

PH102: General Physics II

1 Course Description

PH 102: General Physics II. Four hours.

Prerequisite: PH 101.

A non-calculus-based introductory course including electricity and magnetism, optics, and modern physics. Lectures and laboratory. Students will be introduced to the essential conceptual and mathematical structure of electricity, magnetism, optics, and modern physics (including quantum, atomic, and nuclear physics). Laboratory experiments will augment lecture- and discussion-based learning, and introduce students to key experimental techniques and analysis. The course will stress a conceptual understanding of everyday phenomena and recent technologies in terms of their basic underlying physical principles.

2 Course Objectives

General Learning Outcomes for 100- and 200-level courses

1. Scientific method: Students will understand the scientific method and critically evaluate scientific information.[knowledge, evaluation, analysis]
2. Effective teamwork: Students will develop skills in working together in team activities

Anticipated Learning Outcomes for this Course

Upon completion of this course you should have a basic understanding of electricity (including electric circuits), magnetism, optics, special relativity, quantum physics, and atomic and nuclear physics. Expected learning outcomes include but are not limited to the following.

1. Conceptual understanding of forces: Students will understand concepts which require a solid knowledge of electrical and magnetic forces and formulate solutions to physical problems.
2. Conceptual understanding of fields and potential: Students will understand concepts of electric fields and electric potential to and apply these to relevant problems.
3. Knowledge of electrodynamics: Students will understand the dynamical relationships between electric and magnetic quantities and use them to formulate solutions to physical problems.
4. Analysis of electric circuits: Students will analyze electric circuits and predict their function.
5. Knowledge of optics: Students will solve problems which require the knowledge of ray optics and optical image formation.
6. Identify the basic principles of special relativity and their consequences
7. Identify the basic principles of quantum physics and their consequences

8. Knowledge of basic atomic and nuclear physics, and identify their relevance to the macroscopic properties of matter and current technologies

2.1 Assessment of Learning Outcomes for this Course

1. A concept inventory test administered at the start and completion of the course
2. Homework questions which encourage students to think through the principles they have learned rather than making rote application of basic equations and standard approaches. This includes questions which require in part or in whole discursive answers.
3. Weekly quizzes designed to encourage students to keep up with the course and to provide experience in responding to exam-like questions.
4. Hour examinations periodically during the semester to assess the students' cumulative knowledge of the material to date.
5. A comprehensive final examination at the end of the course.
6. Rigorous application of a reasonable academic standard which encourages students to make the necessary effort to achieve the objectives of the course.

3 Course Topics

Physics 102 covers a great deal of material, much of which is directly relevant for the Medical College Admissions Test (MCAT). Below is a broad list of topics we will cover, in roughly the order in which we will cover them:

- Relativity
- Electric forces and fields
- Electrical energy and capacitance
- Current and resistance
- dc circuits
- Magnetism
- Electromagnetic induction and ac circuits
- Electromagnetic waves & the nature of light
- Reflection and Refraction
- Mirrors and Lenses
- Wave optics
- Quantum physics
- Atomic physics
- Nuclear physics