Lower Division

PHYS 1010 Physics Freshman Orientation I (1)
An introduction to Physics and its subfields, and the Physics curriculum. Emphasis on study skills and problem solving. A challenge problem will be presented and a laboratory experiment will be performed. Includes seminars by guest speakers. Primarily for Physics majors, but may be taken by others interested in the sciences or Engineering. 50 minutes lecture/discussion.

PHYS 1020 Physics Freshman Orientation II (1)
Continuation of PHYS 1010. An introduction to resume writing and internships in Physics. Emphasis on mathematical tools used in Physics. A challenge problem will be presented and a laboratory experiment will be performed. Includes seminars by guest speakers. Primarily for Physics majors, but may be taken by others interested in the sciences or Engineering. 50 minutes lecture/discussion.

PHYS 1609 Introduction to Astronomy (3)
Historical development of modern astronomy. Contents of the universe, the solar system, stars, and galaxies. Stellar evolution and solar processes. The planets. Modern cosmology. 100 minutes lecture and 150 minutes laboratory per week. Satisfies general education requirement B1.

PHYS 2010 Physics Sophomore Orientation I (1)
Continuation of PHYS 1020. An introduction to professional societies in Physics and graduate study in Physics. Emphasis on statistical methods and error analysis. A challenge problem will be presented and a laboratory experiment will be performed. Includes seminars by guest speakers. Primarily for Physics majors, but may be taken by others interested in the sciences or Engineering. 50 minutes lecture/discussion.

PHYS 2020 Physics Sophomore Orientation II (1)
Continuation of PHYS 2010. An introduction to fields related to Physics and career opportunities in these fields. Emphasis on the role of simulations and models in science. A challenge problem will be presented and a laboratory experiment will be performed. Includes seminars by guest speakers. Primarily for Physics majors, but may be taken by others interested in the sciences or Engineering. 50 minutes lecture/discussion.

PHYS/ECE/ENGR 2070 Electric Circuits (4)
An introduction to the analysis of electrical circuits. Use of analytical techniques based on the application of circuit laws and network theorems. Analysis of DC and AC circuits containing resistors, capacitors, inductors, dependent sources and/or switches. Natural and forced responses of first and second order RLC circuits; the use of phasors; AC power calculations; power transfer; and energy concepts. 150 minutes lecture and 150 minutes laboratory. Prerequisites: PHYS 2220 with a grade of C- or better, or the equivalent, or permission of the instructor.

PHYS 2110 College Physics I (4)
This course is intended for students needing a one-year course in Physics as requirement by their major program. Offered with non-calculus based text. Newtonian mechanics with emphasis on kinematics, dynamics, work and energy, momentum, simple harmonic motion, fluids, mechanical waves and sound, thermodynamics and statistical physics. This class includes an introduction to logarithms, exponentials and trigonometry. 150 minutes of lecture and 150 minutes laboratory. Prerequisite: MATH 1040 or 1050 or equivalent.

PHYS 2111 College Physics I Recitation (1)
Students work on questions or problems related to the PHYS 2110 coursework. Emphasis on qualitative conceptual reasoning. Students will generally work in teams of about four to discuss, analyze, understand, and solve physics problems. 50 minutes discussion. Credit/no-credit grading. Corequisite: PHYS 2110.

PHYS 2120 College Physics II (4)
This course is intended for students needing a one-year course in physics as requirement by their major program. Offered with non-calculus based text. Maxwellian electromagnetics with emphasis on electrostatics, magnetism, DC circuits, optics, and modern physics. 150 minutes of lecture and 150 minutes laboratory. Prerequisite: PHYS 2110 or equivalent.

PHYS 2121 College Physics II Recitation (1)
Students work on questions or problems related to the PHYS 2120 coursework. Emphasis on qualitative conceptual reasoning. Students will generally work in teams of about four to discuss, analyze, understand, and solve physics problems. 50 minutes discussion. Credit/no-credit grading. Corequisite: PHYS 2120.

PHYS 2150 Thermodynamics (2)
Algebra-based thermodynamics for science majors. 75 minutes of lecture and 75 minutes of laboratory per week. Prerequisites: Consent of the instructor.

PHYS 2160 Electromagnetism (2)
Trigonometry-based electricity and magnetism for science majors. 75 minutes of lecture and 75 minutes of laboratory per week. Prerequisites: Consent of the instructor.

PHYS 2210 Physics for Scientists and Engineers I (4)
Intended for students majoring in the physical sciences and engineering. An introduction to kinematics, dynamics, work and energy, momentum, gravitation, simple harmonic motion, and fluids. 150 minutes lecture and 150 minutes laboratory. Prerequisites: MATH 2310 or 2510 or 2020 with grade C- or better.

PHYS 2211 Physics for Scientists and Engineers I Recitation (1)
Students work on questions or problems related to the PHYS 2210 coursework. Emphasis on qualitative conceptual reasoning. Students will generally work in teams of about four to discuss, analyze, understand, and solve physics problems. 50 minutes discussion. Credit/no-credit grading. Corequisite: PHYS 2210.

PHYS 2220 Physics for Scientists and Engineers II (4)
Intended for students majoring in the physical sciences and engineering. Core topics include electrostatics, magnetism, DC and AC circuits, Maxwell's equations, thermodynamics, and statistical physics. 150 minutes lecture and 150 minutes laboratory. Prerequisites: PHYS 2210 with a grade C- or better, and MATH 2320 or 2520 or 2020.

PHYS 2221 Physics for Scientists and Engineers II Recitation (1)
Students work on questions or problems related to the PHYS 2220 coursework. Emphasis on qualitative conceptual reasoning. Students will generally work in teams of about four to discuss, analyze, understand, and solve physics problems. 50 minutes discussion. Credit/no-credit grading. Corequisite: PHYS 2220.

PHYS 2230 Physics for Scientists and Engineers III (4)
Intended for students majoring in the physical sciences and engineering. Core topics include waves, geometric optics, optical instruments, wave optics, special relativity, and introduction to quantum mechanics. Additional possible topics include atomic physics, condensed matter, nuclear physics, and particle physics. 150 minutes lecture and 150 minutes laboratory. Prerequisite: PHYS 2220 with a grade of C- or better or the equivalent, or permission of the instructor.

PHYS 2231 Physics for Scientists and Engineers III Recitation (1)
Students work on questions or problems related to the PHYS 2230 coursework. Emphasis on qualitative conceptual reasoning. Students will generally work in teams of about four to discuss, analyze, understand, and solve physics problems. 50 minutes discussion. Credit/no-credit grading. Corequisite: PHYS 2230.

PHYS 2700 Special Topics in Physics (1-3)
Topics and prerequisites to be announced. May be repeated for different topics.

Upper Division

PHYS 3010 Intermediate Laboratory in Modern Physics (3)
Students will perform a number of experiments chosen from Speed of Light, Photoelectric Effect, Blackbody Radiation, Millikan's Oil-Drop Experiment, Faraday Rotation, and others. Experimental equipment consists of self-contained units with detailed manuals. 50 minutes lecture/discussion and 300 minutes laboratory. Prerequisites: PHYS 2230.

PHYS 3070 Analog Electronics (3)
Introduces basic analog circuit designs that emphasize practical applications. Includes properties of diodes and transistors; operational amplifies for use as filters, amplifiers, oscillators, and function generators. 100 minutes lecture/discussion and 150 minutes laboratory. Prerequisites: PHYS 2070 or ENGR 2070 or ECE 2070 with a grade C- or better.

PHYS 3110 Classical Mechanics I (2)
An intermediate level course intended for majors in the physical sciences. Newtonian and Lagrangian dynamics of particles and systems. Topics covered in PHYS 3110 and 3120 may include conservation laws, harmonic oscillators, damped and forced oscillations, nonlinear systems, gravity, central-force motion, non-inertial reference frames, coupled oscillators, waves, and special relativity. 100 minutes lecture/discussion. Prerequisites or corequisites: PHYS 2230, 3500 and MATH 2530.

PHYS 3120 Classical Mechanics II (2)
Continuation of PHYS 3110. 100 minutes lecture/discussion. Prerequisite: PHYS 3110.

PHYS 3210 Electricity and Magnetism I (2)
An upper-level course intended for majors in the physical sciences. Classical theory of electric and magnetic phenomena. Topics covered in PHYS 3210 and 3220 may include: Coulomb's Law, electric fields, electric potential, electrostatics, motion of charges in static fields; conductors and dielectrics, steady currents, polarization. Magnetic fields and magnetostatics, vector potential; magnetization, magnetic materials; induction, development of Maxwell's equations, electromagnetic waves and radiation. 100 minutes lecture/discussion. Prerequisites: PHYS 2230 and 3500.

PHYS 3220 Electricity and Magnetism II (2)
Continuation of PHYS 3210. 100 minutes lecture/discussion. Prerequisites: PHYS 3210.

PHYS 3310 Thermal Physics (3)
Elements of classical thermodynamics and statistical mechanics. Applications may include heat engines, distribution functions, magnetism, classical and quantum gases and more. 150 minutes lecture/discussion. Prerequisites: PHYS 2230, 3500.

PHYS 3320 Statistical Mechanics (2)
Advanced topics in thermodynamics and statistical mechanics. Applications may include: non-ideal gases, phase equilibrium, ionization equilibrium, thermodynamic fluctuations, phase transitions elements and critical phenomena, and elements of the kinetic theory. 100 minutes lecture/discussion. Prerequisites: PHYS 3310.

PHYS 3500 Mathematical Methods for Physical Sciences and Engineering (2)
An upper-level course intended for majors in the Physical Sciences and Engineering to demonstrate the use of Calculus and Vector Algebra in real-world problems. Introduction of mathematical tools such as Fourier series, Dirac's delta function, the calculus of variations, complex analysis and the theory of residues. 100 minutes lecture/discussion. Prerequisite or corequisite: PHYS 2230. Prerequisite: MATH 2530.

PHYS 3510 Modern Physics (2)
Development of quantum and relativistic physics. Quantum description of atoms, solids, and nuclei. Fundamental forces of nature, introduction to particle physics and quantum fields. 100 minutes lecture/discussion. Prerequisite: PHYS 2230.

PHYS 3520 Concepts in Scientific Computing (3)
Computer solutions to scientific problems. Symbolic manipulations and array processors. Mathematical operations, plotting, and symbolic and numerical techniques in calculus. Numerical methods such as histogramming, Monte Carlo methods, statistical analysis, curve fitting and numerical algorithms. Prior knowledge of computers is not required. 100 minutes lecture/discussion, 150 minutes laboratory. Prerequisite: PHYS 2230.

PHYS 4010 Advanced Laboratory in Modern Physics (2)
Students will perform a number of experiments chosen from Nuclear Magnetic Resonance, Lifetime of Muons in Cosmic Rays, Wave Particle Duality, and others. Continuation of PHYS 3010, but students may need to design and define the scope of the experiments. 300 minutes laboratory. Prerequisites: PHYS 3010.

PHYS 4410 Quantum Mechanics I (2)
The postulates and meaning of quantum mechanics. Schroedinger's equation and its relation to one-dimensional problems; the harmonic oscillator. 100 minutes lecture/discussion. Prerequisites: PHYS 3110, MATH 2530.

PHYS 4420 Quantum Mechanics II (2)
Continuation of PHYS 4410, including the hydrogen atom, angular momentum, atoms and molecules, introduction to perturbation theory. 100 minutes lecture/discussion. Prerequisite: PHYS 4410.

PHYS 4510 Condensed-Matter Physics (3)
Introduction to crystal structure, direct and reciprocal lattices, x-ray diffraction analysis, thermal, electronic, magnetic and optical properties of crystalline solids. 150 minutes lecture/discussion. Prerequisites: PHYS 4410.

PHYS 4520 Atomic and Molecular Physics (3)
Spectra of one- and many-electron atoms; hyperfine structure; interaction of radiation with matter; selection rules; rotational and vibrational spectra of molecules; electronic transitions in diatomic molecules; lasers. 150 minutes lecture/discussion. Prerequisites: PHYS 4410.

PHYS 4600 Teaching Physics (1-3)
Students may gain experience in teaching Physics at the High School level or at the lower division level. The determination of course credits, evaluation, and grading are the responsibility of the departmental faculty in consultation with the student's supervisor. Offered on a credit, no-credit basis only. Department will determine application of credit. (Can be repeated for credit.) Prerequisite: Major or minor in Physics or permission of the instructor.

PHYS 4700 Special Topics in Physics (1-3)
Topics and prerequisites to be announced. Typical courses include astrophysics, advanced electronic systems, advanced mechanics, and statistical physics. May be repeated in different topics. Prerequisite: Major or minor in Physics and permission of the instructor.

PHYS 4800 Research Participation (1-3)
Individual study, under supervision, in scientific investigation. (Experience as a research assistant does not count for credit.) May include research in the areas of curriculum and materials development. May be repeated. Prerequisite: Consent of instructor.

PHYS 4900 Senior Seminar (2)
Presentation of papers and discussion by faculty and students. Topics to be chosen in consultation by faculty. Participants will be grouped by disciplinary and interdisciplinary interests. Prerequisite: Major or minor in Physics or consent of the instructor.

PHYS 4910 Senior Project (2)
Design and construction of a Physics experiment/demonstration or Engineering project under faculty supervision. Students are expected to work in small groups. Projects are presented in a formal report, describing all phases of the project, including data taking and analysis, and a formal oral presentation. Prerequisite: Major or minor in Physics.