements for the major. The five course requirement of (B), above, remains in effect. Unless special approval is given by the undergraduate advising head, transfer and cross-listed courses will count as lower-level electives.

This department participates in the European cultural studies major.

Requirements for the Minor

A. All philosophy minors must complete satisfactorily at least five (5) semester courses from among philosophy and cross-listed courses.

B. At least three (3) semester courses counted toward the minor must be taught by faculty of the philosophy department.

C. At least one (1) course must be upper-level (100 and above)

D. A maximum of one (1) semester of 98a,b can be counted towards the minor (5PE94A does not count)

E. No course with a grade below a C will count toward meeting the requirement of five courses for the minor; student may petition the department for waiver of this requirement for a maximum of one course.

F. No course taken pass/fail may count toward requirements for the minor.

G. With the approval of the department minors advisor, transfer students and those taking a year's study abroad may apply up to two (2) semester courses taught elsewhere toward fulfilling the requirements for the minor. The three-course requirement of (B), above, remains in effect. Unless special approval is given by the minors advisor, transfer and cross-listed courses will count as lower-level electives.

Courses of Instruction

(1-99) Primarily for Undergraduate Students

PHIL 1a Introduction to Philosophy

[wi hum]

Enrollment varies according to instructor. Refer to the Schedule of Classes each semester for information regarding applicability to the writing intensive requirement.

A general course presenting the problems of philosophy, especially in the areas of metaphysics, epistemology, ethics, and social and political philosophy. Texts include works of selected philosophers of various historical periods from antiquity to the present. Usually offered every semester. Messrs. Berger, Greenberg, Hirsch, Samet, Teuber, and Yourgrau; Ms. Smiley, Ms. McGrath

PHIL 6a Introduction to Symbolic Logic

[hum]

Symbolic logic provides concepts and formal techniques that elucidate deductive reasoning. Topics include truth functions and quantifiers, validity, and formal systems. Usually offered every year. Mr. Samet

PHIL 12b Philosophy and Literature

[hum]

A philosophical exploration of major literary texts by Shakespeare, Milton, Swift, Austen, Bronte, Eliot, Hardy, among others. Usually offered every second year. Staff

PHIL 13b The Idea of the Market: Economic Philosophies

[hum]

Historical survey of philosophical assumptions in the defense and critique of market capitalism, starting from Adam Smith's views on value, self, and community. Explores philosophical alternatives in Marx, Weber, Durkheim, Dewey, and Nozick, including debates on justice and individualism. Usually offered every second year. Mr. Gaskins

PHIL 17a Introduction to Ethics

[hum]

Explores the basic concepts and theories of ethical philosophy. What makes a life good? What are our moral obligations to other people? Applications of ethical philosophy to various concrete questions will be considered. Usually offered every year. Ms. Smiley

PHIL 18a Philosophy of Race and Gender

[hum]

Examines the concepts of race and gender as well as explores the legal and social issues of sexual harassment, educational and workplace affirmative action, and the regulation of hate speech and pornography. Readings are taken principally from the fields of philosophy and law. Ms. Edwards

PHIL 19a Human Rights

[hum]

Examines international human rights policies and the moral and political issues to which they give rise. Includes civilians' wartime rights, the role of human rights in foreign policy, and the responsibility of individuals and states to alleviate world hunger and famine. Usually offered every second year. Mr. Teuber

PHIL 20a Social and Political Philosophy: Democracy and Disobedience

[hum]

Focuses on the relation of the individual to the state and, in particular, on the theory and practice of nonviolent resistance, its aims, methods, achievements, and legitimacy. Examines the nature of obligation and the role of civil disobedience in a democratic society. Explores the conflict between authority and autonomy and the grounds for giving one's allegiance to any state at all. Examples include opposition to the nuclear arms race, disobedience in China and Northern Ireland and at abortion clinics. Usually offered every second year. Mr. Teuber

PHIL 22b Philosophy of Law

[wi hum]

Examines the nature of criminal responsibility, causation in the law, negligence and liability, omission and the duty to rescue, and the nature and limits of law. Also, is the law more or less like chess or poker, cooking recipes, or the Ten Commandments? Usually offered every second year. Mr. Teuber

PHIL 23b Biomedical Ethics

[hum]

An examination of ethical issues that arise in a biomedical context, such as the issues of abortion, euthanasia, eugenics, lying to patients, and the right to health care. The relevance of ethical theory to such issues will be considered. Usually offered every second year. Mr. Hirsch

PHIL 24a Philosophy of Religion

[hum]

An introduction to the major philosophical problems of religion. The existence of God, "God-talk," evil and suffering, mystical experiences, life after death, free will and determinism, the relation of religion to morality. Usually offered every year.

Mr. Hirsch

PHIL 28a Western Philosophical Tradition: Feminist Perspectives

[hum]

Examines the place of gender in the history of Western philosophy and goes on to ask a series of philosophical questions that are informed by contemporary feminism, including "Is there a woman's voice?" and "What is gender equality and is it valuable?" Usually offered every year.

Ms. Smiley

PHIL 35a Philosophy of Science

[hum]

Philosophers in the 20th century have often taken scientific activity to be the ideal source of our knowledge about the world. Discusses the problems involved in the analysis of the principles and methods of scientific activity, with an eye to assessing this claim. Usually offered every second year.

Mr. Berger, Mr. Hirsch or Ms. Hourdequin

PHIL 37a Philosophy of Language

[hum]

Theories of meaning, reference, and methodological issues in account of language and translation. Readings from contemporary sources. Usually offered every year.

Messrs. Berger, Hirsch, or Yourgrau

PHIL 38b Philosophy of Mathematics

[hum]

Prerequisite: A course in logic or permission of the instructor.

Basic issues in the foundations of mathematics will be explored through close study of selections from Frege, Russell, Carnap, and others, as well as from contemporary philosophers. Questions addressed include: What are the natural numbers? Do they exist in the same sense as tables and chairs? How can "finite beings" grasp infinity? What is the relationship between arithmetic and geometry? The classic foundational "programs": logicism, formalism, and intuitionism are explored. Usually offered every second year.

Messrs. Berger or Yourgrau

PHIL 39b Philosophy of Mind

[hum]

Topics include the mind-body relation and consciousness, reductionism, and the philosophical implications of recent work in neuroscience, cognitive science, and artificial intelligence. Usually offered every year.

Mr. Samet or Ms. McGrath

PHIL 66b Contemporary Analytic Philosophy

[hum]

Covers major figures and schools of philosophy in the 20th century. A basic historical treatment of this period, stressing its continuity with the modern period. Emphasis on the role of logic and language in solving philosophical problems, such as the possibility of doing metaphysics, and whether there are a priori, necessary, or analytic truths. Although meant as an introduction to analytic philosophy, and therefore, not intended just for those who are thinking of graduate study in philosophy, it is nonetheless an excellent first step for admission into graduate school and as preparation for the first year in graduate school. Usually offered every year.

Messrs. Berger or Greenberg

PHIL 67b Contemporary Continental Philosophy: The Traditions and Feminist Engagements

[hum]

Covers the major movements and figures in 20th century continental philosophy and feminist engagements with and in this tradition. Examines phenomenology, hermeneutics, critical theory, structuralism, and deconstruction along with feminist concerns about how philosophy has denigrated or denied women's subjectivity. Usually offered every fourth year.

Ms. McAfee

PHIL 74b Foundations of American Pragmatism

[hum]

Introduction to American instrumentalism as a philosophical movement and cultural force. Special attention to pragmatic imprints on law and science across the 20th century. Recurring critical debates over ethical relativism, religious skepticism, legal activism, and the cult of scientific and professional expertise. Usually offered every fourth year.

Mr. Gaskins

PHIL 78a Existentialism

[hum]

An analysis of existential philosophy with special attention to the works of Kierkegaard and Nietzsche. Other existential philosophers are also studied.

Usually offered every fourth year.

Staff

PHIL 98a Readings in Philosophy

Readings, reports, and discussions on assigned topics. Usually offered every semester.

Staff

PHIL 98b Readings in Philosophy

Readings, reports, and discussions on assigned topics. Usually offered every semester.

Staff

PHIL 99d Senior Research

The course is normally a two-semester sequence. It is open to seniors who are candidates for degrees with honors in philosophy and involves the preparation and writing of a thesis, under the direction of a member of the faculty. Usually offered every year.

Staff

(100-199) For Both Undergraduate and Graduate Students**PHIL 106b Mathematical Logic**

[sn hum]

Prerequisite: One course in logic or permission of the instructor.

Covers in detail several of the following proofs: the Godel Incompleteness Results, Tarski's Undefinability of Truth Theorem, Church's Theorem on the Undecidability of Predicate Logic and Elementary Recursive Function Theory. Usually offered every year.

Mr. Berger

PHIL 110a The Good Life or How Should I Live?

[wi hum]

Prerequisite: Two courses in philosophy or permission of the instructor.

Much recent philosophy in the English-speaking world has focused on the nature of things and our knowledge and reasoning about such things. But most human mental activity is not theoretical, but practical, less concerned with how the world is than with what is to be done. In the earliest moments of Western philosophy Socrates distinguished himself by asking "How Should One Live?" Increasingly, however, that question and its variants have taken a back seat in philosophy, abandoned to the best-seller lists and to publications produced by recent graduates of assertiveness training workshops. We reclaim these questions and take them up again from within the discipline of philosophy itself. Questions asked include: "How Should I Live?" "What Are the Good Things in Life?" "Does Life Have Meaning?" Readings include Darwin, Nietzsche, Freud, Murdoch, Dennett, Dawkins, Hacking, Nozick, and Nagel. Usually offered every third year.

Mr. Teuber

PHIL 111a What is Justice?

[hum]

Prerequisite: One course in philosophy or politics or permission of the instructor.

What is justice and what does justice require? The course examines theories of justice, both classical and contemporary. Topics include liberty and equality, "who gets what and how much," welfare- and resource-based principles of justice, justice as a virtue, liberalism, multiculturalism, and globalization. Usually offered every second year.

Ms. Smiley

PHIL 112b Philosophy and Public Policy

[hum]

Prerequisite: Two courses in philosophy or economics (or one course in each subject) or permission of the instructor.

The course examines the case that can be made for and against distributing certain goods and services on an open market as the result of free exchange, or through public mechanisms of planning and control. For examples, the arguments for and against public funding of the arts, fire departments, patents, zoning laws, and national health care. Usually offered every third year.
Mr. Teuber

PHIL 113b Aesthetics: Painting, Photography, and Film

[wi hum ca]

Prerequisite: Two courses in philosophy or fine arts (or one course in each subject) and one of the following courses: AMST 120b, ENG 27b, 101a, 147a, 177a, or FILM 100a, or permission of the instructor.

Explores representation in painting, photography, and film by studying painters Rembrandt, Velasquez, and Vermeer, as well as later works by Manet, Degas, Cezanne, and Picasso; photographers Ansel Adams, Dorothea Lange, Edward Weston, Walker Evans, Alfred Stieglitz, and Diane Arbus; and filmmakers Renoir and Hitchcock. Usually offered every second year.
Mr. Teuber

PHIL 114b Topics in Ethical Theory

[hum]

Prerequisite: Phil 1a or one course numbered PHIL 17a-23b or PHIL 110a-121a.

Is morality something we have reasons to obey regardless of our interests and desires, or do the reasons grow out of our interests and desires? Is the moral life always a personally satisfying life? Is morality a social invention or is it more deeply rooted in the nature of things? This course will address such questions. Usually offered every second year.

Ms. Smiley or Ms. McGrath

PHIL 116a Topics in Political Philosophy

[hum]

Prerequisite: PHIL 1a, 17a, or POL 10a.

Normative justifications of the state. Examines how western philosophers have used constructs such as the state of nature, the social contract, and the general will to justify state powers. Usually offered every second year.

Ms. Smiley

PHIL 117b Topics in the Philosophy of Law

[hum]

Prerequisite: Two courses in philosophy or legal studies, or one course in each, or one in either subject and one of the following: POL 115a,b, 116a, or permission of the instructor. Topics vary from year to year. Course may be repeated once for credit.

Topics include such key issues as privacy, free speech, theories of judicial review, and legal and moral rights.

Ms. Edwards

PHIL 119b Chinese Philosophy

[nw hum]

Focuses on the major philosophical schools of Classical China, covering the time between the 12th century B.C.E. through the unification of China in 221 B.C.E. Special attention is given to the ethical, religious, and political thought of the Confucian, Mohist, Daoist, and Legalist 'schools.' No knowledge of Chinese is required; all readings are in translation. Usually offered every third year.
Staff

PHIL 120b Gender and Moral Philosophy

[hum]

Prerequisite: PHIL 1a or one course numbered PHIL 17a-23b or PHIL 110a-121a
Provides an overview of moral philosophy (including Aristotle and Kant) and examines how gender norms have shaped its development. Addresses whether traditionally "male" concerns with disinterested principles of reason have a higher moral value than "feminine" concerns with context and care. Usually offered every fourth year.
Ms. McAfee

PHIL 121a Politics, Philosophy, and the Legal Regulation of Sexuality

[hum]

Prerequisite: PHIL 1a or 66b, or one course numbered PHIL 35a-39b.

Treating the sexual exchange as a proper subject for politics, students read traditional philosophers like Tocqueville and Mill, as well as laws and court opinions in an effort to understand how sex is regulated in America as a political matter. Usually offered every fourth year.
Staff

PHIL 123b Topics in Biomedical Ethics: Mental Illness

[wi hum]

Topics vary from year to year. May be repeated once for credit.

Examines a number of philosophical, scientific, social, and ethical issues concerning mental illness. Topics include: radical critiques of psychiatry, the concept of mental illness, the nature and problems of psychiatric diagnostic classification, objectivity and the scientific credibility of research concerning mental illness and its treatment, controversial treatments and intervention practices (e.g., electroconvulsive therapy, suicide prevention, involuntary treatment), and psycho-legal issues (e.g., duty to warn, competence to stand trial, insanity defense.) Readings are drawn from the relevant disciplinary literatures. Usually offered every second year.

Mr. Poland

PHIL 135a Theory of Knowledge

[hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

An investigation into the nature, sources, and extent of human knowledge, with emphasis on the problem of justifying our beliefs about the existence and character of the external world. Usually offered every second year.

Mr. Hirsch

PHIL 136a Personal Identity

[hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

An examination of some major issues involved in the question of personal identity. What am I? What are the conditions of self-identity? How does the identity of the self relate to the identity of a physical object? Is identity an illusion? Usually offered every second year.

Mr. Hirsch or Mr.Greenberg

PHIL 137a Innateness

[hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

How much of what we are? what we believe and know, what we think and feel, how we act? is due to our environment and training and how much is a function of our inherent nature? Analyzes the contemporary debate as well as the main positions in the history of philosophy on this question. Also considers recent research in linguistics and the cognitive sciences. Usually offered every third year.

Mr. Samet

PHIL 138a Metaphysics

[hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

Metaphysics is an attempt to describe in a general way the nature of reality and how people fit into the scheme of things. Topics vary from year to year but may include truth, ontology, necessity, free will, causality, temporal passage, and identity. Usually offered every year.

Messrs. Berger, Hirsch, or Yourgrau, Ms. McGrath

PHIL 139b Topics in Logic

[hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

Topics may vary from year to year and the course may be repeated for credit. Topics in the past included: Is logic an a priori or empirical science? Does it make sense to say that we can revise or adopt our logic? Is logic true by conventional rules of language? Set theory and the paradoxes. Usually offered every year.

Mr. Berger or Mr. Yourgrau

PHIL 140a Logic and Language

[hum]

Prerequisite: PHIL 1a, 6a, or 106a, or permission of the instructor.

Covers basic problems and puzzles regarding reference and identity?topics that dominate issues in philosophy of language today. Topics include puzzles about belief, necessity, substitutivity of identity statements, and formal semantics for parts of language that includes modal and intensional notions. Usually offered every second year.

Mr. Berger or Mr. Yourgrau

PHIL 141b Topics in Philosophy and Cognitive Science

[ss hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

Explores the various ways in which philosophical ideas are reflected in and illuminate scientific theorizing about the mind and also examines the implications of recent work in the cognitive sciences for traditional philosophical concerns. Topics differ from year to year. Usually offered every second year.

Mr. Samet

PHIL 142b The Subjective Point of View

[hum]

Prerequisite: PHIL 1a or 66b, or one course numbered PHIL 35a-39b.

Explores the relation between the variable and the constant in experience?a relation embraced by what we as subjects bring to our experience?our subjective point of view of the world. Addresses the question of how our experience, with its inherent subjectivity, variable and constant, can provide us with knowledge of reality. Usually offered every second year.

Mr. Greenberg

PHIL 143a Consciousness and Self

[hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

The origins of our concept of consciousness can be found among the fundamental ideas of modern philosophy, tied to the concept of self. This connection will be the subject matter of this course. Usually offered every fourth year.

Mr. Greenberg

PHIL 144a Philosophical Problems of Space and Time

[hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

An examination of philosophical problems concerning the concepts of space and time as these arise in contemporary physics, modern logic and metaphysics, as well as in everyday life. Specific topics usually include philosophical aspects of Einstein's theory of relativity, the possibility of "time travel," the distinction between space and time, and McTaggart's famous distinction between the "A-series" and the "B-series" of time. Usually offered every second year.

Messrs. Berger, Hirsch, and Yourgrau

PHIL 145b Topics in the Philosophy of Language

[hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

Topics may vary from year to year and course may be repeated for credit. Topics include the relationship between the language we speak and our view of reality, reference, the sense in which language may structure reality, and formal semantics.

Usually offered every second year.

Mr. Berger or Mr. Hirsch

PHIL 146a Idea of God

[hum]

Prerequisite: PHIL 1a or 66b or one course numbered PHIL 35a-39b.

Engages in a philosophical investigation, not of religion as an institution, but of the very idea of God. Studies the distinction between human being and divine being and addresses the issue of the relation of God's essence to His existence. Usually offered every second year.

Mr. Yourgrau

PHIL 147b Topics in the Philosophy of Space and Time

[hum]

Prerequisite: Either one course in logic, or PHIL 35a, or permission of the instructor.

Examines the notions of space and time in the theories of Aristotle, Galileo, and Einstein. Examines which concepts no longer make sense when we go from one space-time to the other. Students will learn how to read Gallilean and Minkowski space-time diagrams. Usually offered every third year.

Mr. Berger

PHIL 148b Philosophy of the Humanities

[hum]

Prerequisite: PHIL 1a or 66b, or one course numbered PHIL 35a-39b.

Explores the nature of the humanities, their methods and goals, with a particular focus on the discipline of history. Is history a "science" and should it be? What is the nature of the claims to knowledge that historians (and other humanists) make? How does one know a narrative? How does one know an interpretation? And: what is the role of power in legitimating the claims to knowledge advanced by scholars, teachers, and students of history? Usually offered every second year.

Mr. Levisohn

PHIL 161a Plato

[hum]

Prerequisite: PHIL 1a or permission of the instructor.

An introduction to Plato's thought through an intensive reading of several major dialogues. Usually offered every year.

Mr. Yourgrau

PHIL 162b Aristotle

[hum]

Prerequisite: PHIL 1a or permission of the instructor.

An introduction to Aristotle's philosophy through an intensive reading of selected texts. Usually offered every second year.

Mr. Yourgrau

PHIL 168a Kant

[hum]

Prerequisite: PHIL 1a or permission of the instructor.

An attempt to understand and evaluate the main ideas of the Critique of Pure Reason, the subjectivity of space and time, the nature of consciousness, and the objectivity of the concepts of substance and causality. Usually offered every year.

Mr. Greenberg

PHIL 170a Special Topics in History of Philosophy: Descartes' Meditations

[hum]

Prerequisite: PHIL 1a or 39b, or permission of the instructor.

A close reading of Descartes' Meditations, one of the cornerstones of modern philosophy. Considers responses of Descartes' contemporaries to this work and Descartes's replies, and contemporary discussions and interpretations. Topics include knowledge and skepticism, the mind-body problem, the relation of perception and knowledge, the existence of God, the nature of the self, and the distinction between our ideas of primary and secondary qualities. Usually offered every fourth year.

Mr. Samet

PHIL 171b Problems of A Priori Knowledge

[hum]

Prerequisite: One course in philosophy or permission of the instructor.

Examines some of the main problems of a priori knowledge as seen from a Kantian point of view. Usually offered every second year.

Mr. Greenberg

PHIL 174a Special Topics in the History of Philosophy: Hume's First Enquiry

[hum]

Prerequisite: PHIL 1a or permission of the instructor.

A close reading of Hume's short classic Enquiry Concerning Human Understanding, which attempts to distill the key elements of Hume's Empiricism and make his philosophy accessible to a general audience. Topics include the nature of thought, skepticism and the possibility of knowledge, free will, the credibility of miracles, and the prospects for a life hereafter. Usually offered every fourth year.

Mr. Samet

PHIL 178b Major Figures in the Christian Faith

[hum]

Prerequisite: PHIL 1a.

Presents the important theological contributions of the major thinkers of the Western Church covering the modern period. Usually offered every fourth year.

Mr. Yourgrau

PHIL 179a Continental Rationalism: Descartes, Spinoza, Leibniz

[hum]

Prerequisite: PHIL 1a, or PHIL 66b, or one PHIL course numbered 35a-39b.

Examines the metaphysical and epistemological doctrines of Rene Descartes, Benedict Spinoza, and G.W. Leibniz, central figures of seventeenth and eighteenth century European Rationalism, and their contributions to contemporary philosophical debates. Usually offered every third year.

Mr. Samet

PHIL 180b British Empiricism

[hum]

Prerequisite: PHIL 1a, or 66b, or one course numbered PHIL 35a-39b.

Examines the metaphysical and epistemological doctrines of John Locke, Bishop Berkeley, and David Hume, the central figures of 17th- and 18th-century British Empiricism. Also explores the influence of Empiricism on contemporary philosophy. Usually offered every third year.

Mr. Samet

PHIL 181a Schopenhauer and Nietzsche: Art and Politics

[hum]

Prerequisite: One course in philosophy or European cultural studies.

Two philosophers whose subversive ideas and brilliant prose have stirred the deepest human anxieties and hopes for man's relationship to nature, values, aesthetics, religion, law, and society. Their impact on art and politics illustrated through works by Mann and Kafka. Usually offered every third year.

Mr. Gaskins

Cross-Listed Courses

The department approves cross-listed courses for philosophy credit each semester, based on the course content and instructor. Please consult the schedule of classes or contact the undergraduate advising head to confirm if a particular class is cross-listed for philosophy credit in a given semester.

ED 159b

Philosophy of Education

LING 130a

Semantics: The Structure of Concepts

NEJS 159a

Major Trends in Modern Jewish Philosophy

POL 186b

Classical Political Thought

Physical Education

Objectives

Movement and activity are basic functions necessary for the human body to grow, develop, and maintain health. Realizing that good health is largely self-controlled, the physical education department's curriculum focuses on fitness, dance, and lifetime sports to encourage lifestyle changes in its students.

Brandeis prides itself on education of the body as well as education of the intellect. The physical education department curriculum focuses on cardiovascular fitness, flexibility, body composition (percent of body fat), the maintenance of muscular strength, and endurance.

Students should complete the physical education requirement by the end of their sophomore year. Transfer students may offer toward the requirement physical education courses that appear on the transcript of their previous institutions. Most physical education courses meet for two hours per week and are limited in size; preference is given to first-year students.

Any student who has served in the military, foreign or domestic, is exempt from the entire physical education requirement. Proper documentation must be provided to the physical education department.

Faculty**Sheryl Sousa, Chair****Kathleen Anderson**

Fitness - pilates.

Carol Ann Baer

Dance.

Vincent Christiano

Karate.

Michael Coven

Fitness - weight training. Team sports.

Denise Dallamora

Fitness - yoga.

Lisa DeNicola

Fitness - aerobics.

Susan Dibble

Dance.

John Evans

Fitness - D.D.R.

Anthony Ewing

Team sports - basketball.

Zabelle Margosian

Dance.

Mark Reytblat

Fitness - team sports.

Niki Rybko

First aid. CPR.

William Shipman

Fencing. Racquet sports. Golf.

Mary Sullivan
Aquatics. First aid. CPR.

Jean-Robert Theodat
Fitness - Tae Kwon Do.

Richard Varney
Team sports. Racquet sports.

Colin Tabb
Power walking. Golf.

James True
Personal safety.

James Zotz
Aquatics. Stress management.

Undergraduate Degree Requirements

Physical education is an undergraduate degree requirement at Brandeis. This requirement is satisfied by successful completion of two, semester-long, noncredit courses, participation on a varsity athletics team, or by passing a fitness test taken during the first two years.

Completion of one full season of participation on a varsity athletics team, as certificated by the Department of Athletics, is equal to the completion of one, semester-long, noncredit course. A student may satisfy the physical education requirement through the completion of two full seasons of participation on a varsity athletics teams.

All students have four opportunities during their first two years at Brandeis to exempt themselves from all or part of the physical education requirement by taking a battery of tests that measure muscular strength and endurance, flexibility, cardiovascular endurance, and body composition. A student unable to pass the fitness test should enroll in a course in the Personal Fitness Group.

A grade of 70-79 percent will exempt you from one physical education class or half of your requirement. A grade of 80 percent or better will exempt you from two physical education classes or all of your requirement. Physical education classes meet the first day of regular classes and attendance is mandatory. A maximum of **two absences** is allowed in a class that meets once per week and a maximum of **four absences** for a class that meets twice per week.

Courses of Instruction

(1-99) Primarily for Undergraduate Students

PE 1a Beginner's Swimming

[pe-sc]
Designed to teach the non-swimmer the basic skills of floating, treading water, and the crawl stroke. Usually offered in the fall semester.
Ms. Sullivan

PE 2a Swim Fitness

[pe-sc]
Designed to improve overall fitness levels through lap swimming. Emphasis is on using the heart rate to improve cardiovascular endurance level. The instruction is geared more to understanding and implementing swimming as a vehicle to fitness and less toward teaching individual swimming stroke mechanics. Usually offered every semester.
Mr. Zotz

PE 2b Water Aerobics

[pe-sc]
Designed to improve overall fitness levels through water exercise. Emphasis is on improving cardiovascular endurance through a cross-section of exercises done in the water. Usually offered every semester.
Mr. Zotz

PE 5a First Aid and Community CPR

[pe-1]
An instruction in the American Red Cross standard First Aid and Cardiopulmonary Resuscitation. Upon course completion, certificates will be given to students who successfully complete the skills test and pass the written test with scores of 80 percent or better. Usually offered every semester.
Ms. Rybko and Ms. Sullivan

PE 6a Sports Medicine

[pe-1]
Introduction to sports medicine and a basic understanding of human anatomy and sports is required. The course will look at many facets of sports medicine including weight training, nutrition, drug education, flexibility, and rehabilitation. Each of the major joints of the body will be examined anatomically, based on injuries sustained. Class will also look briefly at surgical repair of certain joints. Usually offered every spring semester.
Staff

PE 9a Volleyball

[pe-1]
An introduction to the fundamentals of volleyball—scoring, rotation, rules, and the basic skills of passing, serving, hitting, and setting. Methodology includes lectures, demonstrations, drills, but mostly play. Course is intended to be fun through active participation. Usually offered every fall.
Staff

PE 10a Basketball

[pe-1]
Structured to meet needs of students with an overview of offensive and defensive skills. Methods used are lecture, demonstrations, drills, and play. Usually offered every semester.
Staff

PE 11a Nautilus/Free Weights

[pe-1]
Instruction of proper use of Nautilus, Body Master, and free-weight training. Classes also include aerobic activity such as use of Lifecycles and Tru-Climb 450. Usually offered every semester.
Staff

PE 12a Step Aerobics

[pe-1]
Step aerobics is a program that includes stepping up and down on an adjustable platform while performing upper-body movements to music. Unlike aerobics, it is low impact and can be moderated to any fitness level. Usually offered every semester.
Ms. DeNicola

PE 14a Yoga

[pe-1]
Hatha yoga is physical in nature and is based on proper body alignment and is distinctive in its use of props such as belts, walls, and blankets. Classes start with gentle stretches and work toward more challenging poses. Usually offered every semester.
Ms. Dallamora

PE 16a Golf

[pe-1]
A beginning golf group instructional course. Techniques such as grip, set-up, swing, chipping, pitching, and putting are covered. Some discussion on golf rules and etiquette is introduced. Usually offered every semester.
Staff

PE 17a Beginner's Fencing

[pe-1]
Covers basic mobility, offensive and defensive strategy, and tactics. Competitive bouts is done, with a class tournament scheduled for the end of the semester. Usually offered every semester.
Mr. Shipman

PE 18b Intermediate Fencing

[pe-1]

Prerequisite: PE 17a.

Basic mobility and blade actions are reviewed, with advanced attacks and tactics, strategy, and more bouts included. Introduction to saber and epee. Usually offered every spring semester.
Mr. Shipman

PE 20a Intermediate Tennis

[pe-1]

Prerequisite: prior tennis experience.

Designed for the student who already possesses the fundamental tennis skills and knows how to play the game. Emphasis is on match play tactics and the integration of footwork, conditioning, and shot selection into a complete game. Usually offered every semester.
Staff

PE 21a Tennis

[pe-1]

Students must provide their own racquet.

An overview of grips, groundstrokes, serve, return of serve, and net play. Basic singles and doubles strategy, rules, and scoring of the game are introduced. Usually offered every semester.
Staff

PE 22a Squash

[pe-1]

Students must provide their own racquet and protective eye wear.

Covers rules for squash. The serve, return of serve, grip, forehand, backhand, and other basic strokes are introduced. Strategy and play will be emphasized. Usually offered every semester.
Staff

PE 24a Beginner's Karate

[pe-1]

The first three Kata of Uechi-Ryu is taught. Application to kanshiwa and kanshu is explored. Students begin slow speed, focused free-fighting, with emphasis on technique from Uechi-Ryu Kata. Usually offered every semester.
Mr. Christiano

PE 25a Intermediate Karate

[pe-1]

Prerequisite: PE 24a.

Advanced Kotekitae and body conditioning, especially shin and toe development, is practiced. Study of self-defense focuses on multiple, unarmed attackers. Usually offered every spring semester.
Mr. Christiano

PE 26a Ballroom Dance

[pe-1]

Latin dances are covered: introduction to cha-cha, rumba, tango, and mambo. Also, swing, waltz, and fox-trot. Usually offered every semester.
Ms. Evans-Baer

PE 26b Intermediate Ballroom Dance

[pe-1]

Prerequisite: PE 26a or comparable dance experience.

A follow-up to PE 26a. Learn new steps in cha-cha, rumba, tango, and waltz. Usually offered every spring semester.
Ms. Evans-Baer

PE 27a Keeping Stress in Check

[pe-1]

Designed to help students achieve wellness through exercise, nutrition, and health education. Students are taught to recognize components of their lifestyles that are detrimental to their health while developing a personal fitness program. Usually offered every semester.
Mr. Zotz

PE 31a Ballet

[pe-1]

Students begin with warm-up exercises (barre work); balance, control, stretch, and arm movements will be incorporated. When dancers become strong enough, class will proceed to center work, including balancing exercises, turns, and jumps. Dancers will learn stretching and cool-down exercises. Usually offered every semester.
Ms. Margosian

PE 31b Intermediate Ballet

[pe-1]

Students need to have two to three years of recent ballet training to participate. Same material as beginning ballet is covered at an accelerated pace. Russian-style ballet and the Legat Technique is taught. Usually offered every semester.
Ms. Margosian

PE 32a Modern Dance

[pe-1]

A beginning course in modern dance technique, based on Martha Graham and Jose Lemon style. The course will offer stretching and alignment to dance sequences. Usually offered every semester.
Ms. Dibble

PE 33a Walking for Fitness

[pe-1]

Designed to improve your overall fitness level through walking. Emphasis is on improving cardiovascular endurance level. Instruction is given on how to develop a personal fitness program. Usually offered every semester.
Staff

PE 35a Power Walking

[pe-1]

Designed to help increase the fitness level of the students through a high-intensity, low-impact workout. The workout consists of walking with hand-held weights. Usually offered every semester.
Staff

PE 38a Indoor Soccer

[pe-1]

An introduction to the fundamentals of soccer?skill development, dribbling, passing, shooting, offense, and defense. Intended to be fun through participation in elementary games and exercises.
Mr. Coven and Mr. Reytblat

PE 40a Personal Safety/Self Defense

[pe-1]

Teaches students to assert themselves and deal with the natural excitement and fear that can cause a person to freeze up when faced with an aggressor. Students are led through simple but effective drills and scenarios designed to help them overcome the uncomfortable feelings and fear that can mark a person as an easy target for an attack.
Mr. True

PE 41a Pilates

[pe-1]

A series of exercises designed to strengthen the abdominals and back muscles. These core exercises are combined with some yoga stretches to enhance flexibility and well-being. Usually offered every semester.
Ms. Anderson

PE 42a Tae Kwon Do

[pe-1]

A series of physical exercises designed to build strength, flexibility, and endurance. Through physical training, students build a strong mind and spirit. Usually offered every semester.
Mr. Theodat

PE 43a Dance Dance Revolution

[pe-1]

Students play a video game which requires them to use their feet instead of their thumbs. Following the lighted arrows with their feet, Dance Dance Revolution is aerobic in nature and can burn as many calories as a Stairmaster or jogging. Usually offered every semester.
Staff

PE 44a The First-Year Experience: Spirit, Mind, and Body

[pe-1]

Open only to first-year students.

Applying general health and wellness principles, students learn to develop a balanced and healthy lifestyle which will assist them in becoming engaged and contributing citizens to the Brandeis community. Usually offered every semester.
Ms. O'Malley

Courses of Related Interest

These courses count as activity courses towards the physical education requirement.

THA 9a

Movement for the Stage I

THA 9b

Movement for the Stage II

THA 10b

Stage Combat

THA 11a

Movement for the Performer

THA 110b

Modern Dance and Movement

THA 120a

Dance in Time

THA 120b

Movement and Dance Theater Composition

THA 130a

Suzuki

Department of Physics

Courses of Study:
Minor
Major (B.A./B.S.)
Combined B.A./M.S.
Master of Science
Doctor of Philosophy

Objectives

Undergraduate Major

A typical scenario for a physical explanation of a given situation is this: a small collection of basic physical principles relevant to the situation is used to create a mathematical model of it; computations are carried out using the model, leading to predictions that are checked experimentally; if there is agreement, the physical situation is deemed to have been explained. The objective of the program in physics is to make it possible for students to execute such a scenario for a wide range of physical situations. To that end, students are required to attain a firm grasp of the basic principles of classical physics and familiarity with those of quantum physics, to learn how to decide which principles are relevant to a given situation and how to construct the appropriate mathematical model, to develop the mathematical skills necessary to carry out the computations that generate predictions, and to strengthen the experimental skills used in exploring new phenomena and in carrying out the verification step of the typical scenario.

The ability to execute the typical scenario of physical explanation is useful not only to research physicists, but also to scientists in many other fields, especially interdisciplinary ones, such as biophysics and environmental science; it is also useful to engineers, to members of the medical profession, and to architects. For that reason, the physics program has made special arrangements to integrate a physics major with study preparing for a career in any of the areas mentioned above. Students interested in combining biology and physics should see the Interdepartmental Program in Biological Physics elsewhere in this *Bulletin*.

Graduate Program in Physics

The Graduate Program in Physics is designed to equip students with a broad understanding of major fields of physics and to train them to carry out independent, original research. This objective is to be attained by formal course work and supervised research projects. As the number of students who are accepted is limited, a close contact between students and faculty is maintained, permitting close supervision and guidance of each student.

Advanced degrees will be granted upon evidence of the student's knowledge, understanding, and proficiency in classical and modern physics. The satisfactory completion of advanced courses will constitute partial fulfillment of these requirements. Research upon which theses may be based, with residence at Brandeis, may be carried out in the following areas:

1. *Theoretical Physics*

Quantum theory of fields; relativity; supergravity; string theory; condensed matter physics; statistical mechanics; quantum theory of the solid state; critical phenomena and phase transitions; computational neuroscience.

2. *Experimental Physics*

High-energy experimental physics; condensed matter physics; radio astronomy; and biophysics.

Every graduate teaching fellow (TF) is supervised by a member of the faculty who serves as a mentor to improve the quality of the TF's teaching. In recognition of this objective each year the physics department awards the David Falkoff Prize to an outstanding teaching fellow. An additional goal of the department is to enable graduate students to be able to present their research findings in a clear and effective manner. Each spring the department organizes the Stephan Berko Symposium, where students give short presentations of their research. These talks are prepared with the assistance of their faculty research advisors. The best graduate student research project and the best undergraduate research project are recognized with Stephan Berko Prizes.

How to Become an Undergraduate Major

Since the sequence in which physics courses should be taken is tightly structured, and in most cases requires at least three years to complete, students contemplating a major in physics should consult the physics advising coordinator at the first opportunity. For most students either such consultation should take place before enrolling in courses at the beginning of the first year, or PHYS 11a and 19a should be part of the first-semester program.

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 to candidates for admission to the graduate area in physics. Admission to advanced courses in physics will be granted following a conference with the student at entrance.

Faculty
Robert Meyer, Chair

Physics of liquid crystals, colloids, and polymer gels.

James Bensinger

Experimental high-energy physics.

Craig Blocker

Experimental high-energy physics.

Karl Canter

Experimental biophysics.

Bulbul Chakraborty

Theoretical condensed matter physics.

Stanley Deser

Quantum theory of fields. Gravitation. Supergravity. Strings.

Richard Fell

Theoretical quantum electrodynamics.

Seth Fraden

Physics of liquid crystals, colloids, and macromolecules.

Lawrence Kirsch

Experimental high-energy physics.

Jané Kondev

Theoretical condensed matter physics.

Robert Lange

K-12 science and environmental education, teacher training, and curriculum research.

Albion Lawrence

String theory and its applications to particle physics and cosmology.

Edward Martens

Premedical physics instruction.

David Roberts

Theoretical astrophysics. Radio astronomy.

Howard Schnitzer

Quantum theory of fields. String theory.

Xiao-Jing Wang (Volen National Center for Complex Systems)

Computational neuroscience.

John Wardle

Radio astronomy. Cosmology.

Hermann Wellenstein

Experimental high-energy physics.

Requirements for the Undergraduate Majors
Degree of Bachelor of Arts

The requirement for the major in physics leading to the degree of Bachelor of Arts is the equivalent of 11 semester courses in physics and two semester courses in mathematics. There must be the equivalent of at least three semesters in laboratory courses (PHYS 19a and 19b together count as one semester, as do PHYS 18a and 18b). One must also take PHYS 30b. Mathematics and physics courses numbered under 10 may not be used to fulfill the requirement for the major in physics. A student not intending to pursue graduate study in physics may be permitted to substitute two advanced courses in other fields to meet the requirements for the major in physics, subject to the approval of the advising coordinator. A student with a major in physics and an interest in biophysics may want to take courses in biophysics, biology, biochemistry, chemistry, or neuroscience. With departmental approval, a student may use such courses to satisfy part of the requirements for the major in physics.

Degree of Bachelor of Science

To satisfy the requirements for the major in physics leading to the degree of Bachelor of Science, students must successfully complete the 11 physics courses required for the B.A. in physics and six additional courses. Two of the additional six courses should be chosen from the following: PHYS 25b, 32b, 39a, 40a, 100a, 104a, 105a, 110a. Another two courses must be selected from the following: NPHY 115a, NBIO 136b, CHEM 41a, 41b, any MATH course numbered 27 or higher (excluding courses used to fulfill the math requirement below), any COSI course numbered 21 or higher, or any other course approved by the physics department that is either listed or cross-listed in other departments within the School of Science. The final two courses must be chosen from one of the following pairs of courses: MATH 15a and MATH 20a, or MATH 21a and MATH 21b, or any two MATH courses numbered higher than 21.

Combined B.A./M.S. Program

A student may be admitted to a special four-year B.A./M.S. program upon recommendation of the department and the Graduate School by May 1 preceding the senior year. The student must successfully complete **at least** 38 courses. All the regular requirements for the M.A. degree in physics must be met: successful completion of six graduate courses in physics numbered 160 or above, and satisfactory performance on the qualifying examination. No more than two of the graduate-level courses may be counted towards major requirements. Grades of B- or better are required in the six courses numbered 160 or above. The qualifying examination includes the final examinations in PHYS 161a, 161b, 162a and 162b, 163a and two oral examinations on all of physics through the first-year graduate level. The department will recommend admission to this program only if the student's record indicates that the student can successfully complete the requirements. Consultation with the physics advising coordinator before March 1 of the sophomore year is highly recommended for a student contemplating this program.

Requirements for the Undergraduate Minor

Six semester courses in physics at the level of PHYS 10 or above.

Note that PHYS 18a,b and PHYS 19a,b count as one semester course.

Special Notes Relating to Undergraduates

There are several natural tracks through the undergraduate physics courses. The first is: Year 1—PHYS 11a,b, 19a,b, MATH 10a,b; Year 2—PHYS 20a,b, 29a,b, MATH 21a,b or PHYS 110a; Year 3—PHYS 30a,b; Year 4—PHYS 40a, 100a.

The second, a premedical track, is: Year 1—PHYS 11a,b, 19a,b, MATH 10a,b; Year 2—PHYS 20a,b, 29a,b, CHEM 11a,b, 18a,b; Year 3—BIOL 22a (Formerly BIBC 22a), BIOL 22b, 18a,b, CHEM 25a,b, 29a,b; Year 4—PHYS 30a,b.

Students are encouraged to construct other tracks that might better suit their needs in consultation with their advisors.

Students considering a career in engineering should consult the description of the Columbia University School of Engineering Combined Degree Program in the Special Academic Opportunities section of this *Bulletin*.

A student intending to pursue graduate work in physics will normally add to the tracks above PHYS 25b, 39a, 100a, 104a, and 105a or graduate courses dealing with previously treated subjects at a more advanced level, such as PHYS 161a,b (formerly 101a,b), and 162a,b (formerly 102a,b). Normally only two or three of the six courses PHYS 25b, 32b, 100a, 104a, 105a, and 110a will be offered in a given year; the others will normally be offered in the following year. Undergraduates are not permitted to enroll in physics courses numbered above 160 without the explicit approval of their appropriate major advisors.

A student who has attained a grade of 4 or 5 on the Advanced Placement Examination Physics B may obtain credit for PHYS 10a,b; a student who has attained a grade of 4 or 5 on the Advanced Placement Examination C: Mechanical may obtain credit for PHYS 11a while a grade of 4 or 5 on Advanced Placement Examination Physics C: Electrical may earn credit for PHYS 11b. A student who claims any of these advanced placement credits may not take the same or equivalent courses for credit: PHSC 9b, PHYS 10a,b, PHYS 11a,b.

In order to be a candidate for a degree with distinction in physics, one must take a departmentally approved honors program of either PHYS 99d or two semester courses in physics numbered above 160, and one must obtain honor grades. Students should have their honors programs approved by the departmental honors advisor before the beginning of the senior year.

Requirements for Advanced Degrees

Normally, first-year graduate students will elect courses from the 100 series, with at least four courses numbered above 160. The normally required first year courses are PHYS 113a,b, 161a, 162a,b, 163a, and 169b. To obtain credit toward residence for a graduate course taken at Brandeis, a student must achieve a final grade of B- or better in that course. Students may obtain credit for advanced courses taken at another institution provided their level corresponds to the level of graduate courses at Brandeis and that an honor grade in those courses was obtained. To place out of PHYS 161a, 162a or b, or 163a, a student must pass an exemption exam before the end of the second week of the course.

Requirements for the Degree of Master of Science

Residence Requirement

One year in residence as a full-time student. No transfer residence credit will be allowed toward the fulfillment of the master's requirements.

Course Requirements

Six semester-courses in physics numbered above 160. A thesis on an approved topic may be accepted in place of a semester-course.

Language Requirement

There is no foreign language requirement for advanced degrees in physics.

Qualifying Examination

Satisfactory performance in the qualifying examination is required. The qualifying examination consists of a written and an oral part and both parts are administered during the first year of the program. The written part of the qualifying examination is the final examinations in PHYS 161a, 162a,b, and 163a, unless these courses have been exempted by separate examination, or credit has been given for equivalent courses taken elsewhere. There are two oral exams on general physics, the first at college physics level, the second at the first-year graduate level.

Requirements for the Degree of Doctor of Philosophy

All of the requirements for the master's degree and the following:

Residence Requirement

The minimum residence requirement is three years. A student may obtain up to one year's residence credit toward the Ph.D. requirements for graduate studies taken at another institution.

Teaching Requirement

It is required that all Ph.D. candidates participate in undergraduate teaching during the course of their studies.

Course Requirements

In addition to the normally required first-year courses listed above, at least two graduate courses in the following list must be taken during the first four terms: PHYS 161b, 167b, 168b, 200a, 202a, 204a. Note, however, that not all of the above courses will necessarily be given each year. PHYS 161b and 202a are normally required for all students. A total of at least nine semester courses in physics numbered above 160 are required for the doctoral degree.

Qualifying Examination

PHYS 161a, 162a,b and 163a must be passed with grades of B or above, in addition to the requirements listed for the master's degree.

Advanced Examinations

Advanced examinations are in topics partitioned in the several areas of research interest of the faculty. Faculty members working in each general area function as a committee for this purpose and provide information about their work through informal discussions and seminars. The advanced examination requirement consists of a written paper and an oral examination. While no original research by the student is required, it is hoped that a proposal for a possible thesis topic will emerge. It is expected that the candidates will take the advanced examination in the field they wish to pursue for the Ph.D. thesis by the middle of the fourth term in order to qualify for continued departmental support beyond the second year.

Thesis Research

After passing the advanced examination, the student begins work with an advisor who guides his or her research program. The advisor should be a member of the Brandeis faculty but in special circumstances may be a scientist associated with another research institution. The graduate committee of the physics faculty will appoint a dissertation committee to supervise the student's research. The student's dissertation advisor will be the chair of the dissertation committee.

Dissertation and Final Oral Examination

The doctoral dissertation must represent research of a standard acceptable to the faculty committee appointed for each Ph.D. candidate. The final oral examination, or defense, is an examination in which the student will be asked questions pertaining to the dissertation research.

Courses of Instruction

(1-99) Primarily for Undergraduate Students

PHSC 2b Introductory Astronomy

[sn qr]

Does not meet requirements for the major in physics.

Elementary physical ideas will be used to discuss the life and death of stars, the structure of the galaxies, and the large-scale features and evolution of the universe. Usually offered every year.

Mr. Wardle

PHSC 4a Science and Development

[sn qr]

Does not meet requirements for the major in physics.

Focuses on specific scientific and technological issues encountered in economic development. The scientific material needed to understand different approaches will be analyzed using simple mathematics as an essential tool. Usually offered every second year.

Mr. Lange

PHSC 7b Technology and the Management of Public Risk

[sn qr]

Does not meet requirements for the major in physics.

Analyzes some of the public safety issues involved in assessing risk and making technological decisions. The case history method will be used. Usually offered every fourth year.

Staff

PHSC 8b Concept and Theories in Physics

[sn]

Does not meet the requirements for the major in physics.

An introductory study of key ideas in fundamental physical science and the philosophy it has helped to shape. General physics and topics in astronomy, cosmology, and relativity are explored utilizing basic quantitative methods and critical thinking techniques. Usually offered every year.

Mr. Farber

PHSC 9b Introduction to Physics

[sn qr]

Does not meet requirements for the major in physics.

Introduces students to the laws, concepts, and phenomena of physics. Lecture and laboratory are well integrated to explore selected topics of general interest. Usually offered every year.

Mr. Wellenstein

PHYS 10a Physics for the Life Sciences I

[sn qr]

Corequisite: MATH 10a or equivalent.

Introduces students in the life sciences to the laws and concepts of mechanics and thermodynamics. Usually offered every year.

Staff

PHYS 10b Physics for the Life Sciences II

[sn qr]

Prerequisite: PHYS 10a.

Introduces students in the life sciences to the phenomena and concepts of acoustics, electricity and magnetism, optics, and modern physics. Usually offered every year.

Staff

PHYS 11a Basic Physics I

[sn qr]

Corequisite: MATH 10a,b or the equivalent.

Classical mechanics, plus topics from kinetic theory and thermodynamics.

Usually offered every year.

Mr. Blocker

PHYS 11b Basic Physics II

[sn qr]

Prerequisite: PHYS 11a.

Elementary electromagnetism presented from a modern point of view, plus topics in special relativity. Usually offered every year.

Mr. Fraden

PHYS 15a Honors Basic Physics I

[sn qr]

Prerequisite: MATH 10a,b or the equivalent. Corequisite: PHYS 19a

Advanced version of PHYS 11a for students with good preparation in physics and mathematics. Newtonian mechanics. Kinetic theory and thermodynamics. Usually offered every year; not currently offered.

Staff

PHYS 15b Honors Basic Physics II

[sn qr]

Prerequisite: MATH 10a,b or the equivalent. PHYS 11a or 15a or the equivalent. Corequisite: PHYS 19b

Advanced version of PHYS 11b for students with good preparation in physics and mathematics. Elementary electromagnetism presented from a modern point of view. Special relativity. Usually offered every year; not currently offered.

Staff

PHYS 18a Introductory Laboratory I

Corequisite: PHYS 10a. May yield half-

course credit toward rate-of-work and graduation. Two semester hour credits.

Laboratory course consisting of basic physics experiments designed to accompany PHYS 10a. One two-and-a-half hour laboratory per week. One, one-hour lecture per week. Usually offered every year.

Staff

PHYS 18b Introductory Laboratory II

Corequisite: PHYS 10b. May yield half-course credit toward rate-of-work and graduation. Two semester hour credits.

Laboratory course consisting of basic physics experiments designed to accompany PHYS 10b. One two-and-a-half hour laboratory per week. One, one-hour lecture per week. Usually offered every year.

Staff

PHYS 19a Physics Laboratory I

May yield half-course credit toward rate-of-work and graduation. Two semester hour credits.

Laboratory course designed to accompany PHYS 11a. Introductory statistics and data analysis including use of microcomputers and basic experiments in mechanics. One afternoon or evening of laboratory per week. One, one-and-a-half hour lecture per week. Usually offered every year.

Mr. Fell

PHYS 19b Physics Laboratory II

May yield half-course credit toward rate-of-work and graduation. Two semester hour credits.

Laboratory course designed to accompany PHYS 11b. Basic experiments in electricity, magnetism, and optics. Basic electrical measurements. Determination of several fundamental physical constants. One afternoon or evening of laboratory per week. One, one-and-a-half hour lecture per week. Usually offered every year.

Mr. Fell

PHYS 20a Modern Physics I

[sn]

Prerequisites: PHYS 11a, 11b, or equivalent.

A survey of phenomena, ideas, and mathematics underlying modern physics—special relativity, waves and oscillations, optics, thermal and statistical physics, and introductory quantum mechanics, as well as a selection of topics such as nuclear physics and radioactivity, elementary particles, cosmology, and electronic properties of crystals, semiconductors, and metals. Usually offered every year.

Mr. Fell

PHYS 20b Modern Physics II

[sn]

Prerequisite: PHYS 20a.

Continuation of PHYS 20a. Usually offered every year.

Mr. Wardle

PHYS 22a The Science in Science Teaching and Learning

[sn]

Does not meet requirements for the major in physics.

General science concepts and scientific inquiry will be studied in depth using direct instruction, student projects, and discovery learning. This laboratory-based course, especially relevant to future elementary school teachers, will be co-taught with schoolteachers and enlivened by children's visits. Usually offered every year.

Mr. Lange

PHYS 25b Astrophysics

[sn]

Prerequisites: PHYS 10a, 10b or 11a, 11b, and Math 10a, 10b.

Application of basic physical principles to the study of stars, galaxies, quasars, and the large-scale structure of the universe.

Usually offered every second year.

Mr. Roberts or Mr. Wardle

PHYS 29a Electronics Laboratory I

[sn]

Prerequisites: PHYS 10a, 10b or 11a, 11b, and 18a, 18b or 19a, 19b.

Introductory laboratory in analog electronics. Topics to be covered are DC circuits, AC circuits, complex impedance analysis, diodes, transistors, and amplifiers. Usually offered every year.

Mr. Kirsch

PHYS 29b Electronics Laboratory II

[sn]

Prerequisite: PHYS 29a.

Introductory laboratory in digital electronics. Topics to be covered are Boolean algebra, combinational logic, sequential logic, state machines, digital-analog conversion, and microprocessors. The last part of the semester is spent on individual design projects. Usually offered every year.

Mr. Blocker

PHYS 30a Electromagnetism

[sn]

Prerequisite: PHYS 20b or permission of the instructor.

The fundamentals of electromagnetic theory. Includes electrostatics, magnetostatics, electric and magnetic circuits, and Maxwell's equations. Usually offered every year.

Staff

PHYS 30b Quantum Theory

[sn]

Prerequisites: PHYS 11a,b and PHYS 20a,b; or permission of the instructor.

Introduction to quantum mechanics: atomic models, Schrodinger equation, angular momentum, and hydrogen atom.

Multielectron atoms and interaction of atoms with the electromagnetic field. Usually offered every year.

Mr. Bensinger

PHYS 32b Microprocessor Laboratory

[sn]

Prerequisite: PHYS 29a or 29b.

Study of microprocessor design and use as controller for other devices. Topics include architecture of microcomputers, interfacing, digital control, analog control, and software development. Usually offered every second year.

Mr. Kirsch

PHYS 39a Advanced Physics Laboratory

[wi sn qr]

Prerequisite: PHYS 20a. This course may be repeated once for credit with permission of the instructor. This course is co-taught with PHYS 169b.

Experiments in a range of topics in physics, possibly including selections from the following: wave optics, light scattering, Nuclear Magnetic Resonance, X-ray diffraction, scanning tunnelling microscopy, numerical simulation and modeling, holography, electro-optics, phase transitions, rubber elasticity, laser tweezers, chaotic dynamics, and optical microscopy. Students work in depth on three or four experiments during the term. Usually offered every semester.

Mr. Meyer

PHYS 40a Introduction to Thermodynamics and Statistical Mechanics

[sn]

Statistical approach to thermal properties of matter. Theoretical tools are developed for studying questions such as: "Why does a rubber band contract upon heating?" or "What is the size of a white dwarf star?" Usually offered every year.

Mr. Fraden

PHYS 97a Tutorial in Physics

Tutorial for students studying advanced material not covered in regular courses. Usually offered every year.

Staff

PHYS 97b Tutorial in Physics

Tutorial for students studying advanced material not covered in regular courses. Usually offered every year.

Staff

PHYS 98a Readings in Physics

Open to exceptional students who wish to study an area of physics not covered in the standard curriculum. Usually offered every year.

Staff

PHYS 98b Readings in Physics

Open to exceptional students who wish to study an area of physics not covered in the standard curriculum. Usually offered every year.

Staff

PHYS 99d Senior Research*Permission of the advising coordinator required.*

Research assignments and preparation of a report under the direction of an instructor. Usually offered every year.

Staff

(100-199) For Both Undergraduate and Graduate Students**PHYS 100a Classical Mechanics**

[sn]

Prerequisites: PHYS 20a and 20b or permission of the instructor.

Lagrangian dynamics, Hamiltonian mechanics, planetary motion, general theory of small vibrations. Introduction to continuum mechanics. Usually offered every second year.

Mr. Fell

PHYS 104a Soft Condensed Matter

[sn]

Mechanical, thermal, and electronic properties of matter including fluids, solids, liquid crystals, and polymers. Simple models of matter are developed and used to discuss recent experimental findings.

Usually offered every second year.

Staff

PHYS 105a Biological Physics

[sn]

May not be taken for credit by students who took PHYS 104a in the fall of 2002.

Physical forces in living matter are studied from the perspective offered by statistical mechanics, elasticity theory, and fluid dynamics. Quantitative models for biological structure and function are developed and used to discuss recent experiments in single-molecule biology.

Usually offered every second year.

Staff

PHYS 107b Particle Physics

[sn]

Prerequisite: PHYS 30a or permission of the instructor. Corerequisite: PHYS 30b or permission of the instructor.

The phenomenology of elementary particles and the strong, weak, and electromagnetic interactions are studied. Properties of particles, quarks, neutrinos, vector bosons, Higgs particles, supersymmetry, symmetries, and conservation laws are covered. This course is co-taught with the graduate course PHYS 167b, and the work load will be appropriate to each group.

Usually offered every second year.

Mr. Bensinger or Mr. Blocker

PHYS 110a Mathematical Physics

[sn]

Complex variables; Fourier and Laplace transforms; special functions; partial differential equations. This course is co-taught with PHYS 161a, and the work load will be appropriate to each group. Usually offered every year.

Mr. Schnitzer

PHYS 113a First Year Tutorial I

[sn]

A review of physics from the most elementary topics to those treated in other first-year graduate courses. The environment of an oral qualifying examination is reproduced in the tutorial. Usually offered every year.

Staff

PHYS 113b First Year Tutorial II

[sn]

Continuation of PHYS 113a. Usually offered every year.

Staff

NPHY 115a Dynamical Systems, Chaos, and Fractals

[sn]

Prerequisite: PHYS 10a or 11a, MATH 21a, MATH 36a, or approved equivalents. This course may not be repeated for credit by students who have taken PHYS 115a in previous years.

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.

Mr. Wang

PHYS 161a Electromagnetic Theory I

[sn]

Electrostatics, magnetostatics, boundary value problems. This course is co-taught with PHYS 110a, and the work load will be appropriate to each group. Usually offered every year.

Mr. Schnitzer

PHYS 161b Electromagnetic Theory II

[sn]

Maxwell's equations. Quasi-stationary phenomena. Radiation. Usually offered every year.

Mr. Schnitzer

PHYS 162a Quantum Mechanics I

[sn]

Nonrelativistic quantum theory and its application to simple systems; spin systems and the harmonic oscillator. Feynman diagram visualization of time-dependent perturbation theory. Usually offered every year.

Mr. Roberts

PHYS 162b Quantum Mechanics II

[sn]

Path integral formulation of quantum mechanics. Quantum treatment of identical particles. Approximate methods: variational, WKB, and perturbation theory. Applications to atoms, molecules, and solids. Usually offered every year.

Mr. Lawrence

PHYS 163a Statistical Physics and Thermodynamics

[sn]

The thermal properties of matter. Derivation of thermodynamics from statistical physics. Statistical theory of fluctuations. Usually offered every year.

Ms. Chakraborty

PHYS 167b Particle Phenomenology

[sn]

The phenomenology of elementary particles and the strong, weak, and electromagnetic interactions. Properties of particles, kinematics of scattering and decay, phase space, quark model, unitary symmetries, and conservation laws. This course is co-taught with PHYS 107b, and the work load will be appropriate to each group. Usually offered every second year.

Mr. Bensinger or Mr. Blocker

PHYS 168b Introduction to Astrophysics

[sn]

Bremsstrahlung, synchrotron radiation, inverse Compton scattering. Extended and compact radio sources, jets, superluminal motion. Quasars and active galactic nuclei, IR to X-ray continua, spectral line formation. Black holes and accretion disks. Usually offered irregularly as demand requires; consult department.

Mr. Roberts

PHYS 169b Advanced Laboratory

[sn]

Experiments in a range of topics in physics, possibly including selections from the following: wave optics, light scattering, Nuclear Magnetic Resonance, X-ray diffraction, scanning tunnelling microscopy, numerical simulation and modeling, holography, electro-optics, phase transitions, rubber elasticity, laser tweezers, chaotic dynamics, and optical microscopy. Students work in depth on three or four experiments during the term. This course is co-taught with PHYS 39a. Usually offered every semester.

Mr. Meyer

(200 and above) Primarily for Graduate Students**PHYS 200a General Relativity**

Introduction to current research and problems in gravitational physics. Physical and mathematical background are provided as needed, but emphasis is on recent literature. Usually offered every second year.

Staff

PHYS 202a Quantum Field Theory

Methods of statistical and quantum field theory including path integrals, second quantization, Feynman diagrams, renormalization group, epsilon expansions, effective field theory. Applications ranging from phase transitions and critical phenomena to gauge theories of particle physics. Usually offered every year.

Mr. Lawrence

PHYS 204a Condensed Matter II

Modern techniques such as effective field theory, scaling, and the renormalization group are introduced and used to study solids, magnets, liquid crystals, and macromolecules. Most of the theory is developed on simple models and applied experiments. Usually offered every second year.

Staff

PHYS 210a High Energy Theoretical Physics Seminar I

Analysis of important recent developments in particle physics. Usually offered every year.

Mr. Lawrence

PHYS 210b High Energy Theoretical Physics Seminar II

A continuation of PHYS 210a. Usually offered every year.

Mr. Lawrence

PHYS 213a Advanced Examination Tutorial I

Supervised preparation for the advanced examination. Usually offered every year.

Staff

PHYS 213b Advanced Examination Tutorial II

Supervised preparation for the advanced examination. Usually offered every year.

Staff

PHYS 301a Astrophysics Seminar I

Advanced topics and current research in astrophysics are discussed. Usually offered every year.

Mr. Roberts

PHYS 301b Astrophysics Seminar II

A continuation of PHYS 301a. Usually offered every year.

Mr. Wardle

PHYS 302a Particle Seminar I

Seminar covers latest advances in elementary particle physics. Includes student presentations and invited speakers. Usually offered every year.

Mr. Kirsch

PHYS 302b Particle Seminar II

A continuation of PHYS 302a. Usually offered every year.

Mr. Blocker

PHYS 304a Condensed Matter Seminar I

Analysis and discussion of recent important developments in solid-state physics.

Usually offered every year.

Ms. Chakraborty

PHYS 304b Condensed Matter Seminar II

A continuation of PHYS 304a. Usually offered every year.

Mr. Kondev

PHYS 305a Liquid Crystals I

Recent advances in the physics of liquid crystals and related systems such as microemulsions, colloidal suspensions, and polymer solutions. Usually offered every year.

Mr. Meyer

PHYS 305b Liquid Crystals II

A continuation of PHYS 305a. Usually offered every year.

Mr. Fraden

NPHY 341b Neural Computation

An advanced graduate seminar course on current theoretical issues dealing with the dynamics and information processing of neural systems. Usually offered every year.

Mr. Wang

PHYS 349a Readings in Condensed Matter

Usually offered every year.

Ms. Chakraborty

PHYS 405d Experimental Elementary Particle Physics

Specific sections for individual faculty members as requested.

Staff

PHYS 408d Computational Neuroscience

Specific sections for individual faculty members as requested.

Staff

PHYS 409d Theoretical High Energy Physics

Specific sections for individual faculty members as requested.

Staff

PHYS 417d Theoretical Condensed Matter Physics

Ms. Chakraborty and Mr. Kondev

PHYS 421d Relativity

Mr. Deser

PHYS 426d Astrophysics

Specific sections for individual faculty members as requested.

Staff

PHYS 430d Experimental Solid-State Physics

Specific sections for individual faculty members as requested.

Staff

PHYS 431d Experimental Condensed-Matter Physics

Specific sections for individual faculty members as requested.

Staff

PHYS 436d Biophysics

Staff

Cross-Listed Courses

BIOP 200b

Biophysics and Structural Biology Graduate Seminar