

# PHYSICS (PHYS)

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## **PHYS 140. Physics for Future Leaders. 1 Credit.**

**Offered Occasionally; Lecture hours:3,Other:3**

The science behind key issues facing us as engaged citizens and future leaders. Topics include energy, climate change, space travel, and technology, as well as the processes that lead to scientific progress. Designed for non-science majors. No prerequisites. Not open to students who have completed a 200-level physics course.

## **PHYS 141. Secrets of the Universe. 1 Credit.**

**Offered Occasionally; Lecture hours:3,Other:3**

The great ideas of 20th-century physics (symmetry principles, relativity, and quantum mechanics) and their application to cosmology and the evolution of the universe. Also, historical development and philosophical implications of these ideas. Designed for non-science majors. No prerequisite. Not open to students who have successfully completed a 200-level physics course.

## **PHYS 142. Light and Vision. 1 Credit.**

**Offered Occasionally; Lecture hours:3,Other:3**

Particle and wave theories of light, cameras and optical instruments, the visual process, lasers, and optical communications. Designed for non-science majors. No prerequisite. Not open to students who have successfully completed a 200-level physics course.

## **PHYS 144. How Things Work. 1 Credit.**

**Offered Occasionally; Lecture hours:3,Other:3**

This course introduces the ideas of physics in the context of everyday phenomena, including common inventions and topics in medicine, sports, and music. Designed for non-science majors. No prerequisite. Not open to students who have successfully completed a 200-level physics course.

## **PHYS 147. Energy and Sustainability. 1 Credit.**

**Offered Either Fall or Spring; Lecture hours:3,Other:3**

Examination of energy, its transformations, its effects on resource depletion, and environmental degradation. Models of sustainability for transportation, architecture, waste management, and personal lifestyle choices. Designed for non-science majors. No prerequisite. Not open to students who have successfully completed a 200-level physics course.

## **PHYS 211. Classical and Modern Physics I. 1 Credit.**

**Offered Fall Semester Only; Lecture hours:2,Other:5**

The first course in a two-course sequence that surveys major areas of physics. Topics include Newtonian mechanics, relativity, thermodynamics and statistical mechanics, and gravity. Corequisite: MATH 201.

## **PHYS 212. Classical and Modern Physics II. 1 Credit.**

**Offered Spring Semester Only; Lecture hours:2,Other:5**

The second course in a two-course sequence that surveys major areas of physics. Topics include electricity and magnetism, light and waves, quantum mechanics, and particle physics. Prerequisites: PHYS 211 and MATH 201, or permission of the instructor.

## **PHYS 212E. Classical and Modern Physics II. 1 Credit.**

**Offered Spring Semester Only; Lecture hours:4,Lab:3**

Same topics as PHYS 212 with some extra material and new techniques. This course is intended for students with a strong interest in exploring physics. Prerequisites: PHYS 211 and MATH 201, or permission of the instructor. Corequisite: MATH 202.

## **PHYS 221. Classical Mechanics. 1 Credit.**

**Offered Fall Semester Only; Lecture hours:3,Lab:3**

Newtonian mechanics including conservation laws, rotational dynamics, forced damped harmonic motion, and coupled oscillations. Prerequisites: PHYS 211 and MATH 202.

## **PHYS 222. Wave Mechanics and Quantum Physics. 1 Credit.**

**Offered Spring Semester Only; Lecture hours:4**

Physics of coupled oscillations and waves, including classical wave equation. Wave-particle duality; origin and elementary applications of quantum mechanics; the Schrodinger wave equation; atomic and nuclear physics. Prerequisites: PHYS 212 (or PHYS 212E) and MATH 211.

## **PHYS 235. Applied Electronics. 1 Credit.**

**Offered Spring Semester Only; Lecture hours:2,Lab:4**

Circuit fundamentals, linear and digital integrated circuits, transducers, analog to digital conversion, filtering, Fourier methods, microcomputers, and computer interfacing. Designed for science and computer science majors. Prerequisite: PHYS 212 (or PHYS 212E). Open to electrical engineering students by permission only.

## **PHYS 301. Astrophysics. 1 Credit.**

**Offered Alternating Spring Semester; Lecture hours:3**

An introduction to general astrophysics covering mechanics of orbiting bodies, radiation laws, stellar spectra, stellar atmospheres, the internal constitution of stars, stellar energy, galaxies, and cosmology. Prerequisites: PHYS 222 and MATH 212, or permission of the instructor. Crosslisted as ASTR 301.

**PHYS 303. Modern Optics. 1 Credit.**

**Offered Occasionally; Lecture hours:3**

Geometrical optics, interference and diffraction, and topics such as: quantum optics, optical properties of matter, lasers and holography. Prerequisite: PHYS 222 or permission of the instructor.

**PHYS 309. Condensed Matter Physics. 1 Credit.**

**Offered Occasionally; Lecture hours:3**

Crystal structure, phonons, free electron theory of metals, band theory, semi-conductors, magnetism, superconductivity and superfluidity, liquid crystals and other special topics. Prerequisite: PHYS 222 or permission of the instructor.

**PHYS 310. Experimental Physics. 1 Credit.**

**Offered Spring Semester Only; Lecture hours:1,Other:5**

Methods and techniques used in experimental and computational physics, including data analysis and numerical methods, use of standard research equipment, and documentation of laboratory work emphasizing written and oral communication of scientific results. Prerequisite: PHYS 222 or permission of the instructor.

**PHYS 315. Experimental Biophysics. 1 Credit.**

**Offered Alternating Fall Semester; Lecture hours:1,Other:5**

Methods and techniques used in experimental and computational biophysics, including optical tweezers, microscopy, computational methods, use of standard research equipment, and documentation of laboratory work emphasizing written and oral communication of scientific results. Juniors and seniors majoring in Biophysics only.

**PHYS 317. Thermodynamics and Statistical Mechanics. 1 Credit.**

**Offered Fall Semester Only; Lecture hours:3**

The laws of thermodynamics, thermodynamic functions, kinetic theory of gases, statistical mechanics. Prerequisites: PHYS 212 (or PHYS 212E) and either PHYS 221 or PHYS 222, or permission of the instructor.

**PHYS 331. Advanced Classical Mechanics. 1 Credit.**

**Offered Fall Semester Only; Lecture hours:3**

Kinematics and dynamics of particles, systems, and rigid bodies. Hamilton's principles, Lagrange's equations, theory of small vibrations, orbital mechanics, accelerated frames, and nonlinear dynamics. Prerequisites: PHYS 221 and MATH 212, or permission of the instructor.

**PHYS 332. Quantum Mechanics. 1 Credit.**

**Offered Fall Semester Only; Lecture hours:3**

Basic postulates and applications, perturbation theory, angular momentum, scattering theory, relativistic effects. Prerequisites: PHYS 222 and MATH 211, or permission of the instructor.

**PHYS 333. Electromagnetic Theory I. 1 Credit.**

**Offered Fall Semester Only; Lecture hours:3**

Classical electromagnetic theory, including scalar and vector potentials, electrostatics, magnetostatics, time-dependent fields, and culminating with Maxwell's equations. Prerequisites: PHYS 212 (or PHYS 212E) and MATH 211. Juniors and seniors only, except by permission.

**PHYS 334. Electromagnetic Theory II. 1 Credit.**

**Offered Alternating Spring Semester; Lecture hours:3**

Continuation of PHYS 333. Electromagnetic waves, radiation theory, theory of relativity, and elements of plasma physics. Prerequisite: PHYS 333.

**PHYS 336. Mathematical Methods in Physics. 1 Credit.**

**Offered Occasionally; Lecture hours:3**

Topics will include two or three of the following: complex variables, special functions, tensor analysis, group theory, partial differential equations. Prerequisites: PHYS 221 and PHYS 222, MATH 212 and MATH 245, or permission of the instructor. Crosslisted as PHYS 636.

**PHYS 337. Independent Study in Physics. .5-1 Credits.**

**Offered Either Fall or Spring; Lecture hours:Varies; Repeatable**

Independent study in areas of current interest in the physics and astronomy community. Prerequisites: permission of the department and permission of the instructor. Crosslisted as PHYS 637.

**PHYS 338. Contemporary Study in Physics. 1 Credit.**

**Offered Occasionally; Lecture hours:3; Repeatable**

Seminar in topics of current interest in the physics and astronomy community. Co- and prerequisites are dependent on topic and instructor. Prerequisite: permission of the instructor. Crosslisted as PHYS 638.

**PHYS 339. Advanced Quantum Mechanics and Particle Physics. 1 Credit.**

**Offered Alternating Spring Semester; Lecture hours:3**

Advanced topics in quantum mechanics including applications to elementary particle physics. Prerequisite: PHYS 332, or permission of instructor.

**PHYS 340. Biophysics. 1 Credit.**

**Offered Alternating Spring Semester; Lecture hours:3**

Physics of cellular structures and processes, with emphasis on mechanics and thermodynamics. Juniors and seniors only. Prerequisite: PHYS 212 or PHYS 212E and either PHYS 221 or PHYS 222 or permission of the instructor.

**PHYS 350. Undergraduate Research. .5-1 Credits.**

**Offered Either Fall or Spring; Lecture hours:Varies; Repeatable**

Undergraduate research. Prerequisite: permission of the instructor.

**PHYS 3NT. Physics Non-traditional Study. 1-4 Credits.**

**Offered Fall, Spring, Summer; Lecture hours:Varies,Other:4**

Non-traditional study in Physics.