

PHIL 4450. Philosophy of Ecology. 3 hours. Traces the development of ecology from its roots in 19th-century natural history through general ecology, restoration ecology, deep ecology and social ecology. Examines the central philosophical concepts of biological and cultural diversity; the relations between societies and their environments; environmental and social problems determined by losses in biocultural diversity; agriculture, land ethics and conservation; non-Western conceptions of nature and society.

PHIL 4500. Existentialism. 3 hours. Examination of humanity's place in the natural and social worlds. Emphasis on problems of freedom, authenticity, alienation, anxiety, affirmation, morality, religion and atheism. Figures typically include Kierkegaard, Nietzsche, Heidegger and Sartre.

PHIL 4550. Philosophy of Science and Technology. 3 hours. Examines 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; the role of technology in the broader social impacts of science and technology; the relationship of biotechnology, information technology, imaging technology and nanotechnology to society.

PHIL 4600. Phenomenology. 3 hours. The study of human experience and of the ways things present themselves to us in and through such experience. Examines phenomenology as a method of inquiry, a philosophical movement, and a study of the structures and conditions of experience. Figures typically include Husserl, Heidegger, Merleau-Ponty and Ricoeur.

PHIL 4650. Philosophy of Water. 3 hours. Examination of water issues at the interface of science, policy, philosophy, art and culture. Philosophical approaches include ethics, aesthetics and ontology of water; epistemological analysis of water conflicts; local and global governance theories.

PHIL 4700. Environmental Ethics. 3 hours. An examination of appropriate human interventions in the natural world. Topics include the history of ideas behind environmental thought, the legal and moral standing of nature, animal rights and welfare, deep ecology, social ecology, environmental justice.

PHIL 4750. Philosophy and Public Policy. 3 hours. Explores how recent developments in moral theory, political philosophy, and philosophy of science and technology can clarify issues in public policy. Topics include the nature of government, the justification and limitations of collective action, the instruments of public policy, democracy and the economy, social costs and benefits, science and technology policy, computers and information policy, food and water policy, and environmental and development policy.

PHIL 4800. Postmodernism. 3 hours. An examination of contemporary philosophers and writers who question the premise of Enlightenment thought that Reason will liberate us from superstition, tradition and hardships imposed by nature. Topics may include a critique of foundationalism, representational epistemology, historical progress and Eurocentrism.

PHIL 4900-PHIL 4910. Special Problems. 1–3 hours each.

PHIL 4951. Honors College Capstone Thesis. 3 hours. Major research project prepared by the student under the supervision of a faculty member and presented in standard thesis format. An oral defense is required of each student for successful completion of the thesis. Prerequisite(s):

completion of at least 6 hours in honors courses; completion of at least 12 hours in the major department in which the thesis is prepared; approval of the department chair and the dean of the school or college in which the thesis is prepared; approval of the dean of the Honors College. May be substituted for HNRS 4000.

PHIL 4960. Proseminar in Philosophy. 3 hours. Advanced study of specific figures, themes or problems in philosophy and religion studies. May be repeated for credit as topics vary each semester.

PHIL 4970. Capstone Seminar. 3 hours. Seminar on philosophical writing and argument focusing on the comparative study of important figures in the history of philosophy. Prerequisite(s): senior standing and consent of department. Required course for philosophy majors only.

Physical Education

see Kinesiology, Health Promotion and Recreation

Physics

Astronomy, PHYS

PHYS 1052 (PHYS 1404). The Solar System. 3 hours. (3;2) History of astronomy and the physical properties of the earth, moon, planets and minor bodies. Includes weekly outdoor and indoor laboratory exercises. Prerequisite(s): proficiency in algebra (MATH 1100 or above). *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1062 (PHYS 1403). Stars and the Universe. 3 hours. (3;2) Properties of stars and stellar systems and a study of the origin, evolution and future of the universe. Includes weekly outdoor and indoor laboratory exercises. Prerequisite(s): proficiency in algebra (MATH 1100 or above). *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

Physics, PHYS

PHYS 1210 (PHYS 1415). Conceptual Physics. 3 hours. (3;3) Principles and applications of mechanics, heat, sound, light, electricity and atomic physics for the elementary education major. Prerequisite(s): MATH 1100 or higher and interdisciplinary studies (elementary education) major status. May not use both PHYS 1210 and PHYS 1315 to satisfy a laboratory science requirement. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum (by elementary education students).*

PHYS 1270. Science and Technology of Musical Sound. 3 hours. (3;2) Sound production; nature of vibrations in percussion, string, and wind instruments. Sound propagation; sound speed; echoes. Sound intensity, physical and perceived. Sound pitch, physical and perceived; intervals. Complex sounds; harmonic series. Room acoustics; reverberation time; ideal listening rooms. Wave phenomena; interference and diffraction. Digital sound recording; musical scales; the human voice. Includes weekly laboratory exercises. Prerequisite(s): MATH 1100 or above. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1315 (PHYS 1410). Introduction to the World of Physics. 3 hours. (3;3) Basic principles and concepts of physics for the liberal arts major necessary to the understanding of our increasingly technological environment and the science on which it is based; current ideas concerning the micro world and the universe at large. Topics include mechanics; properties of matter; heat; sound; electricity and magnetism; light; and atomic, nuclear and fundamental particle physics. Includes weekly laboratory exercises. Prerequisite(s): proficiency in algebra (MATH 1100 or above). *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1316. Essential Physics. 3 hours. (3;3) Principles and concepts of physics essential to the understanding of modern technological society by the liberal arts major are examined in their cultural context. Topics include Newtonian mechanics, relativity, light, electromagnetic theory, atomic physics, quantum mechanics and nuclear physics. Includes weekly laboratory exercises. Prerequisite(s): admission to the Honors College. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1410-PHYS 1420. General Physics. 3 hours each. (3;0;1) Non-calculus based physics sequence suitable for life sciences majors and preprofessional students.

PHYS 1410 (PHYS 1301). General Physics I. Principles and applications of mechanics, sound and heat. Prerequisite(s): proficiency in algebra and trigonometry. It is recommended that the course be taken concurrently with PHYS 1430. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1420 (PHYS 1302). General Physics II. Principles and applications of electricity, magnetism, light and atomic physics. Prerequisite(s): PHYS 1410 or consent of department. It is recommended that the course be taken concurrently with PHYS 1440. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1430-PHYS 1440. Laboratory Sequence for General Physics. 1 hour each. (0;3) Laboratory to accompany the course sequence PHYS 1410-PHYS 1420.

PHYS 1430 (PHYS 1101). General Physics Laboratory I. Prerequisite(s): PHYS 1410 (may be taken concurrently). *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1440 (PHYS 1102). General Physics Laboratory II. Prerequisite(s): PHYS 1420 (may be taken concurrently). *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1510-PHYS 1520. General Physics with Calculus Sequence. 3 hours each. (3;0;1) Calculus-based physics sequence suitable for future science teachers and for pre-medicine and other health-related preprofessional students.

PHYS 1510. General Physics I with Calculus. Principles and applications of mechanics, sound and heat. Prerequisite(s): MATH 1710 (may be taken concurrently), and consent of department. It is recommended that the course be taken concurrently with PHYS 1530. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1520. General Physics II with Calculus. Principles and applications of electricity, magnetism, light, atomic and nuclear physics. Prerequisite(s): PHYS 1510. It is recommended that the course be taken concurrently with PHYS 1540. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1530-PHYS 1540. Laboratory Sequence for General Physics with Calculus. 1 hour each. (0;3) Laboratory to accompany the course sequence PHYS 1510-PHYS 1520.

PHYS 1530. General Physics with Calculus Laboratory I. Laboratory to accompany PHYS 1510. Prerequisite(s): concurrent enrollment in PHYS 1510. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1540. General Physics with Calculus Laboratory II. Laboratory to accompany PHYS 1520. Prerequisite(s): concurrent enrollment in PHYS 1520. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 1710-PHYS 2220-PHYS 3010. General Technical Physics. 3 hours each. (3;0;1) Calculus-based physics sequence suitable for physics, engineering physics, engineering technology, mathematics, computer science and chemistry majors.

PHYS 1710 (PHYS 2325). Mechanics. Laws of motion; inertia, acceleration, force, energy, momentum and angular momentum. Rotational and oscillatory motion. Gravitation. Prerequisite(s): MATH 1710. It is recommended that the course be taken concurrently with PHYS 1730. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 2220 (PHYS 2326). Electricity and Magnetism. Electric fields, dc and ac circuits, magnetic fields and magnetic induction. Electric and magnetic properties of matter. Prerequisite(s): PHYS 1420 or PHYS 1710; MATH 1720. It is recommended that the course be taken concurrently with PHYS 2240. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 3010. Modern Physics. Relativity, quantum physics, atomic structure, properties of matter and nuclear physics. Prerequisite(s): PHYS 1420 or PHYS 2220, and MATH 1710. It is recommended that the course be taken concurrently with PHYS 3030.

PHYS 1730-PHYS 2240-PHYS 3030. Laboratory Sequence for General Technical Physics. 1 hour each. (0;3) Laboratory to accompany the course sequence PHYS 1710-PHYS 2220-PHYS 3010.

PHYS 1730 (PHYS 2125). Laboratory in Mechanics. Prerequisite(s): PHYS 1710 (may be taken concurrently). *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 2240 (PHYS 2126). Laboratory in Wave Motion, Electricity, Magnetism and Optics. Prerequisite(s): PHYS 2220 (may be taken concurrently). *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

PHYS 3030. Laboratory in Modern Physics. Prerequisite(s): PHYS 3010 (may be taken concurrently).

PHYS 2900-PHYS 2910. Special Problems. 1–3 hours each. Individualized instruction in theoretical or experimental problems. For elective credit only.

PHYS 3210–PHYS 3220. Mechanics. 3 hours each. (3;0;1)

PHYS 3210. Vector treatment of the motion of a particle in one, two and three dimensions; motion of a system of particles; conservation laws; the statics of fluids and solids; the motion of rigid bodies. Prerequisite(s): PHYS 2220.

PHYS 3220. Gravitation; moving coordinate systems; mechanics of continuous media; generalized coordinates and the Lagrangian and Hamiltonian formulations of mechanics; applications of tensors to rotation of rigid bodies; theory of small vibrations. Prerequisite(s): PHYS 3210.

PHYS 3310. Mathematical Methods in the Physical Sciences. 3 hours. (3;0;1) Application of advanced mathematical techniques to the solution of problems in physics. Vector spaces, complex analysis, matrices, linear transformations, vector calculus, Fourier series and integrals, the Laplace transformation, and special functions. Prerequisite(s): PHYS 2220 and MATH 1720.

PHYS 3420. Electronics. 4 hours. (1–3;4–6) Analog and digital electronics, applications and diagnostic techniques. Selections from direct- and alternating-current circuits, and measurements; uses of diodes, transistors, etc., as switches; applications of Boolean algebra; memory and storage devices; counters and shift registers; computer structures and bussing; servo systems and operations amplifiers; digital and analog-digital instrumentation and interfacing with computers. Prerequisite(s): PHYS 1420/PHYS 1440 or PHYS 2220/PHYS 2240, and MATH 1710.

PHYS 4110. Statistical and Thermal Physics. 3 hours. (3;0;1) Basic probability concepts; statistical description of systems of particles; statistical thermodynamics and thermodynamic laws; macroscopic and microscopic descriptions of systems; phase transformation. Prerequisite(s): PHYS 3010/PHYS 3030.

PHYS 4150. Experimental Physics I. 3 hours. (1;6) Laboratory experience via use of research-quality instruments. Modern experiments in solid state, atomic and molecular physics. Topics, which may vary, include nonlinear dynamics and chaos in circuits and lasers; SQUIDS and high temperature superconductivity; holography; X-ray diffraction; and electron scanning microscopy. Prerequisite(s): PHYS 3010/PHYS 3030.

PHYS 4160. Experimental Physics II. 3 hours. (1;6) Experimental techniques of precision measurements in nuclear and atomic physics. Topics, which may vary, cover recent developments in modern physics suitable for advanced undergraduates and graduate students. Rutherford scattering, low energy nuclear reactions; ion-induced innershell ionization at MeV energies; nuclear magnetic resonance to obtain local electronic structure; magnetic transport and magneto-optics; and modern techniques in surface analysis (ion sputtering). Prerequisite(s): PHYS 3010/PHYS 3030.

PHYS 4170. Experimental Physics III. 3 hours. (2;4) Physics laboratory experience via use of research-quality equipment. Ion beam based experimental techniques for materials growth and modification and analysis using solid-state, nuclear, atomic physics principles. Prerequisite(s): PHYS 3010.

PHYS 4210. Electricity and Magnetism. 3 hours. (3;0;1) Vector treatment of static electric and magnetic fields in free space, multipole field distributions, boundary value problems, fields in material media, and electromagnetic waves. Prerequisite(s): PHYS 2220/PHYS 2240.

PHYS 4220. Electromagnetic Waves. 3 hours. (3;0;1) Maxwell's equations; plane and spherical waves; reflection, refraction, guided waves, radiation and scattering. Prerequisite(s): PHYS 4210.

PHYS 4310. Quantum Mechanics. 3 hours. (3;0;1) Origins of the modern theory of atomic structure; Schroedinger's formulation of non-relativistic, single-particle quantum mechanics and application to simple systems; the one-electron atom. Prerequisite(s): PHYS 3010/PHYS 3030.

PHYS 4350. Advanced Modern Physics I – Atomic and Molecular Physics. 3 hours. Introduction to various quantum mechanical models of atomic and molecular structure and spectra. Hydrogen atom and simple spectra; external fields, line splitting; line broadening; addition of angular momentum and spin; effective fields, variational method; Hartree and Hartree-Fock theory; structure and spectra of multielectron atoms; Rydberg atoms; molecular binding; rotational, vibrational and electronic states and spectra of diatomic molecules. Prerequisite(s): PHYS 4310.

PHYS 4360. Advanced Modern Physics II – Nuclear and Particle Physics. 3 hours. Comprehensive study of nuclear structure and dynamics; survey of particle physics; properties of the nuclear force; interpretation of experimental data via specific many-body models; interaction of radiation with matter; classification of particles and nuclei; scattering theory; conservation laws and symmetry; and contemporary results. Prerequisite(s): PHYS 4350.

PHYS 4420. Physical Optics. 3 hours. (3;0;1) Huygens' principle and application to geometrical optics; interference phenomena; Fraunhofer and Fresnel diffraction; polarization; electromagnetic theory of light and interaction with matter. Part of the instruction will be in a laboratory setting. Prerequisite(s): PHYS 2220/PHYS 2240.

PHYS 4500. Introduction to Solid-State Physics. 3 hours. An introduction to the major areas of solid-state physics, including crystal structure and symmetry, lattice vibrations and phonons, thermal properties, energy bands, semiconductors, superconductivity, and magnetic properties. Prerequisite(s): PHYS 3010.

PHYS 4550. Modern Classical Dynamics. 3 hours. Introduction to nonlinear dynamical systems; onset of chaos, phase space portraits, universality of chaos, strange attractors, experimental verification, fluid dynamics and the KAM theorem. Prerequisite(s): PHYS 3220.

PHYS 4600. Computer Based Physics. 3 hours. Symbolic and numerical evaluations of single-variable and multi-variable integrals with a single line of programming. Symbolic evaluation of derivatives. Symbolic manipulation of lists including vectors and matrices. Data analysis. Multidimensional plots. Symbolic derivations. Symbolic and numerical solutions to single and multiple, linear and nonlinear, differential and partial differential equations. Probability densities and Monte Carlo methods. Random walk and classical trajectory simulations. Prerequisite(s): PHYS 2220.

PHYS 4610. Topics in Astronomy. 3 hours. (3;0;1) Selected topics in planetary and stellar astronomy: techniques of astronomical observation and measurement; evolution, composition and properties of our solar system and the universe; history of astronomy. Designed for students seeking secondary physical science/science teacher certification. The recitation hour for PHYS 4610 serves to cover teaching methods in astronomy, including the demonstration of measurement equipment (e.g., spectrometers, digital imaging, telescopes, etc.). Prerequisite(s): consent of department.

PHYS 4630. Topics in Astronomy Laboratory. 1 hour. (0;3) Laboratory sequence for PHYS 4610. Designed for students seeking secondary physical science/science teacher certification. Emphasizes data acquisition (e.g., via astronomical observations), data analysis (e.g., of stellar spectra) for the selected topics covered in PHYS 4610, and includes an overview of how to set up the equipment for the laboratory exercises. Prerequisite(s): PHYS 4610 (may be taken concurrently).

PHYS 4700. Research Methods for Secondary Science Instruction. 3 hours. (2;4) Techniques used to solve and address scientific inquiry. Design of experiments. Use of statistics to interpret experimental results and measure sampling errors. Ethical treatment of human subjects. Laboratory safety. Mathematical modeling of scientific phenomena. Oral and written presentation of scientific work. Prerequisite(s): 16 hours of physics, completion of freshman and sophomore science courses required for certification and consent of department. EDSE 3500 and EDSE 4000 are highly recommended. Students seeking secondary certification in mathematics or computer science who have completed the other science requirement of their majors also may enroll. Does not count as an elective toward a major or minor in physics, except for students seeking certification. (Same as CHEM 4700 and BIOL 4700).

PHYS 4710. Foundations of Theoretical Physics. 3 hours. Overview of topics in theoretical physics. Symmetry; mechanics: Newton's laws, celestial mechanics, Hamiltonian formalism; electromagnetism: Maxwell's equations, nonlinear optics and classical field theory, quantum optics, lasers, chaotic diffraction; quantum mechanics: measurements and scattering theory; statistical physics: entropy, equilibrium statistical mechanics; and contemporary areas: fractals, chaos and nonlinear dynamics. Topics may vary. Prerequisite(s): PHYS 4210 and PHYS 4310; PHYS 4110 (may be taken concurrently).

PHYS 4900-PHYS 4910. Special Problems. 1–3 hours each. Must have the consent of the faculty member prior to enrollment. May be repeated for credit.

PHYS 4950. Senior Thesis. 3–6 hours. (0; 0; 9–18) Individual research on a problem chosen in consultation with a faculty member. Research may be conducted on campus, during an internship off-campus, or as an exchange student in a study abroad program. Prerequisite(s): consent of faculty member.

PHYS 4951. Honors College Capstone Thesis. 3 hours. Major research project prepared by the student under the supervision of a faculty member and presented in standard thesis format. An oral defense is required of each student for successful completion of the thesis. Prerequisite(s): completion of at least 6 hours in honors courses; completion of at least 12 hours in the major department in which the thesis is prepared; approval of the department chair and the dean of the school or college in which the thesis is prepared; approval of the dean of the Honors College. May be substituted for HNRS 4000.

PHYS 4960-PHYS 4970. Science Institute (Physics). 1–6 hours each. For students accepted by the university as participants in special institute programs. May be repeated for credit but not to exceed a total of 6 hours in each course.

Political Science

Political Science, PSCI

Students are eligible to take advanced courses after 6 hours of introductory work.

Prerequisites: PSCI 1040 and PSCI 1050 are prerequisite to advanced courses in American government and politics, public law, public policy, and international relations (See Fields A, B, D and F in departmental copy). Three hours of political science are prerequisite to advanced courses in political theory and methodology and comparative government and politics (See Fields C and E in departmental copy).

PSCI 1040-PSCI 1050-PSCI 1060. American Government. 3 hours each. *PSCI 1040 must be taken to satisfy the requirement of a course emphasizing U.S. and Texas constitutions. PSCI 1050 or PSCI 1060 fulfills the remaining 3 hours of the legislative requirement for 6 hours of government.*

PSCI 1040 (GOVT 2301). American Government: Laws and Institutions. U.S. and Texas constitutions, federalism, local government, institutions, civil rights and civil liberties. *Satisfies legislative requirement of a course emphasizing U.S. and Texas constitutions.*

PSCI 1050 (GOVT 2302). American Government: Process and Policies. Political parties, elections, interest groups, mass media, public opinion and public policy.

PSCI 1060. American Government: Topics. Individually or team-taught courses that explore in depth a substantive aspect of American government or politics. Topics vary and may include (but are not limited to) specific contemporary public issues, institutional simulations, and politics through the arts and literature. May be repeated for credit as topics vary. May be used for duplication only when topic is the same.

PSCI 1041-PSCI 1051. Honors American Government. 3 hours each. *Fulfills legislative requirement of 6 hours of American government for students in the Honors College; 1041 satisfies the requirement of a course emphasizing U.S. and Texas constitutions.*

PSCI 1041. Constitutions of the United States and Texas, federalism and political processes. Prerequisite(s): acceptance to Honors College.

PSCI 1051. Organization, powers, processes and functions of national and state governments. Prerequisite(s): PSCI 1041 and acceptance to Honors College.