

Physics Course Descriptions

(Department of Physics and Physical Oceanography)

PHY 101-102. Elementary College Physics (4-4) Corequisite: MAT 111. Mechanics, heat, sound, light, electricity and magnetism, and introduction to modern physics. Three lecture and two laboratory hours each week.

PHY 103. Great Ideas in Physics (3) Introduces the nature of science to the nonscientist by emphasizing the concepts underlying four great ideas in physics: the conservation of energy, the second law of thermodynamics, the relativity of time, and the wave-particle duality of nature. Explores the mutual influence of science and the humanities (literature, philosophy, history, and the arts).

PHY 105. Introductory Physics (4) Survey covering the fundamentals of mechanics, heat, light, sound, and electricity and magnetism, and their application in today's society. Three lecture and two laboratory hours each week.

PHY 111. Naked-eye Astronomy and Archaeoastronomy (3) Detailed knowledge of the motions of the sun, moon, planets, and stars is used to understand ancient skywatching techniques, calendars, celestial lore, sky mythology, cosmological concepts and traditions; the impact of astronomy on the architecture, city planning and cultures of prehistoric societies: ancient European (Stonehenge), Babylonian, Egyptian, Mesoamerican, and Native North American. Occasional night viewings.

PHY 201-202. General Physics (4-4) Corequisite: MAT 161-162, 201: Kinematics, Newtonian statics and dynamics, gravitation, fluids, kinetic theory, thermodynamics, 202: Electric and magnetic fields, circuits, Maxwell's equations, waves, optics. Four lecture and two laboratory hours each week.

PHY 211-212. Electric Circuits (4-4) Corequisite: MAT 161. Fundamental laws of electric circuits; transient and steady state sinusoidal analysis of linear circuits by complex frequency, phasor and two-port networks. Three lecture and three laboratory hours each week.

PHY 225. Electronics (3) Prerequisite: Consent of instructor. An introduction to electronics with emphasis on instrumentation and techniques used in scientific laboratories. Two lecture and two laboratory hours each week.

PHY 260. Introduction to Astronomy (3) Descriptive course in principles, theories, and techniques of astronomy. Occasional night viewings.

PHY 300. Analog Circuits (2) Prerequisite: PHY 202. Study of passive (resistors, capacitors, inductors) and active (diodes, transistors) components in AC and transient circuits, and integrated circuits utilizing them; skills such as soldering, splicing, and component testing. Culminates in the design and construction of a functional electronic device. Two lecture and two laboratory hours each week.

PHY 311-312. Mathematical Physics (4-4) Prerequisite: PHY 202. An introduction to the mathematical techniques useful in physics: vector analysis, operator and matrix analysis; functions of a complex variable and calculus of residues; differential equations, special functions of mathematical physics; Fourier series and transforms, eigenfunctions and Sturm-Liouville equation; Green's functions; variational methods; and perturbation theory.

PHY 321-322. Classical Dynamics (3-3) Prerequisite: PHY 202. Corequisite: PHY 311 or MAT 361. Newtonian, Lagrangian, and Hamiltonian formulations of mechanics applied to single particles and systems of particles, central forces, collisions, oscillations, normal mode analysis, motion of rigid bodies, and elastic waves in continuous media. Rotating frames of reference. Special relativity.

PHY 335. Modern Physics (4) Prerequisite: PHY 202. Survey of modern physics. Special relativity, atomic and nuclear physics, and an introduction to wave mechanics.

PHY 400. Advanced Laboratory (2) Prerequisite: PHY 300. Seminal experiments illuminating a particular branch of modern physics, using topics drawn from atomic, nuclear, solid-state, plasma, and optical physics. Students participate in the design and implementation of experiments and acquire skills such as data organization, error analysis, and interpretation of results. Four laboratory hours each week.

PHY 411-412. Electricity and Magnetism (3-3) Prerequisite: PHY 202 and corequisite: MAT 261. Electric and magnetic field theory; Poisson's and Laplace's equation; harmonic methods, special methods for solution of electrostatics problems, material media and boundary value problems; electromagnetic waves and radiation; electromagnetic laws of optics.

PHY 415. Solid State Physics (3) Prerequisite: PHY 335. A study of the basic properties of solids--crystal structure; mechanical, thermal and electromagnetic properties as determined by the phonon, electron, and magnon characteristics.

PHY 420. (EVS 420) (GLY 420) Global Climate Change (3) Prerequisites: PHY 102, CHM 102, MAT 162. Analysis of natural and anthropogenic global climate change. Historical and geological records of climate including sediment, tree ring, and ice core analysis. Physics and chemistry of climate, including Earth's energy balance, global carbon cycle, climate modeling, atmospheric composition and dynamics.

PHY 425. Atomic and Molecular Physics (3) Prerequisite: PHY 444. The quantum theory of atomic and molecular structure and spectra. Topics include relativistic and electromagnetic interactions; the hydrogen atom, the helium atom, multielectron atoms; radiative and Auger transitions, selection rules; diatomic and simple polyatomic molecules.

PHY 435. Nuclear Physics (3) Prerequisite: PHY 335 or consent of instructor. Introduction to properties of the nucleus; natural and artificial radioactivity; nuclear reactions and particle accelerators.

PHY 444. Quantum Theory (4) Prerequisite: PHY 335 and corequisite: MAT 361. Introduction to basic principles of quantum mechanics. Topics include operators, symmetry, orbital and spin angular momentum, perturbation theory, and applications to simple systems.

PHY 445. Optics (3) Prerequisite: PHY 202 and MAT 261. Physical and geometrical optics. Huygen's principles, electromagnetic theory of light.

PHY 455. Thermal Physics (3) Prerequisite: PHY 335 or consent of instructor. Principles of thermodynamics and heat transfer; response of molecules to temperature effects illustrated by introduction to kinetic theory and statistical mechanics.

PHY 475. (575) Physical Oceanography (3) Prerequisite: MAT 152 and PHY 102. An introduction to the descriptive and dynamical features of ocean circulation. Topics include: the physical properties of seawater; oceanic heat budget; dynamics of ocean currents; descriptive oceanography; waves and tides.

PHY 490. Special Topics in Physics (1-3) Prerequisite: Junior or senior standing. Selected topics in physics that are beyond the scope of regular course offerings. May be repeated once under a different subtitle.

PHY 491. Directed Individual Study (1-3) Prerequisite: Overall GPA of at least 2.00, junior or senior standing, and consent of instructor, department chair and dean. Involves investigation under faculty supervision beyond what is offered in existing courses. For further information, consult the Directed Individual Studies section in this catalogue.

PHY 493. Physics Laboratory Teaching Practicum (1) Prerequisite: Consent of instructor. Students work under the tutelage of a faculty member to develop skills needed to prepare, conduct and evaluate introductory laboratory assignments. Some instruction and evaluation in an ongoing physics laboratory is required; specific responsibilities are set by the supervisor in consultation with the student trainee.

PHY 495. Physics Seminar (1-3) Prerequisite: Consent of instructor. Discussion of selected topics in physics.

PHY 498. Internship in Physics (1-3) Prerequisite: Overall GPA of at least 2.50 and a GPA in PHY courses of at least 2.80. Practical experience and academic training in the student's principal area of interest. Joint supervision and evaluation by a physics faculty member and an on-site supervisor. Open to students of junior or senior standing who have been pre-approved by the faculty supervisor, department chair and dean. May be repeated for a total of three credit hours.

PHY 499. Honors Work in Physics (2-3) Prerequisite: Eligibility for honors program and senior standing. Independent study for honors students.

For 292 and 492; 294 and 494, see explanations on p. 184, 107.