Physics (PHYS)

PHYS 101 General Physics I (Lab) (4)
This broad study of classical and modern physics includes all major fields. The mathematical description utilizes geometry, trigonometry, algebra and calculus. Lectures: three hours; laboratory, three hours.

PHYS 102 General Physics II (Lab) (4)
This broad study of classical and modern physics includes all major fields. The mathematical description utilizes geometry, trigonometry, algebra and calculus. Lectures: three hours; laboratory, three hours. *Prerequisite: PHYS 101.*

PHYS 103 Modern Mechanics (Lab) (4)
This course begins with the conservation of momentum and energy. It deals with energy and gravitational interactions, and emphasizes the atomic structure of matter, and the modeling of materials as particles connected by springs. The course is designed for engineering and science students. The main goal of this course, which is formatted with an integrated lab-lecture (studio) approach, is to have the students engage in a process central to science-the attempt to model a broad range of physical phenomena using a small set of powerful fundamental principles. The course counts in fulfillment of the general distribution requirement for a laboratory science course. The course is not open for credit to students who have earned credit for PHYS 101. *Open only to new first-year students and first-year students.*

PHYS 104 Electric and Magnetic Interactions (Lab) (4)
This course deals with electric and magnetic fields. The main goal of this course, which is formatted with an integrated lab-lecture (studio) approach, is to have the students engage in a process central to science-the attempt to model a broad range of physical phenomena using a small set of powerful fundamental principles. The course is designed for engineering and science students. The course counts in fulfillment of the general distribution requirement for a laboratory science course. The course is not open for credit to students who have earned credit for PHYS 102. *Open only to new first-year students. Prerequisite: PHYS 103.*

PHYS 106 Foundations of Global Warming (4)
A study of the physical principles and mechanisms underlying global warming. Influences of the sun, earth surface, atmosphere, and oceans are considered. Observational records that describe surface temperatures and changes in the gaseous atmosphere are examined. Also discussed are effects of global warming and possible future scenarios.

PHYS 120 The Science of Music (4)
An introductory course on musical acoustics which includes the principles of sound production, propagation, and perception through inquiry-based methods. The ways in which different sounds are produced are explored through experimentation with both existing and student-constructed instruments (e.g., string, woodwind, brass, percussion). Modern digital music technologies and concepts are also introduced as well as issues related to room and concert hall acoustics. *RESTRICTION MISMATCHnew first-year students.*

PHYS 149 Survey of Astronomy (4)
A one-semester, non-laboratory course intended for non-science majors. The topics covered include history of astronomy, physics of astronomy, and current developments in this dynamic field. There is an out-of-class assignment to visit the Cordell-Lorenz Observatory for a two-hour observing session three times during the semester during clear nights more than five days away from the Full Moon.

PHYS 201 Optics (4)
A study of the fundamental principles of geometrical and physical optics with lasers and holography used extensively in the laboratory. Lecture, three hours.

PHYS 202 Thermodynamics (4)
Classical thermodynamics theory with applications and an introduction to statistical mechanics. Lecture, three hours.

PHYS 203 Intermediate Electricity and Magnetism I (4)
The electric and magnetic fields produced by simple charge and current distributions are calculated. Alternating and direct-current circuits with passive and active components are tested.

PHYS 204 Intermediate Electricity and Magnetism II (4)
The electric and magnetic fields produced by simple charge and current distributions are calculated. Alternating and direct-current circuits with passive and active components are tested. *Prerequisite: PHYS 203.*

PHYS 207 Introduction to Modern Physics (2)
A brief introduction to modern physics. Topics will include photoelectric effect, relativist energy and momentum, Rutherford and Compton scattering, brief introduction to one-dimensional quantum mechanics, models of the atom, radioactivity, and quantum computing or quantum entanglement. *Prerequisite: PHYS 101 or PHYS 103.*

PHYS 250 Solar System Astronomy (Lab) (4)
A study of the development of astronomy from ancient to modern times with special emphasis on the solar system-in particular to mathematical and physical models used in describing it. No prerequisites. Open to all students but designed to meet the needs and abilities of a science major. Satisfies the physical science requirement. Cannot be taken for credit if PHYS 149 has been completed. Lecture, three hours; laboratory in the Observatory.

PHYS 251 Stellar and Galactic Astronomy (Lab) (4)
Stellar and galactic astronomy. Comparisons and tests of physical models applied to astronomy using photographically obtained data, and the limitations of this tool as a method of analysis will be stressed in the accompanying laboratory. Lecture, three hours; laboratory, three hours.

PHYS 303 Mechanics (4)
A required course for physics majors and most engineering students. Mathematical methods are emphasized. Lecture, three hours.

PHYS 304 Theoretical Mechanics (4)
Moving coordinate systems, rigid-body dynamics, Lagrangian mechanics, and variational principles. *Prerequisite: PHYS 303.*

PHYS 305 Advanced Laboratory (2)
This course offers an introduction to the theory and practice of experimental physics, with an emphasis on modern experiments and techniques. Experimental topics can include spectroscopy from gamma energies into the infrared, NMR, visible and infrared optics, holography and diffractive optics, scanning electron microscopy, and advanced electronics with computer interfacing. Some experiments are performed offsite to use instruments not available on campus. Programming languages such as LabVIEW, MatLab, and Mathematica are used. Attendance at departmental seminars is required. This course can be repeated once for credit. *Prerequisite or Corequisite: PHYS 203.*

PHYS 307 Introduction to Modern Physics I (4)
Surveys important developments in physics during the twentieth century, including general and special relativity, superconductivity, quantum theory and its applications to the description of the atomic and subatomic world. Lecture, three hours.

PHYS 308 Introduction to Modern Physics II (4)
Surveys important developments in physics during the twentieth century, including general and special relativity, superconductivity, quantum theory and its applications to the description of the atomic and subatomic world. Lecture, three hours. *Prerequisite: PHYS 307.*

PHYS 312 Junior Seminar (2)
A series of lectures by faculty, students, and invited speakers. Every student is expected to present at least one talk on a topic of his or her choice in physics. The public is invited.

PHYS 349 Readings in Cosmology (4)
A course for those with some background in physics or astronomy who are interested in the origin and structure of our universe. Readings include Stephen Hawking's *A Brief History of Time* and other modern texts, in addition to historical cosmology tests such as Aristotle's *On the Heavens* or Galileo's *Dialogue Concerning the Two Chief World Systems*. Writing assignments include two papers -- one of these on non-western cosmology -- and a class project involving observation of a supernova or gamma ray burst. *Prerequisite: PHYS 101 or PHYS 102 or PHYS 103 or PHYS 104 or PHYS 110 or PHYS 149 or PHYS 250 or PHYS 251.*

PHYS 401 Quantum Mechanics (4)
The mathematical formalism of quantum mechanics is developed and applied to potential wells, the harmonic oscillator, and the hydrogen atom. Dirac notation is introduced and used in the description of angular momentum and electron spin.

PHYS 407 Physics Research I and Modern Physics (2 or 4)
An introduction to research in physics through theoretical and experimental investigation of an original problem. Reporting research work at seminars and professional meetings is encouraged.

PHYS 408 Physics Research II (2 or 4)
An introduction to research in physics through theoretical and experimental investigation of an original problem. Reporting research work at seminars and professional meetings is encouraged.

PHYS 412 Senior Seminar (2)
A series of lectures by faculty, students and invited speakers. Every student is expected to present at least one talk on a topic of his or her choice in physics. The public is invited. *Prerequisite: PHYS 312.*

PHYS 421 Advanced Electromagnetic Theory (4)
Boundary-value problems in rectangular, spherical, and cylindrical coordinates are discussed. The solutions of the wave equation for conducting and non-conducting media are applied to selected topics in optics and plasma physics. *Prerequisite: MATH 212 and PHYS 204.*

PHYS 444 Independent Study (2 or 4)
For selected students. *Prerequisite: Instructor prerequisite override required.*