Physics (PHYS)

Courses

PHYS 113P. Energy for a Sustainable Future. 1 Unit.
An introduction to the scientific study of global energy production and usage that emphasizes renewable energy sources. Also covered are the topics of energy conservation and the impact of various energy sources on global climate change. Mathematics (computations and basic algebra) is used throughout the course in problem sets, laboratories and exams; the relevant mathematical techniques are reviewed and practiced to aid students who lack confidence in their mathematical skills. Weekly labs emphasize the important role observation and measurement in improving understanding and validating theories. No prerequisites. Offered every year. Can be used as a Q course.

PHYS 114P. The Science of Music. 1 Unit.
An introduction to the physics of sound and music. Topics covered include the production, propagation, and reception of sound (physical acoustics), and the physics of musical instruments (musical acoustics). Mathematics (computations and very basic algebra) is used extensively throughout the course in problem sets, laboratories and exams; the relevant mathematical techniques are carefully reviewed and practiced to aid students who lack confidence in their mathematical skills. Three lectures and one laboratory per week. No prerequisites. Can be used as a Q course.

PHYS 121P. College Physics I. 1 Unit.
This is the first course in a two-course, algebra-based, introduction to physics. Topics include mechanics, heat, and wave motion. Three lectures and one laboratory per week. High school algebra is used extensively. Can be used as a Q course.

PHYS 122P. College Physics II. 1 Unit.
This is the second course in a two-course, algebra-based introduction to physics. Topics include electromagnetism, optics, and modern physics. Three lectures and one laboratory per week. High school algebra is used extensively. Prerequisite: PHYS 121P. Can be used as a Q course.

PHYS 141P. University Physics I. 1 Unit.
Calculus-based introductory physics for physics, preengineering, mathematics and other science majors. Topics include mechanics, waves, sound and heat. Four lectures and one laboratory per week. Mathematics prerequisite/corequisite: credit earned for MATH 131Q, MATH 141Q or MATH 151, or registration in MATH 130, MATH 131Q, MATH 141Q, or MATH 151.

PHYS 142P. University Physics II. 1 Unit.
This is the second course in the calculus-based introductory sequence for physics. Topics include electrostatic and magnetostatic fields, dc and ac circuits, electromagnetic radiation, and optics. Four lectures and one laboratory per week. Prerequisite: PHYS 141P. Mathematicsprerequisite/corequisite: credit earned for MATH 142Q or MATH 151, or registration in MATH 131Q, MATH 142Q.

PHYS 243. Modern Physics. 1 Unit.
This course is the third and final course in the introductory sequence of courses. It introduces the fields of physics that were first developed in the twentieth century, and that continue to evolve today. Topics include special relativity, the quantum theory of light, the structure of the atom, elementary wave mechanics, the properties of nuclei, and the properties of elementary particles. Three lectures and one lab per week Prerequisite: PHYS 142P. Corequisites: MATH 243Q or permission of instructor, and PHYS 380.

PHYS 251. Biophysics. 1 Unit.
Principles drawn from physics are used to build an understanding of biological systems. Topics may include: processes or functions at the level of molecules, cells, or organs; the theory underlying techniques used to make measurements; and the theory underlying techniques used to treat injuries and disease. Prerequisites: MATH 131Q or MATH 141Q, and PHYS 122P or PHYS 142P, and BIOL 141P.

PHYS 285. Independent Study. 0.5 or 1 Units.

PHYS 304. Mathematical Methods in Physics. 1 Unit.
This course introduces the mathematical tools that are required for many of the upper-level physics courses. The course emphasizes recognizing the equations that appear repeatedly in many different areas of physics and understanding their solutions. Topics include ordinary differential equations of first and second order, series solution of differential equations, vector analysis, Fourier series, partial differential equations, boundary value problems, Laplace and Fourier transforms, calculus of variations, and functions of a complex variable. Five lectures per week. Prerequisite: MATH 243Q.

PHYS 312. Laboratory Techniques. 1 Unit.
A study of experimental techniques and apparatus. Topics include an introduction to laboratory software, statistical analysis of data, error analysis, cryogenics, vacuum techniques, radiation safety and detection, and signal processing. One lecture and two laboratory periods per week. Prerequisite: PHYS 243. Corequisite: PHYS 380.

PHYS 322. Mechanics I. 1 Unit.
This course revisits the Newtonian mechanics learned in University Physics, but it harnesses more sophisticated mathematical tools that allow a much richer set of physical problems and phenomena to be studied. Topics include Newton's laws, dynamics of particles, statics of rigid bodies, noninertial reference frames, and gravitation and central forces. Prerequisite: PHYS 141P. Corequisites: PHYS 304 or permission of the instructor, and PHYS 380.

PHYS 332. Electricity and Magnetism. 1 Unit.
This course further develops the basic principles of electricity and magnetism introduced in University Physics by harnessing symmetry arguments and vector calculus for derivations and problem solving. Topics include electric fields and potentials, capacitance and dielectrics, magnetic flux and magnetic materials, and electromagnetic induction. Prerequisites: PHYS 142P and PHYS 304 or permission of instructor. Corequisite: PHYS 380.

PHYS 343. Quantum Mechanics I. 1 Unit.
This course revisits the wave mechanics that were introduced in Modern Physics, but it examines the theory more thoroughly and applies it to much more sophisticated problems. Topics include the Schrödinger equation, infinite and finite steps, barriers and wells, harmonic oscillators, and the hydrogen atom. Prerequisites: PHYS 243 and PHYS 304 or permission of the instructor. Corequisite: PHYS 380.

PHYS 352. Optics. 1 Unit.
This course covers basic optical theory, examining both geometric optics (the ray model) and physical optics (wave theory). Many of the optical phenomena and instruments discussed in the lectures are examined in the laboratory. Topics include thin lenses, thick lenses via matrix methods, optical instruments, interference and interferometers, polarization, diffraction, lasers, holography, Fourier optics, and non-linear optics. Prerequisite: PHYS 142P.

PHYS 356. Electronics. 1 Unit.
This is an introductory course in laboratory electronics covering both analog and digital circuits. Many of the circuits discussed in the lectures are built and tested in the laboratory. Topics include ac circuits, transistor circuits, amplifiers, and linear and digital integrated circuits. Prerequisite: PHYS 142P.

PHYS 362. Thermophysics. 1 Unit.
This is an introductory course in thermodynamics and statistical mechanics. The topics that are studied include: heat transfer, general gas laws, equations of state, phase diagrams, the laws of thermodynamics, engines, refrigerators, entropy, Maxwell's thermodynamic relations, microcanonical, canonical and grand canonical ensembles, and statistical distribution laws. Prerequisites: PHYS 243 and PHYS 304 or permission of instructor. Corequisite: PHYS 380.

PHYS 380. Physics Colloquium. 0.0 Units.
(Pass/Fail only). Physics Colloquium is a corequisite for many physics courses numbered 200 or higher. Physics majors should register for it every semester even if they happen to not be in one of the courses explicitly requiring it as a corequisite. The class will meet once a week and will be the venue for most student presentations assigned as a part of other physics courses. Other activities may include presentations given by faculty or visiting speakers, or discussions of current events that are of interest to the physics community.

PHYS 385. Independent Study. 0.5 or 1 Units.
Study of selected topics or laboratory research under the guidance of a professor.

PHYS 390. Special Topics in Physics. 1 Unit.
Topics determined by student interest and the availability of staff. Examples include: computational physics, digital electronics, and physical acoustics. Prerequisite: permission of instructor.

PHYS 395. Teaching Apprenticeship. 0.5 Units.

PHYS 397. Internship in Physics. 0.5 or 1 Units.
(Letter-graded or Pass/Fail). This course allows students in the physics,, applied physics, and biophysics tracks to complete an internship experience in an approved research/development setting. Settings include industrial research and development laboratories, technical consulting firms, and national laboratories or other technically oriented government agencies. Students will be required to maintain a laboratory notebook (consistent with any proprietary requirements) and will present a colloquium talk on their internship work. A letter of evaluation from the student's supervisor will also be required. Typically, full unit internships require approximately 140 hours for the semester. Specific requirements will be presented by way of a contract signed by the students. If this internship is used to fulfill a major requirement in the applied physics track, it must be letter-graded and for a full unit of credit. Prerequisites: permission of department head and instructor and PHYS 312. Enrollment in an internship course requires students to attend an orientation prior to beginning work at their internship site. For more information regarding internship orientations, please contact Career & Professional Development at career@stetson.edu or 386-822-7315.

PHYS 412. Advanced Laboratory Techniques. 1 Unit.
This is a continuation of PHYS 312 intended for students who are interested in pursuing graduate study in physics or a career working in the laboratory. One lecture and two three-hour laboratory periods per week. Prerequisite: PHYS 312 or permission of instructor. Corequisite: PHYS 380.

PHYS 422. Mechanics II. 1 Unit.
This is a continuation of Mechanics I. Topics include the mechanics of continuous media, dynamics of rigid bodies, and an introduction to the Lagrangian and Hamiltonian formulations of mechanics. Prerequisite: PHYS 322. Corequisite: PHYS 380.

PHYS 432. Electromagnetic Theory. 1 Unit.
This is a continuation of Electricity and Magnetism which includes a more sophisticated look at electrostatics and magnetostatics using more advanced problem solving techniques. It then examines the behavior of electromagnetic waves arising from Maxwell's equations. The course concludes with a brief introduction to relativistic electromagnetism. Prerequisite: PHYS 332. Corequisite: PHYS 380.

PHYS 443. Quantum Mechanics II. 1 Unit.
The concepts of quantum mechanics are reexamined using the Dirac formalism, which is used for essentially all advanced work in quantum mechanics. The Dirac formalism is introduced and applied to simple systems. Approximation techniques (time independent and time dependent perturbation theory, the variational principle, and WKB approximation) are applied to more complex systems. Nuclear scattering theory via the Born approximation is also discussed. Prerequisite: PHYS 343. Corequisite: PHYS 380.

PHYS 485. Independent Study. 0.5 or 1 Units.
Study of selected topics or laboratory research under the guidance of a professor.

PHYS 490. Special Topics in Physics. 1 Unit.
Topics determined by student interest and the availability of staff. Examples include: atomic, nuclear and particle physics, solid state physics, astrophysics, and general relativity. Prerequisite: Permission of instructor.

PHYS 497. Senior Project Proposal. 0.5 Units.
Students are matched with a faculty mentor, and then guided through the process of developing, writing, and orally presenting a proposal for their senior project. Corequisite: PHYS 380.

PHYS 498. Senior Project. 1 Unit.
Students perform the laboratory work for their senior project. The class will meet once a week to discuss progress, plans, and any difficulties that have arisen. Prerequisite: PHYS 497. Corequisite: PHYS 380.

PHYS 499. Senior Seminar. 0.5 Units.
Students report the results of their senior project in a number of formats including a journal style paper, a poster, a short conference style presentation, and a 40-minute oral presentation and defense. Prerequisite: PHYS 498. Corequisite: PHYS 380.