Physics (PHYS)

PHYS 100 Descriptive Physics (3)
Lecture, 3 hours. A descriptive survey of the important principles of physics. Satisfies GE Area B1 or B3 (Physical Sciences). Registration for Chemistry, Physics, or Mathematics majors requires Physics and Astronomy Department consent.

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 Area B1 or B3 (Physical Sciences) and GE laboratory requirements.

PHYS 114 Introduction to Physics I (4)
Lecture, 4 hours. The first of three basic sequential courses in physics for science and mathematics majors. A calculus based introduction to classical mechanics; including vector analysis, laws of motion, conservation laws, and rotational motion. Satisfies GE Area B1 or B3 (Physical Sciences). Prerequisite: MATH 161.

PHYS 114W Physics I Workshop (1)
A workshop designed to be taken with PHYS 114. Exploration of first-semester calculus based physics concepts through inquiry based learning and problem solving in a group setting. Cr/NC only. Corequisite: PHYS 114

PHYS 116 Introductory Laboratory Experience (1)
Laboratory, 3 hours. Demonstrations and participatory experiments are used to increase the student's familiarity with classical mechanics. Applications include biological, geophysical, medical, and environmental phenomena. Satisfies GE Area B1 or B3 (Physical Sciences) and GE laboratory requirements. Prerequisite: prior 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 Area 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: PHYS 209A and PHYS 210A or PHYS 114 and PHYS 116. Concurrent enrollment in PHYS 210B is strongly recommended.

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. Satisfies GE Area B1 or B3 (Physical Sciences). Prerequisites: high school algebra and trigonometry or MATH 160.

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. Prerequisite: PHYS 210A or PHYS 114.

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 and 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 and MATH 211. 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. Satisfies GE Area B3 (Specific Emphasis).

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, and applications of circuit simulation programs. Concurrent enrollment in PHYS 313L is mandatory. Prerequisites: MATH 160 or MATH 161 or MATH 161X, 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 the PHYS 313 lecture course. Students will experiment with physical and simulated circuits. Concurrent enrollment in PHYS 313 is mandatory. Prerequisites: MATH 160 or MATH 161 or MATH 161X, 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 thermal physics and equilibrium statistical mechanics, the partition function, Boltzmann statistics. Prerequisites: PHYS 214 and 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 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, orthonomal functions, solutions of systems of linear equations, matrices and tensors, complex numbers, eigenvalues and eigenfunctions, Fourier series and Fourier integrals, and 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 342 Light and Color (3)
Laboratory, 3 hours. A non-mathematical but analytical treatment of the physical properties of light and investigation of its perception and uses. This course includes examining cameras, telescopes and microscopes, the color and depth perception of the human eye; wave optics, holography and current visual reality technology. Satisfies GE Area B3 (Specific Emphasis in Natural Sciences). Prerequisite: any physical science course or consent of instructor.

PHYS 366 Intermediate Experimental Physics (3)
Lecture 2 hours; laboratory 3 hours. An introduction to contemporary techniques and problems in physics. Selected 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, and adaptive optics. Prerequisites: PHYS 314 and 216, or consent of instructor.

PHYS 381 Computer Applications for Scientists (2)
Lecture, 1 hour; laboratory, 3 hours. A survey of problem solving techniques including computer modeling and simulation for the physical sciences. The student is introduced to high-level programming languages such as C++ and various mathematical tools such as Excel, Mathematica, and MatLab. Topics include modern programming techniques, use of graphics and mathematical function libraries, linear least squares data fitting techniques, numerical solution of algebraic and differential equations, and error analysis. Prerequisites: PHYS 114 and MATH 211.

PHYS 395 Community Involvement Program (1-2)
CIP involves students in basic community problems related to physics and astronomy -- performing such tasks as tutoring; reading to the blind; service to local, county, and state agencies; and service as teacher aides to elementary schools. Students receive 1-2 units, depending on the specific task performed. Not more than 4 CIP units will be applicable to the Physics major requirements. May be taken by petition only.

PHYS 396 Selected Topics in Physics (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 430 Electricity and Magnetism (3)
Lecture, 3 hours. An investigation into the fundamentals of electromagnetic theory and its applications. Topics include vector analysis, electrostatics, method of images, magnetostatics, electric currents, electromagnetic induction, electric and magnetic fields in matter, Maxwell's equations, electromagnetic waves, potentials, and fields. Prerequisites: PHYS 214 and PHYS 325. Cross-listed as EE 430.

PHYS 445 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 and junction photodiodes; p-i-n diodes and avalanche photodiodes; and detector noise. Prerequisite: PHYS 314 or consent of instructor. Cross-listed as CES 430 and EE 445.

PHYS 450 Statistical Physics (2)
Lecture, 2 hours. An introduction to statistical methods. Topics include ideal gas, heat capacities, entropy, enthalpy, and the laws of thermodynamics; Boltzmann, Bose, and Fermi statistics; and 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, and 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. Cross-listed as CES 432 and EE 432.

PHYS 492 Instructional Design Project (2)
A directed project to develop at least one laboratory experiment and/or classroom activity that teaches basic concepts in undergraduate physics. Both written and oral presentations (including a demonstration of the experiment or activity) will be required. Prerequisites: PHYS 214 and 216 or PHYS 210B and 209B. Course may be repeated for credit.

PHYS 493 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. Prerequisite: PHYS 313L. Application form required prior to enrollment. Course may be repeated for credit.

PHYS 494 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 495 Special Studies (1-4)
The Physics and Astronomy Department encourages independent study and considers it to be an educational undertaking. Students wishing to enroll for special studies are required to submit proposals to their supervising faculty members that outline their projects and exhibit concrete plans for their successful completion. May be repeated for credit up to 8 units.

PHYS 497 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-level standing and consent of instructor.