

# PHYSICS

## *Lower Division*

### **PHYS 110 Introduction to Astronomy (5)**

Historical development of modern astronomy. Contents of the universe, the solar system, stars, and galaxies. Stellar evolution and solar processes. The planets. Modern cosmology. Four hours lecture/discussion and three-hour laboratories per week. **GE B1/B3**

### **PHYS 150 Introduction to Principles of Physics (5)**

Elements of mechanics, electricity, and modern physics. This course is designed to cover these selected areas of physics in a somewhat abbreviated fashion in a single term, and cannot be used as a prerequisite for other physics courses. Includes two laboratory periods per week. Prerequisite: MATH 85 or satisfaction of the Entry Level Mathematics requirement.

### **PHYS 201 Basic Principles of Newtonian Physics (5)**

Newtonian mechanics; relationships to contemporary physics; field and laboratory investigations with emphasis on the physical measurements of motion. Four hours lecture/discussion and one three-hour laboratory per week. Offered with non-calculus based text. Prerequisite or co-requisite: MATH 192 or equivalent.

### **PHYS 202 Basic Principles of Maxwellian Physics (5)**

Maxwellian electromagnetics; relationships to contemporary physics; field and laboratory investigations in electricity, electronics, magnetism, and heat. Four hours lecture/discussion and one three-hour laboratory per week. Offered with non-calculus-based text. Prerequisite: PHYS 201.

### **PHYS 203 Basic Principles of Contemporary Physics (5)**

Modern physics; principles of relativity, quantum phenomena, light, and the structure of matter. Observations and investigations related to atomic, nuclear, and molecular structure. Four hours lecture/discussion and one three-hour laboratory per week. Offered with non-calculus based text. Prerequisite: PHYS 202.

### **PHYS 207 Electric Circuits (5)**

Circuit laws and analysis of DC and AC circuits. Physical properties, electrical characteristics and circuits of discrete and integrated electrical and electronic devices. Design and construction of circuits with instrumentation applications. Three hours lecture/discussion and two three-hour laboratories per week. Prerequisites: PHYS 222 and MATH 202 or 232 and MATH 222 or CMPS 221 or ENGR 162 (MATH 203 or 233 recommended).

### **PHYS 221 Classical Physics I (6)**

Recommended for majors in the physical sciences, mathematics, and engineering. Vectors, kinematics, the laws of motion, work and energy, conservation of momentum, rotational kinematics and dynamics, oscillations and wave motion, sound, fluids. Five hours lecture/discussion, three hours laboratory. Prerequisite or co-requisite: MATH 201 or 211 or 231.

### **PHYS 222 Classical Physics II (6)**

Temperature and heat, kinetic theory of gases, laws of thermodynamics. Electric charges and forces, the electric field and potential for stationary charges, capacitance. Electric currents and circuits, the magnetic field and forces, magnetic induction, Maxwell's equations in integral form. Five hours lecture/discussion, three hours laboratory. Prerequisite: PHYS 221, Co-requisite MATH 202 or 212 or 232.

### **PHYS 223 Optics and Modern Physics (6)**

Physical optics, relativity, black-body radiation, wave-particle duality, atomic models, introduction to quantum theory, atomic structure, radioactivity and nuclear structure. Five hours lecture/discussion, three hours laboratory. Prerequisite: PHYS 222.

### **PHYS 244 Properties of Materials I (3)**

Application of physical principles to materials, their basic structures and properties. Emphasis on mechanical and chemical properties. Prerequisites: CHEM 211, PHYS 221 or permission of the instructor.

### **PHYS 245 Properties of Materials II (2)**

Continuation of PHYS 244. Emphasis on physical and electrical properties. Prerequisites: PHYS 222 and 244, or permission of the instructor.

### **PHYS 277 Special Topics in Physics (1-5)**

Analysis of contemporary and interdisciplinary problems. Topics and prerequisites to be announced. Field and laboratory investigations.

### **PHYS 289 Experiential Prior Learning (variable units)**

Evaluation and assessment of learning which has occurred as a result of prior off-campus experience relevant to the curriculum of the department. Requires complimentary academic study and/or documentation. Available by petition only, on a credit, no-credit basis. Not open to postgraduate students. Interested students should contact the department office.

*Upper Division***PHYS 307 Principles of Electronics (5)**

Circuit laws, theorems, equivalent circuits. Physical properties, electrical characteristics and circuits of electrical and electronic devices, discrete and integrated. Design and construction of analog and digital circuits with instrumentation applications. Three hours lecture/discussion and two three-hour laboratories per week. Prerequisites: ENGR 207 and PHYS 223 (MATH 205 recommended).

**PHYS 313A Condensed-Matter Physics I (3)**

Introduction to solid state structure and x-ray diffraction analysis, thermal, electronic, magnetic, optical and defect properties of crystalline solids. Two and a half hours lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 223 and MATH 203 or 233 or permission of the instructor.

**PHYS 313B Condensed-Matter Physics II (3)**

Introduction to phase transitions, polymers, and glasses. Two and a half hours lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 313A or permission of the instructor.

**PHYS 321 Classical Mechanics (6)**

An intermediate level course intended for majors in the physical sciences. Kinematics of translation and rotation, particle and rigid body dynamics, damped and forced oscillations. Central forces, dynamics of systems of particles. Introduction to Lagrangian and Hamiltonian formalism. Five hours lecture/discussion, three hours laboratory per week. Prerequisites: PHYS 223 and MATH 205.

**PHYS 322A Thermal Physics (3)**

Elements of Classical Thermodynamics including the first, second, and third laws and applications. Two and a half hours lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 223, MATH 203 or 233 or permission of the instructor.

**PHYS 322B Statistical Mechanics (3)**

Elements of statistical mechanics, probabilistic interpretation of entropy, distribution functions and applications; transport phenomena. Two and a half hours lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 322A or permission of the instructor.

**PHYS 323A Electricity and Magnetism I (3)**

Coulomb's law, electric fields, electrostatics; conductors and dielectrics; steady currents. Two and a half lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 222, MATH 204 or 234 (may be taken concurrently) or permission of the instructor.

**PHYS 323B Electricity and Magnetism II (3)**

Magnetic fields and magnetostatics, magnetic materials, induction; development of Maxwell's equations. Two and a half lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 323A or permission of the instructor.

**PHYS 323C Electricity and Magnetism III (3)**

Electromagnetic waves, radiation theory; motion of charged particles in electromagnetic fields; relation of electromagnetism to relativistic concepts. Two and a half hours lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 323B or permission of the instructor.

**PHYS 324 Modern Physics (6)**

Development of quantum physics; relativity; quantum description of atoms, solids, and nuclei. Introduction to particle physics. Five hours lecture/discussion, three hours laboratory per week. Prerequisites: PHYS 223 (MATH 205 recommended).

**PHYS 325 Principles of Geophysics (5)**

Introduction to applied geophysical methods including reflection and refraction seismology, gravity, magnetics, electrical resistivity, and electromagnetics. In addition to learning the principles behind each method, students will collect, process, and analyze geophysical data. Co-requisite: PHYS 202 or 222 or permission of the instructor. A field trip fee may be required.

**PHYS 411A Quantum Mechanics I (3)**

The postulates and meaning of quantum mechanics. Schroedinger's equation and its relation to one-dimensional problems; the harmonic oscillator. Two and a half hours lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 321, MATH 205 or permission of the instructor.

**PHYS 411B Quantum Mechanics II (3)**

Continuation of PHYS 411A, including the hydrogen atom, and angular momentum. Two and a half hours lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 411A or permission of the instructor.

**PHYS 412A Nuclear Physics (3)**

Applications of quantum mechanics to nuclear physics; nuclear models and nuclear forces; alpha, beta, and gamma emission; relativistic kinematics and scattering; nuclear reactors. Two and a half hours lecture/discussion, one and a half hours laboratory per week. Prerequisite or co-requisite: PHYS 411A or permission of the instructor.

## PHYSICS

### **PHYS 412B Particle Physics (3)**

Introduction to Elementary Particle Physics; particle accelerators; the quark model; symmetry principles. Two and a half hours lecture/discussion, one and a half hours laboratory per week. Prerequisites: PHYS 412A or permission of the instructor.

### **PHYS 477 Special Topics in Physics (1-5)**

Topics and prerequisites to be announced. Typical courses include astrophysics, advanced electronic systems, advanced mechanics, and statistical physics. May be repeated in different topics.

### **PHYS 480 Research Participation (1-5)**

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 489 Experiential Prior Learning (variable units)**

Evaluation and assessment of learning which has occurred as a result of prior off-campus experience relevant to the curriculum of the department. Requires complementary academic study and/or documentation. Available by petition only, on a credit, no-credit basis. Not open to postgraduate students. Interested students should contact the department office.

### **PHYS 490 Senior Seminar (5)**

Presentation of papers and discussion by faculty and students. Participants will be grouped by interdisciplinary interest. Prerequisite: major or minor in Physics.

### **PHYS 496 Internship in Physics (1-5)**

Internships may be arranged by the department with various agencies, businesses, or industries. The assignments and coordination of work projects with conferences and readings, as well as course credits, evaluation, and grading, are the responsibilities of the faculty liaison (or course instructor) working with the field supervisor. Offered on a credit, no-credit basis only. Department will determine credits and application of credit.

### **PHYS 497 Cooperative Education (0-5)**

The Cooperative Education program offers a sponsored learning experience in a work setting, integrated with a field analysis seminar. The field experience is contracted by the Cooperative Education office on an individual basis, subject to approval by the department. The field experience, including the seminar and reading assignments, is supervised by the cooperative education coordinator and the faculty liaison (or course instructor), working with the field supervisor. Students are expected to enroll in the course for at least two quarters. The determination of course credits, evaluation, and grading are the responsibility of the departmental faculty. Offered on a credit, no-credit basis only. Department will determine application of credit.

### *Graduate Courses*

### **PHYS 577 Advanced Topics in Physics (1-5)**

Topics and prerequisites to be announced. May be repeated for different topics. General prerequisite: major or minor in Physics.

### **PHYS 580 Advanced Research Participation (1-5)**

Individual scientific investigation, under supervision. (Experience as a research assistant does not count for credit.) Prerequisite: Consent of instructor.