Physics (PHYS)

**PHYS 100 DESCRIPTIVE PHYSICS (3)**
Lecture, 3 hours. A descriptive survey of the important principles of physics. Satisfies GE, category B1 or B3 (Physical Sciences).

**PHYS 102 DESCRIPTIVE PHYSICS LABORATORY (1)**
Laboratory, 3 hours. Experimental demonstrations, exercises and field trips illustrating the methods by which physicists have learned what they claim to know about the world. Instruction is at the PHYS 100 level. Satisfies GE, category B1 or B3 (Physical Sciences) and GE laboratory requirements. Prerequisite: previous or concurrent enrollment in PHYS 100 or ASTR 100, or consent of instructor.

**PHYS 114 INTRODUCTION TO PHYSICS I (4)**
Lecture, 4 hours. The first of three basic sequential courses in physics for science and mathematics majors. Introduction to vectors; classical mechanics, including particle dynamics and fluid mechanics; simple harmonic motion; thermodynamics and kinetics. Satisfies GE, category B1 or B3 (Physical Sciences) and GE laboratory requirements. Prerequisite: previous or concurrent enrollment in PHYS 114.

**PHYS 209A GENERAL PHYSICS LABORATORY (1)**
Laboratory, 3 hours. Laboratory experiments to accompany PHYS 210A and develop the student's ability to perform measurements of physical phenomena and to increase their appreciation of the sense of the physical universe gained through experimentation. 209A satisfies GE, category B1 or B3 (Physical Sciences) and GE laboratory requirements. Prerequisites: high school algebra and trigonometry and a high school physical science and previous or concurrent enrollment in PHYS 210A.

**PHYS 209B GENERAL PHYSICS LABORATORY (1)**
Laboratory, 3 hours. Laboratory experiments to accompany PHYS 210B and develop the student's ability to perform measurements of physical phenomena and to increase their appreciation of the sense of the physical universe gained through experimentation. Prerequisites: 209A and previous or concurrent enrollment in PHYS 210B.

**PHYS 210A GENERAL PHYSICS (3)**
Lecture, 3 hours. A basic course in physics for students majoring in biology, geology or preprofessional programs. Fundamentals of kinematics, Newton's laws, work, momentum, harmonic motion, and an introduction to fluids and concepts of temperature. Registration by mathematics majors requires Physics and Astronomy Department approval. 210A satisfies GE, category B1 or B3 (Physical Sciences) requirement. Prerequisites: high school algebra and trigonometry or MATH 107. CAN PHYS SEQ A.

**PHYS 210B GENERAL PHYSICS (3)**
Lecture, 3 hours. A basic course in physics for students majoring in biology, geology or preprofessional programs. Topics include: electric charges, potentials, fields and currents, magnetism, electromagnetic waves, and optics. Registration by mathematics majors requires Physics and Astronomy Department approval. Prerequisites: 210A. CAN PHYS SEQ A.

**PHYS 214 INTRODUCTION TO PHYSICS II (4)**
Lecture, 4 hours. The continuation of PHYS 114. Electrostatics, quasistatic fields and currents, magnetostatics; electromagnetic induction; waves; physical and geometric optics. Prerequisites: PHYS 114; previous or concurrent enrollment in MATH 211.

**PHYS 216 INTRODUCTORY LABORATORY (1)**
Laboratory, 3 hours. Selected experiments to increase the student's working physical knowledge of the natural world. Prerequisites: PHYS 114 and 116. Concurrent enrollment in PHYS 214 is strongly recommended.

**PHYS 300 PHYSICS OF MUSIC (3)**
Lecture, 3 hours. Introduction to physical principles encountered in the study of music; applicable laws of mechanics and acoustics; harmonic analysis; musical scales; sound production in musical instruments; elements of electronic music.

**PHYS 313 ELECTRONICS (3)**
Lecture, 3 hours. A comprehensive review of DC and AC circuit theory, applications of diodes, transistors and operational amplifiers, electronic test instruments; electronic transducers; waveform generators; noise; logic gates and Boolean algebra; number systems and codes; combinational logic circuits; applications of circuit simulation programs. Concurrent enrollment in PHYS 313L is mandatory. Prerequisites: MATH 107, PHYS 210B or 214; or consent of instructor.

**PHYS 313L ELECTRONICS LABORATORY (1)**
Laboratory, 3 hours. Laboratory to accompany PHYS 313. Experiments in this lab are designed to address the major topics of PHYS 313 lecture course. Students will experiment with physical and simulated circuits. Concurrent enrollment in PHYS 313 is mandatory. Prerequisites: MATH 107, PHYS 209B or 216; or consent of instructor.

**PHYS 314 INTRODUCTION TO PHYSICS III (4)**
Lecture, 4 hours. The continuation of PHYS 214. Special relativity; elementary quantum mechanics; the Bohr atom and deBroglie waves; the Schrödinger wave equation with applications to simple one-dimensional problems and to atomic structure; elementary nuclear physics; introduction to equilibrium statistical mechanics; the partition function, Boltzmann statistics. Prerequisites: PHYS 214; previous or concurrent enrollment in MATH 261.

**PHYS 320 ANALYTICAL MECHANICS (3)**
Lecture, 3 hours. This course is an exploration into the principles of Newtonian, Lagrangian, and Hamiltonian mechanics. It also includes a treatment of noninertial reference frames, rigid body rotation, central force problems, and the dynamics of a system of particles. Prerequisites: PHYS 114 and previous or concurrent enrollment in PHYS 325.

**PHYS 325 INTRODUCTION TO MATHEMATICAL PHYSICS (3)**
Lecture, 3 hours. This course examines advanced mathematical methods and serves as a foundation for future courses. Topics include coordinate systems and vectors; vector calculus; series expansions; differential equations; orthonormal functions; solutions of systems of linear equations; matrices and tensors; complex numbers; eigenvalues and eigenfunctions; Fourier series and Fourier integrals; use of mathematical symbolic processing software. Prerequisites: PHYS 214 and MATH 261 or consent of instructor.

**PHYS 340 LIGHT AND OPTICS (3)**
Lecture, 3 hours. An examination of the properties of light from geometric and physical optics perspectives. Topics include: ray optics, refraction, diffraction, coherence, interference, and polarization. The course will present Fermat's principle, Huygens' principle and Fourier optics. Prerequisite: PHYS 314 or 325.
PHYS 450 STATISTICAL PHYSICS (2)
Lecture, 2 hours. An introduction to statistical methods. Topics include ideal gas, heat capacities, entropy, enthalpy, the laws of thermodynamics; Boltzmann, Bose and Fermi statistics; applications such as engines and refrigerators. Prerequisite: PHYS 314.

PHYS 460 QUANTUM PHYSICS (3)
Lecture, 3 hours. This course examines the Schrödinger equation and its solution for free particles, potential wells, harmonic oscillators, central potentials, and the hydrogen atom. Other topics may include Hilbert space; Hermitian operators; Dirac notation; angular momentum and spin; scattering; wave function symmetry; and elementary perturbation theory. Prerequisites: PHYS 314 and 325.

PHYS 466 ADVANCED EXPERIMENTAL PHYSICS (3)
Lecture 2 hours; laboratory 3 hours. Advanced topics in lasers and photonics, materials science (including high-magnetic field measurements and surface analysis using scanning electron and atomic force microscopy), X-ray analysis, applied nuclear physics, adaptive optics. Prerequisites: PHYS 314 and 216, or consent of instructor.

PHYS 475 PHYSICS OF SEMICONDUCTOR DEVICES (3)
Lecture, 3 hours. A detailed study of semiconductors and their applications. Topics include semiconductor materials, crystal structure and growth; energy bands and charge carriers, conductivity and mobility; metal-semiconductor and p-n junctions; p-n junction diodes, bipolar junction transistors, field-effect transistors, CCDs, photonic devices and integrated circuits. Conductivity and contact resistance measurements; I-V and C-V characteristics of diodes; characterization of transistors. Prerequisite: PHYS 314 or consent of instructor. (Crosslisted with CES 432 and ES 432.)

PHYS 479 SPECIAL TOPICS (1-4)
A course of lectures on a single topic or set of related topics not ordinarily covered in the physics curriculum. The course may be repeated for credit with a different topic. Prerequisite: consent of instructor.

PHYS 480 UNDERGRADUATE RESEARCH IN PHYSICS (2)
Supervised research in an area of physics that is currently under investigation by one or more members of the Physics and Astronomy Department's faculty. This course may be repeated for up to 6 units of credit. Both written and oral presentations (including a demonstration of the experiment or activity) will be required. Prerequisites: Physics 214 and 216 or Physics 210B and 209B.

PHYS 481 SENIOR DESIGN PROJECT (2)
A directed project to develop either a working prototype or a detailed conceptual design for an operational laboratory device. Both written and oral presentations (including a demonstration) will be required. Prerequisites: PHYS 313L. Application form required prior to enrollment.

PHYS 484 PHYSICS SEMINAR (1)
A series of lectures on topics of interest in physics, astronomy and related fields. May be repeated for credit up to 3 units maximum. Prerequisite: consent of instructor.

PHYS 485 PHOTONICS (3)
Lecture, 3 hours. A practical examination of Gaussian beams; guided-wave optics; fiber optics; optical resonators; resonant cavities; laser oscillation and amplification; laser excitation; optical pumping; solid state, gas, dye, chemical, excimer and free electron lasers; semiconductor lasers; laser spectroscopy; fiber optic communication; photomultiplier and semiconductor radiation detectors including photoconductors, junction photodiodes; p-i-n diodes, avalanche photodiodes; detector noise. Prerequisite: PHYS 314 or consent of instructor. (Crosslisted with CES 430 and ES 445.)

PHYS 487 UNDERGRADUATE RESEARCH IN PHYSICS (2)
Supervised research in an area of physics that is currently under investigation by one or more members of the Physics and Astronomy Department's faculty. This course may be repeated for up to 6 units of credit. Both written and oral presentations will be required. Prerequisites: junior standing and consent of instructor.

Page 360   Courses: Physics (PHYS)   Sonoma State University 2010-2011 Catalog