

# PHYSICS (PHYS)

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## PHYS 101 | Principles of Physics | 4 cr

A one-semester introduction to fundamental principles of physics, their experimental basis, and applications. For students who need an introductory course in physics. Not open to students with credit in PHYS 105 or 201. Three-hour lecture/demo; one-hour discussion.

**Prerequisites:** Completion of computational skills requirement or equivalent.

**Offered:** Fall, Spring.

**Meets:** Natural Science: PHYS

## PHYS 105 | College Physics I | 5 cr

Mechanics, heat, and sound. Not recommended for students majoring in physical science or engineering. Not open to students with credit in PHYS 201. Three-hour lecture; one-hour discussion; three-hour lab. Enrollment in Lecture, Discussion, and a Lab required.

**Prerequisites:** MATH 113, MATH 114 or equivalent.

**Offered:** Fall.

**Meets:** Natural Science: PHYS

## PHYS 106 | College Physics II | 5 cr

Electricity and magnetism, light and modern physics. Not open to students with credit in PHYS 202. Three-hour lecture; one-hour discussion; three-hour lab.

**Prerequisites:** PHYS 105.

**Offered:** Spring.

## PHYS 110 | Introduction to Astronomy | 3 cr

Explores astronomy for non-scientists with limited mathematics. Introduces the celestial sphere, constellations, and planets. Investigates topics such as solar system objects, cosmic distance scale, exoplanets, stellar evolution, galactic structure, and cosmology. Three-hour lecture.

**Prerequisites:** None.

**Offered:** Occasionally.

**Meets:** Natural Science: PHYS

## PHYS 120 | Astronomy of Native America | 3 cr

Examines the astronomical views of Native Americans and looks at how mythos, science and discrimination intersect. Evaluates current cultural conflicts between science and native groups. Draws additional examples of the cultural development of astronomy and science from the Americas, Africa, Oceania, and Asia. Community-based learning designation. Cross-listed with: ETHN 120.

**Prerequisites:** None.

**Offered:** Fall, Spring.

**Meets:** Natural Science: PHYS, Ethnic Diversity, Community Based Learning

## PHYS 150 | Physics of Music | 3 cr

An introduction to the basic physical principles underlying music and musical instruments. Not for credit towards Physics major.

**Prerequisites:** None.

**Offered:** Fall.

**Meets:** Natural Science: PHYS

## PHYS 201 | General Physics I | 5 cr

Investigates mechanics, heat, and sound. For physical science and engineering majors. Enrollment in Three-hour lecture; one-hour discussion; three-hour lab required.

**Prerequisites:** MATH 221 with C or higher or concurrent registration.

**Offered:** Fall, Spring.

**Meets:** Natural Science: PHYS

## PHYS 202 | General Physics II | 5 cr

Investigates electricity and magnetism, geometrical optics, and physical optics. For physical science and engineering majors. Enrollment in Three hour lecture; one-hour discussion; three-hour lab required.

**Prerequisites:** PHYS 201; MATH 222 or concurrent registration.

**Offered:** Fall, Spring.

## PHYS 205 | Modern Physics | 3 cr

Special relativity. Elements of quantum mechanics. Introduction to atomic, molecular, solid state, nuclear, and particle physics. Three-hour lecture.

**Prerequisites:** PHYS 202.

**Offered:** Fall.

## PHYS 213 | Thermodynamics | 3 cr

## PHYS 241 | Scientific Programming | 3 cr

Studies programming in MATLAB and another high-level language, such as Python, with applications to science and engineering.

**Prerequisites:** PHYS 201; MATH 221 or consent of instructor.

**Offered:** Spring.

## PHYS 290 | Special Topics in Physics | 1-4 cr

Special topics in physics will be examined.

**Prerequisites:** Consent of instructor.

**Offered:** Occasionally.

## PHYS 295 | Physics Research Seminar I | 1 cr

Introduces students to branches and interdisciplinary fields of physics; experimental, theoretical, and computational. Emphasizes the breadth of applicability of physics as well as current areas of interest, through note-taking, discussions, and other resources. Leads to individual student oral presentation on physics topic of choice.

**Prerequisites:** PHYS 202 or concurrent enrollment; or consent of instructor.

**Offered:** Fall.

## PHYS 297 | Physics Research Seminar II | 1 cr

Second research seminar course. Introduces students to branches and interdisciplinary fields of physics; experimental, theoretical, and computational. Emphasizes the breadth of applicability of physics as well as current areas of interest, through note-taking, discussions, and other resources. Leads to individual student written presentation on physics topic of choice.

**Prerequisites:** PHYS 202 or concurrent enrollment; or consent of instructor.

**Offered:** Spring.

## PHYS 301 | Classical Mechanics | 4 cr

Vector analysis, conservation laws, planetary motion, rigid body dynamics, free and forced oscillations, normal coordinates, moving coordinate systems, generalized coordinates, Lagrangian and Hamiltonian formulations. Continuum mechanics. Four-hour lecture.

**Prerequisites:** PHYS 201 and PHYS 202 with a grade of C or better; MATH 317, or concurrent registration or consent of instructor.

**Offered:** Fall (even years).

## PHYS 302 | Electricity and Magnetism | 4 cr

Examines electrostatics, magnetostatics, and electromagnetic fields through Maxwell's equations with basic applications. Includes radiation, Lienard-Wiechert potentials, sources of radiation, antenna theory, scalar diffraction theory and wave optics for transparent or conductive media. Four-hour lecture.

**Prerequisites:** PHYS 201 and PHYS 202 with grades of C or better; MATH 317 or concurrent registration; or consent of instructor.

**Offered:** Spring.

**PHYS 303 | Computational Physics | 3 cr**

Introduces computational physics with applications to classical mechanics, electromagnetism, and quantum mechanics. Monte Carlo methods. Introduction to molecular dynamics. Three-hour lecture.

**Prerequisites:** PHYS 201 and PHYS 202 with a grade of C or better; PHYS 205; MATH 223, PHYS 241, or consent of instructor.

**Offered:** Spring.

**PHYS 306 | Advanced Experiments in Physics | 3 cr**

Covers advanced experiments in optics, atomic, molecular, solid state, and nuclear physics. Analog electronics through transistors and op-amps. Basic digital electronics. Six-hour lab.

**Prerequisites:** PHYS 201 and 202 with a grade of C or better; PHYS 205.

**Offered:** Spring (odd years).

**PHYS 401 | Mathematical Methods of Physics | 3 cr**

Applies mathematical methods to physical sciences with emphasis on physics. Covers a wide range of mathematical methods, including vector and tensor analysis and coordinate transformations, complex variables, Fourier series and integral transforms, Sturm-Liouville systems and orthogonal functions, partial differential equations, calculus of variations, and probability and statistics.

**Prerequisites:** MATH 223 and 317.

**Offered:** Fall (even years).

**PHYS 403 | Thermodynamics | 3 cr**

Examines laws of thermodynamics, and equations of state and state variables to describe thermodynamic systems at or near equilibrium.

Covers Legendre transformations and thermodynamic potentials, Maxwell relations, and phase transformations. Investigates applications of thermodynamics such as heat engines, refrigerators, and liquefaction of gases under extreme conditions.

**Prerequisites:** PHYS 201, PHYS 202 with grades of C or better; MATH 223, MATH 317.

**Offered:** Spring.

**PHYS 413 | Statistical Mechanics | 3 cr**

Delves into classical and quantum statistical mechanics: Maxwell-Boltzmann speed distribution, partition functions, statistical ensembles, black body radiation, Debye theory of solids, Fermi and Bose gases, and the Ising model.

**Prerequisites:** PHYS 403 or consent of instructor.

**Offered:** Fall.

**PHYS 441 | Quantum Physics | 4 cr**

Explores quantum mechanics, free particle in wave mechanics, particles in one-dimensional potentials, axiomatic foundations of quantum mechanics, the evolution of states in time, particles in three dimensions, angular momentum, central potentials. Introduces the concept of spin and the exclusion principle, and the Dirac equation with its associated phenomenology. Four-hour lecture.

**Prerequisites:** PHYS 201 and PHYS 202 with grades of C or better; PHYS 205; MATH 301 and MATH 317 or MATH 401; or consent of instructor.

**Offered:** Spring (odd years).

**PHYS 490 | Special Topics in Physics | 1-4 cr**

Examines special topics in physics.

**Prerequisites:** PHYS 201 and PHYS 202 with grades of C or better and consent of instructor.

**Offered:** Occasionally.

**PHYS 494 | Internship in Physics | 1-3 cr**

Work in a physics-related position under joint supervision of a physics faculty and a member of the sponsoring public or private organization.

Consent of instructor and department chair.

**Prerequisites:** PHYS 201 and PHYS 202 with C or better in each; GPA of 2.5 or higher.

**Offered:** Fall, Spring, Summer.

**PHYS 495 | Senior Seminar | 2 cr**

Provides opportunity for a directed study of a current topic in physics.

**Prerequisites:** PHYS 201 and PHYS 202 with C or better in both; junior or senior standing.

**Offered:** Fall, Spring.

**PHYS 497 | Senior Thesis | 1-2 cr**

Investigates advanced topics in physics.

**Prerequisites:** PHYS 201 and PHYS 202 with C or better; and consent of instructor.

**Offered:** Occasionally.

**PHYS 499 | Independent Study | 1-3 cr**

Investigates advanced topics in physics.

**Prerequisites:** PHYS 201 and PHYS 202 with C or better; consent of instructor and department chair.

**Offered:** Occasionally.