

MUTH 5400. Invertible Counterpoint and Fugue. 3 hours. Advanced techniques in contrapuntal writing in 18th-century style. Prerequisite(s): MUTH 3420; satisfactory score on the Graduate Placement Examination, or MUTH 5001, MUTH 5002 and MUTH 5003.

MUTH 5470. Advanced Schenkerian Analysis. 3 hours. Advanced analysis of tonal music according to the theory of structural levels and methods of graphic analysis developed by Heinrich Schenker. Prerequisite(s): MUTH 4370; satisfactory score on the Graduate Placement Examination, or MUTH 5001, MUTH 5002 and MUTH 5003.

MUTH 5720. Computer-Assisted Instruction in Music. 3 hours. Survey of computer-assisted instruction (CAI) systems for music. Development of programming and evaluative skills necessary to develop complete CAI systems for music instruction. Prerequisite(s): CSCE 5013, CECS 5110 or CSCE 5933; satisfactory score on the Graduate Placement Examination, or MUTH 5001, MUTH 5002 and MUTH 5003.

MUTH 5900-MUTH 5910. Special Problems. 1–3 hours each.

MUTH 6500. Form and Style Analysis I. 3 hours. Identification of structural principles and compositional idioms characteristic of historical eras and representative composers from *Ars Antiqua* through the early baroque. Prerequisite(s): satisfactory score on the Graduate Placement Examination, or MUTH 5001, MUTH 5002 and MUTH 5003.

MUTH 6510. Form and Style Analysis II. 3 hours. Identification of structural principles and compositional idioms characteristic of historical eras and representative composers from the late baroque through the 20th century. Prerequisite(s): satisfactory score on the Graduate Placement Examination, or MUTH 5001, MUTH 5002 and MUTH 5003.

MUTH 6660. History of Music Theory. 3 hours. Theoretical systems and treatises from antiquity to the late 15th century and analysis of related compositions. Prerequisite(s): MUMH 5010 or MUMH 5020 (concurrent enrollment is acceptable), or equivalent; satisfactory score on the Graduate Placement Examination, or MUTH 5001, MUTH 5002 and MUTH 5003.

MUTH 6670. History of Music Theory. 3 hours. Theoretical systems and treatises from the 16th to early 18th century and analysis of related compositions. Prerequisite(s): MUMH 5010 or MUMH 5020 (concurrent enrollment is acceptable), or equivalent; satisfactory score on the Graduate Placement Examination, or MUTH 5001, MUTH 5002 and MUTH 5003.

MUTH 6680. Proseminar in Music Theory. 3 hours. Investigation and research; subject matter variable to meet needs of students. Prerequisite(s): satisfactory score on the Graduate Placement Examination, or MUTH 5001, MUTH 5002 and MUTH 5003. May be repeated for credit as topics vary.

MUTH 6700. Analytical Systems I (1700–1900). 3 hours. Examination of analytical systems from the middle works of Rameau to the harmonic theories of Riemann, Schenker and Schoenberg. Prerequisite(s): MUTH 5360, and MUMH 5010 or MUMH 5020 (concurrent enrollment is acceptable), or equivalent.

MUTH 6710. Analytical Systems II (Post 1900). 3 hours. Examination of analytical systems in the 20th century. Prerequisite(s): MUTH 5370, and MUMH 5010 or MUMH 5020 (concurrent enrollment is acceptable), or equivalent.

MUTH 6900-MUTH 6910. Special Problems. 1–3 hours each.

Music/Education

see Music

Music/Laboratories

see Music

Musicology, Music History and Literature

see Music

Nuclear Engineering Technology

see *Undergraduate Catalog*

Philosophy and Religion Studies

Philosophy, PHIL

PHIL 5010. Seminar in the Philosophy of Ecology. 3 hours. Traces the evolution of ecology from its roots in 19th-century natural history to the present with an emphasis on the prominent paradigms and conceptual trends, such as organicism, community ecology, ecosystem ecology, disturbance and flux. Also explores the sociocultural contexts in which ecology emerged and now exists, including the so-called second scientific revolution and the two-culture split.

PHIL 5050. Professional Development Seminar. 3 hours. Examination of philosophies of education and pedagogical techniques and problems. Includes instruction, advising and preparation for professional development for academic careers, troubleshooting in the classroom, course preparation, university policies on teaching and student responsibilities, and teaching demonstrations.

PHIL 5100. Ancient Philosophy. 3 hours. A concentrated examination of some major problem areas in ancient Western philosophy. For example, concepts of nature, concepts of the character and function of knowledge, concepts of the nature and extent of value. Major thinkers normally covered include the historiographical study of pre-Socratic figures, Plato and Aristotle.

PHIL 5200. Modern Philosophy. 3 hours. A concentrated examination of some major problem areas in modern Western philosophy. For example, concepts of nature, concepts of the character and function of knowledge, concepts of the nature and extent of value. Major thinkers covered may include Descartes, Spinoza, Locke, Hume and Kant.

PHIL 5260. Seminar in Philosophy of Social Science.

3 hours. Questions on explanations, observable human purposes and science of valuation. Contrasting science, ideology and occultism. Darwinism as conceptual scheme. The “causal” status of symbols and verbal behavior.

Debates about objectivity, *Verstehen*, phenomenology and behaviorism, referring to K. Popper, G. Netter, L.A. White, B.F. Skinner, C. Geertz, T. Kuhn, P. Winch and M. Weber.

PHIL 5300. Social and Political Philosophy. 3 hours. A focused examination of the relation between philosophical ideas and democracy, rights, justice, political freedom, authority and community. Exploration of historical and contemporary figures and schools of thought, may include Locke, Rousseau and Marx, as well as Rawls and his critiques, feminist political thought, and critical race theory.

PHIL 5400. Seminar in Ethical Theory. 3 hours. A focused examination of a variety of metaethical and normative theories of moral philosophies, such as virtue ethics, utilitarianism, deontology, emotivism and care ethics. Explorations of historical and contemporary philosophical ethics may include feminist ethics and canonical figures such as Aristotle, Kant, and Mill.

PHIL 5451. Environmental Ethics. 3 hours. Examination of basic positions in the field of environmental ethics with emphasis on legal and moral rights for nature, animal liberation, and Western philosophical and religious traditions.

PHIL 5500. Philosophy of Science and Technology. 3 hours. A focused examination of the relationship between science and technology, the role of experiment and instrumentation in scientific practice, the social construction of scientific knowledge and technical artifacts, the nature of technology in human perception and experience, and the broader social impacts of science and technology.

PHIL 5600. Philosophy of Religion. 3 hours. A focused examination of the concepts, belief systems and practices of religions. Topics might include arguments for God’s existence, the problem of evil, the nature of religious experience, religious language, and faith and reason.

PHIL 5700. Seminar in Environmental Ethics. 3 hours. An intensive analysis of new positions in environmental ethics with special emphasis on their theoretical value as a contribution to contemporary philosophy and their practical value with regard to environmental policy and decision making.

PHIL 5900-PHIL 5910. Special Problems. 1–3 hours each. Prerequisite(s): consent of department.

PHIL 5950. Master’s Thesis. 3 or 6 hours. To be scheduled only with consent of department. 6 hours credit required. No credit assigned until thesis has been completed and filed with the graduate dean. Continuous enrollment required once work on the thesis has begun. May be repeated for credit.

PHIL 5960. Seminar in Problems of Philosophy. 3 hours. Intensive analysis of major philosophical issues against the background of classical and contemporary investigations. May be repeated for credit.

PHIL 6110. Epistemology. 3 hours. Examines the nature of knowledge and justification. Issues typically include the relationship between knowledge and opinion, truth and meaning, social construction, and gender and ethnicity in knowing and believing.

PHIL 6150. Metaphysics. 3 hours. Examination of problems that arise from attempts to give an account of reality and its manifestations: possibility and necessity, causality, the nature of events, mind-body and universals.

PHIL 6200. Existentialism. 3 hours. An examination of the place of humanity in the world and its relations to problems of self, authenticity, freedom and anxiety; Kierkegaard, Nietzsche, Heidegger and Sartre. Seminar may be a survey of philosophers or single-philosopher oriented.

PHIL 6250. Aesthetics. 3 hours. An examination of the theories of the beauty and art in the history of philosophy. Topics may include aesthetics experience, artistic expression, the sublime, literature, art and morality, and environmental aesthetics.

PHIL 6300. Seminar in Symbolic Logic and Metamathematics. 3 hours. Review of the history, development and present status of symbolic logic and metamathematics, including a consideration of the problems encountered in the philosophical interpretation of logical concepts.

PHIL 6400. Philosophy of Technology. 3 hours. Examination of the nature of technology and the effects of technologies upon human knowledge, activities, societies and environments. Topics might include technological determinism, autonomous technology, social constructivism, STS, techno-science, converging technologies, ethics and politics of technology, and technology and the environment.

PHIL 6450. Bioethics. 3 hours. Examines the historical development and contested nature of bioethical inquiry in relation to the history of philosophic ethics more generally. Topics include clinical ethics, ethics of research and emerging technologies, the relationship with policy and politics, and the relationship with environmental ethics.

PHIL 6500. Cultural Criticism. 3 hours. Transdisciplinary analysis of culture, popular culture, politics, subjectivity and everyday life. Topics may include Marxism and critical theory, power and knowledge, deconstruction and literary theory, semiotics and psychoanalytic theory, post-colonial discourse, and globalization theory.

PHIL 6550. Religion and Science. 3 hours. Examination of the historical and contemporary relationship between sciences and religions. Issues include the rise of modern science in Europe, evolution and intelligent design, religion and ecology, and science and non-Western religious tradition.

PHIL 6560. Judaic Religion and Philosophy. 3 hours. Philosophical examination of a wide range of Judaic texts—biblical, medieval and modern—which address Jewish law, history and thought from diverse points of view. Topics may include contemporary controversies over Judaism’s teachings concerning environmental ethics.

PHIL 6600. Philosophy and Theory of Religion. 3 hours. Intensive inquiry into versions of theism, panentheism and naturalism. Explores relevant epistemological and postmodern issues.

PHIL 6650. Philosophy of Water. 3 hours. Philosophical examination of water and water issues at the interface of science, policy, art and culture. Topics include aesthetics and ontology of water, water conflicts, and local and global governance theories.

PHIL 6710. Ecofeminism: Women's Studies and Environmental Ethics. 3 hours. Examines the merger of feminism with environmental ethics and its subsequent evolution. Subject matter includes the analysis of patriarchy, gender issues and multicultural perspectives within the larger framework of ethical and philosophical responses to ecocrises.

PHIL 6720. Comparative Environmental Ethics. 3 hours. An exploration of resources for environmental philosophy in non-Western traditions, focusing on South and East Asian traditions.

PHIL 6730. Western Religion and the Environment. 3 hours. A historic and contemporary overview of Euro-American religious thought concerning the environment, including investigation of the ancient Western religions, Judaism, Christianity and Native American religions.

PHIL 6740. Environmental Ethics and Public Policy. 3 hours. Investigates the policy turn in environmental philosophy, exploring ways to make environmental ethics and environmental philosophy more relevant to decision-makers, public agencies and stakeholders groups.

PHIL 6750. Environmental Justice. 3 hours. Examination of the histories, concepts, philosophical implications, and the struggles of people in shaping the environmental justice movement. Examines the underlying notions of environmental goods and harms, the perspectives of environmental law and policy, and the politics of environmental identities.

PHIL 6760. Topics in Environmental Philosophy. 3 hours. Focused examination of the perennial or emerging topics in environmental philosophy, such as the intrinsic value of nature, monism versus pluralism, ecophenomenology, holism versus individualism, and non-Western explorations of environmental ethics and philosophy. May be repeated for credit as topics vary.

PHIL 6900-PHIL 6910. Special Problems. 1–3 hours. Research by doctoral students in fields of special interest. Prerequisite(s): consent of department.

PHIL 6950. Doctoral Dissertation. 3, 6, 9 hours. To be scheduled only with consent of department. 12 hours required. No credit assigned until dissertation has been completed and filed with the graduate dean. Doctoral students must maintain continuous enrollment in this course subsequent to passing qualifying examination for administration for admission to candidacy. May be repeated for credit.

PHIL 6960. Seminar in Problems in Philosophy. 3 hours. Intensive analysis of major philosophical issues against the background of classical and contemporary investigations. May be repeated for credit as topics vary.

Physical Education

see *Undergraduate Catalog*

Physics

Astronomy – see *Undergraduate Catalog*

Physics, PHYS

PHYS 5450. Survey of Solid State Physics. 3 hours. Acquaints students with the major areas of solid state physics. Simple models and physical insight to solid state phenomena are stressed. Intended for physics students of all specializations. Topics include crystal structure, crystal symmetry, reciprocal lattice, X-ray diffraction, crystal binding, phonons and lattice vibrations, thermal properties, free electron theory, semiconductors, superconductivity and magnetic properties. Prerequisite(s): PHYS 4110.

PHYS 5500. Quantum Mechanics I. 3 hours. Fundamentals of quantum theory. Foundations of wave mechanics, wavepackets and the uncertainty principles. Schroedinger equation, one-dimensional problems, operators and eigenfunctions, three-dimensional problems, angular momentum and spin.

PHYS 5510. Quantum Mechanics II. 3 hours. Scattering theory; spin, angular momentum; WKB and variation method; time-independent and time-dependent perturbation theory; identical particles; applications; relativistic waves equations. Prerequisite(s): PHYS 5500.

PHYS 5610. Selected Topics in Modern Physics. 3 hours. Selected topics of contemporary interest in physics. Prerequisite(s): consent of department. May be repeated for credit as topics vary with consent of department chair.

PHYS 5700. Computational Physics. 3 hours. Symbolic and numerical solutions to single and multiple, single-variable and multi-variable, linear and nonlinear, integral and differential equations. Finite-differences method for solving a partial differential equation. Solution visualization techniques, including multidimensional plots. Matrix manipulation. Data analysis. Monte Carlo methods. Random walk simulations. Classical trajectory simulations.

PHYS 5710. Advanced Classical Mechanics I. 3 hours. Variational principles and Lagrange's equations. Central force problem. Rigid body motion. Hamilton's equations; canonical variables and transformations; action-angle variables; Hamilton-Jacobi theory. Prerequisite(s): PHYS 3220 or consent of department.

PHYS 5720. Electromagnetic Theory I. 3 hours. Maxwell's equations, vector, scalar potentials; gauge transformations; wave equation; conservation theorems; boundary conditions; statics. Non-dissipative media and dispersion; dissipative media; reflection and refraction; guided waves. Prerequisite(s): PHYS 4210 and PHYS 6000 (concurrent), or consent of department.

PHYS 5750. Selected Topics in Materials Physics. 3 hours. Topics from specialized areas of materials science, physics, chemistry. Integrated circuit fabrication and materials. Transmission electron microscopy. May be repeated for credit as topics vary.

PHYS 5900-PHYS 5910. Special Problems. 1–6 hours each. Special problems in advanced physics for graduate students. Problem chosen by the student with the approval of the supervising professor and the department chair.

PHYS 5920-PHYS 5930. Research Problems in Lieu of Thesis. 3 hours. An introduction to research; may consist of an experimental, theoretical or review topic.