

# PHYSICS (PS)

## Courses

### PS 101 Physics in Everyday Life (5)

An integrated lecture and laboratory course designed for people pursuing degrees outside the natural or health sciences and who are interested in understanding how physics forms the backdrop of modern life. Topics include motion, gravity, energy, heat, sound, light, electricity, and magnetism, discussed in terms of impact on modern society and everyday life. Laboratory exercises demonstrate physical concepts while emphasizing the scientific process of data collection and analysis. This course requires no previous science or mathematics background and cannot count towards Physics Department degree programs. Fulfills the general education requirement of a natural science course with lab. Course consists of three hours of lecture and three hours of laboratory exercises per week. Prerequisites: None.

Course Attributes:

- KBOR Gen Ed: Natural and Physical Sciences
- KBOR Gen Ed: Scientific Reasoning and Literacy
- Pre-AY 2024-2025 Gen Ed: Natural Science
- USLO: Quantitative and Scientific Reasoning and Literacy

### PS 102 Physics of the Human Body (5)

An integrated lecture and laboratory course designed for students pursuing degrees outside the natural sciences and who are interested in understanding how physics relates to the human body. Topics in classical physics, such as motion, gravity, pressure, energy, heat, sound, light, electricity, and magnetism, are discussed in relation to the human body and everyday life. Laboratory exercises demonstrate physical concepts while emphasizing the scientific process of data analysis. This course requires no previous science or mathematics background and cannot count towards Physics Department degree programs. Fulfills the general education requirements of either Natural Sciences or Scientific Reasoning and Literacy. Course consists of three hours of lecture and three hours of laboratory exercises per week.

Course Attributes:

- KBOR Gen Ed: Scientific Reasoning and Literacy
- Pre-AY 2024-2025 Gen Ed: Natural Science
- USLO: Quantitative and Scientific Reasoning and Literacy

### PS 103 Physics & Engineering Seminar I (1)

An overview of the fields and practice of physics and engineering. Students will participate in weekly readings and discussions, and complete at least one written piece and at least one presentation. Specific content will change each time the course is offered.

### PS 120 Meteorology (3)

The Earth's atmosphere and basic circulation patterns including types and classification of clouds and air masses, the formation of fronts, winds aloft computations, principles of forecasting, energy considerations and other associated physical processes.

Course Attributes:

- KBOR Gen Ed: Scientific Reasoning and Literacy
- Pre-AY 2024-2025 Gen Ed: Natural Science
- USLO: Quantitative and Scientific Reasoning and Literacy

### PS 126 Physical Science for Elementary Educators (5)

This course introduces the fundamentals of physics and chemistry, for the pre-service elementary school teacher. The course features lab-based, hands-on activities, and collaborative, inquiry-based exercises. Course activities serve to improve confidence in both scientific process and content learning, with methods applicable to elementary curricula.

Course Attributes:

- KBOR Gen Ed: Natural and Physical Sciences
- KBOR Gen Ed: Scientific Reasoning and Literacy
- Pre-AY 2024-2025 Gen Ed: Natural Science
- USLO: Quantitative and Scientific Reasoning and Literacy

### PS 131 Biological Physics for the Health and Life Sciences (3)

A one-semester course covering classical and modern physics, designed primarily for students in the health professions. Typical subjects include the laws of motion, gravity, heat, sound, light, electricity, and magnetism. Subjects are treated conceptually along with the use of basic data. Recommended for partial fulfillment of the graduation requirement in natural science. Not applicable toward credit for physics major requirements. Students will not receive credit for both PS 101 and PS 131. Prerequisite: MA 112 Essential Mathematics or MA 116 College Algebra or higher, or concurrent enrollment.

Course Attributes:

- KBOR Gen Ed: Scientific Reasoning and Literacy
- Pre-AY 2024-2025 Gen Ed: Natural Science
- USLO: Quantitative and Scientific Reasoning and Literacy

### PS 132 Biological Physics for the Health and Life Sciences Laboratory (1)

A laboratory exploring classical and modern physics, designed primarily for students in the health professions. Experiments in motion, gravity, heat, sound, light, electricity, and magnetism are designed to teach physics concepts and basic laboratory techniques. The course is designed to introduce students to laboratory techniques used in physics emphasizing instrumentation, data acquisition, and analysis. One three-hour laboratory period per week. Recommended for partial fulfillment of the graduation requirement in natural science. Not applicable toward credit for physics major requirements. Prerequisite: PS 131 Biological Physics for the Health and Life Sciences or concurrent enrollment. Concurrently enrolled students may not drop PS 131 and remain enrolled in PS 132.

### PS 170 Special Topics in Physics (1-3)

Selected topics in physics, announced in advance. Prerequisites: Determined by instructor

### PS 261 College Physics I (5)

Recommended for medical arts and general science students. Mechanics, heat, and sound are studied. Lecture-recitation and laboratory. Prerequisite: MA 117 or MA 123, or MA 151 (or concurrent).

Course Attributes:

- KBOR Gen Ed: Natural and Physical Sciences
- KBOR Gen Ed: Scientific Reasoning and Literacy
- Pre-AY 2024-2025 Gen Ed: Natural Science
- USLO: Quantitative and Scientific Reasoning and Literacy

### PS 262 College Physics II (5)

A continuation of College Physics I. Electricity, optics and modern physics. Lecture-recitation and laboratory. Prerequisite: PS 261 with a grade of C or better.

**PS 281 General Physics I (5)**

Required for students who wish to major in physics and astronomy and for pre-engineering students. Mechanics, heat, and sound are studied. Lecture-recitation and laboratory. Prerequisite: MA 151.

Course Attributes:

- KBOR Gen Ed: Natural and Physical Sciences
- KBOR Gen Ed: Scientific Reasoning and Literacy
- Pre-AY 2024-2025 Gen Ed: Natural Science
- USLO: Quantitative and Scientific Reasoning and Literacy

**PS 282 General Physics II (5)**

A continuation of General Physics I. Electricity and magnetism, optics, and modern physics. Lecture-recitation and laboratory. Prerequisite: PS 281 with a grade of C or better.

**PS 303 Physics & Engineering Seminar II (1)**

An overview of the fields and practice of physics and engineering. Students will participate in weekly readings and discussions, and complete at least one written piece and at least one presentation. Specific content will change each time the course is offered. Prerequisite: upper-division standing

**PS 310 Relativity (2)**

Concepts of space and time, frames of reference, Einstein's Theory of Special Relativity and Elements of General Relativity. Prerequisite: PS 262 or PS 282; MA 253.

**PS 320 Electromagnetic Theory I (3)**

The basic theory of electro-magnetic fields and waves using the calculus and vector methods. Prerequisites: PS 262 or PS 282; MA 253.

**PS 321 Electromagnetic Theory II (3)**

A continuation of Physics 320. Prerequisite: PS 320.

**PS 322 Circuits and Electronics (3)**

Design and applications of DC and AC circuits along with electrical measurement and analysis. Topics include filters, complex impedance, Fourier analysis, and semiconductor devices. Two lecture hours and three laboratory hours per week. Prerequisite: PS 262 or PS 282.

**PS 330 Optics (3)**

Physical and geometrical optics. Lecture-recitation. Prerequisite: PS 262 or PS 282.

**PS 332 Optics Lab (1)**

Experiments with lens systems, mirrors, aberrations, the spectrometer, interference and diffraction, and polarization. Prerequisite: PS 330 or concurrent enrollment.

**PS 334 Thermodynamics (3)**

Consideration of heat phenomena, first and second laws of thermodynamics, their principal consequences and application to simple systems, and the kinetic theory of gases. Prerequisite: PS 262 or PS 282; MA 253.

**PS 335 Theoretical Mechanics I (3)**

A mathematical study of classical mechanics. Rigid body statics and dynamics, kinematics and dynamics of particles and systems of particles, and conservative and non-conservative force fields. Prerequisites: PS 262 or PS 282; MA 253.

**PS 336 Theoretical Mechanics II (3)**

A continuation of Theoretical Mechanics I. Prerequisite: PS 335.

**PS 340 Computer Interfacing and Instrumentation (3)**

Design and implementation of scientific instruments via computer interfacing, emphasizing both software and hardware considerations. LabVIEW and Arduino platforms are used specifically. Two lecture hours and one three-hour laboratory per week. Prerequisites: PS 262 or PS 282

**PS 350 Modern Physics I (3)**

Phenomena specific to the extra-nuclear structure of the atom; phenomena peculiar to the atomic nucleus; introduction to quantum and wave mechanics, and relativity. Prerequisites: PS 262 or PS 282; MA 253.

**PS 351 Modern Physics II (3)**

A continuation of Physics 350. Prerequisite: PS 350.

**PS 352 Modern Physics Laboratory (1)**

Measurements of constants fundamental to atomic physics: Planck's constant, electron charge and mass, speed of light, etc. Techniques of nuclear alpha, beta and gamma ray spectroscopy. Prerequisite: PS 350.

**PS 360 Physics Research (1, 2)**

Experimental design and techniques. Extensive use of technical literature will be necessary. Independent work is encouraged. This Capstone requires summative reflection, serving as a culminating experience for Bachelor's degree students. Prerequisite: Consent of instructor.

**PS 365 Introduction to Theoretical Physics (3)**

Application of ordinary and partial differential equations, Fourier series and Transforms, partial differential equations with solution methods, and tensor analysis as applied to problems in the fields of physics and engineering. Prerequisites: PS 262 or PS 282 or concurrent enrollment; MA 253.

**PS 366 Introduction to Computational Physics (3)**

Techniques and models in computational physics. Prerequisites: PS 262 or PS 282; MA 253.

**PS 368 Computational Physics Research (1)**

Computational physics research in any of the areas of physics. A written and an oral presentation of the work is required. This Capstone requires summative reflection, serving as a culminating experience for Bachelor's degree students. Prerequisite: Departmental permission.

**PS 370 Special Subjects in Physics (1-3)**

Offered on demand as teaching schedules permit. Material is to be chosen according to student interest from any one of a number of fields of physics. Prerequisite: consent of instructor.