

PHYC112 General Physics 2

Course Description

Static and current electricity, magnetism, light and optics, and an introduction to modern physics including relativity and elements of atomic and nuclear physics. *Prerequisite:* PHYC 110. (4 credit hours)

Course Objectives

PHYC 112 serves as a foundation course for students not pursuing a major or minor in physics. It also serves as a content course for students majoring in other areas in which physics provides a conceptual framework for developments within those disciplines. Thus PHYC 112 serves a broader cross-section of students than just physics majors. In this broader sense, PHYC 112 functions as a component of the general studies program at Ball State. The following course objectives are designed to instruct students in the acquisition of the broad-based competencies of the general studies program as well as the development of foundation skills needed for the further study of physics at a more advanced level.

The students will learn factual knowledge. This knowledge may be applied in other fields and/or provide a basis for studies at a more sophisticated level in other course work taken by students as they progress through their college careers and continue the life-long education process.

The students will learn the basic fundamentals of precise scientific communication. This will enable the students to communicate more effectively later in life with other professionals such as scientists, engineers, lawyers, medical personnel, government leaders and business officials to name a few. For example, the fundamental physical systems of units as applied to the descriptions of mass, length, time, force, energy, power, temperature, electrical terms, optical phenomena, acoustics, atomic-nuclear systems, etc., are introduced and developed in the PHYC 110 and 112 course sequence.

The students will learn problem solving techniques. One of the most important aspects of the introductory physics course is to provide students with extensive experiences in analyzing problems and synthesizing solutions. Contemporary applied problems with political, environmental, and technical implications are investigated from the scientific perspective. This approach will assist the students in developing their abilities to think analytically and reason critically.

The students will acquire training in the scientific methods of observation and recording of data. This will be accomplished in the laboratory portion of the course in which the students test their ideas concerning physical phenomena and explore new ones. To obtain experience handling equipment and to gain confidence in their ability to compute reliable answers in the laboratory are additional objectives associated with laboratory component of the course.

Course Rationale

The PHYC 112 course and the prerequisite course (PHYC 110) in the two-semester sequence require first-year college algebra and trigonometry as a prerequisite. Therefore, students taking PHYC 112 as part of their general studies program requirement will possess special mathematical talents and abilities. In this course they will apply these skills to solving problems that relate to everyday life. In addition, students will develop problem solving skills and a scientific vocabulary while using the scientific method and gaining factual scientific knowledge.

Course Content, Format, and Bibliography

Content

Electric Forces and Electric Fields

- Electric charge and Coulomb's law

- Electric field and superposition

- Electric flux and Gauss' Law

Electric energy and Capacitance

- Potential difference

- Work and energy in electrostatics

- Equipotential surface

- Capacitors with dielectrics

Current and Resistance

- Electric current

- Resistance, resistivity, and Ohm's Law

- Work and power in electric circuits

Direct-current Circuits

- Resistors in series and parallel

- Kirchhoff's rules

- RC circuits

Magnetism

- Magnetic Fields

Force on charged particles and a current-carrying conductor in magnetic field

Ampere's law

Torque on a current loop

Induced Voltages and Inductance

Induced emf

Faraday's law and Lenz' law

Mutual inductance and self inductance

LR and LC circuits

Alternating-Current Circuits and Electromagnetic waves

R-L-C series circuits

Series resonance

Speed and types of electromagnetic waves

Maxwell's equations

Reflection and Refraction of Light

The nature of light

Reflection and the law of refraction

Total internal reflection

Mirrors and Lenses

Images formed by concave and convex mirrors

This lenses

Wave Optics and Optical Instruments

Interference and diffraction

Polarization of light waves

The camera, eye, and microscope

Relativity and Quantum Physics

Special relativity

The photoelectric effects and Compton effect

The particle theory of wave

Wave function and uncertainly principle

Atomic Physics

The atomic spectra and Bohr model of atom

The Exclusion principle and periodic table

Nuclear Physics

Properties of nuclei and binding energy

Radioactivity and nuclear reactions

Format

The general format by which PHYC 112 is taught consists of lectures (including demonstrations and problem solving) and laboratory. Students are expected to attend three lecture periods per week plus one laboratory session. During the laboratory session they complete an experiment related to subject matter discussed in the lecture periods.

The course content is selected from the following sample schedule for the fifteen weeks of instruction. (Note: The number of exams may vary depending on the instructor. Likewise, problem solving abilities are developed through homework problem assignments, and this number varies depending on the instructor.)

Bibliography

College Physics, 9th Ed by Serway and Vuille, Brooks/Cole Cengage Learning