PHYS 252
General Physics III
4 Credits (3 lecture hours, 3 laboratory hours, and 1 recitation hour)

Community College of Baltimore County
Common Course Outline

Description

PHYS 252 – General Physics III: includes electromagnetic waves, geometric and physical optics, the special theory of relativity, and selected topics in modern physics. It serves as the third course in a set of three calculus-based courses in the basic principles of physics for students who plan to major in Engineering, Mathematics or a physical science.

Co-requisites: Concurrent enrollment in or successful completion of PHYS 251 with a grade of "C" or better

Overall Course Objectives

Upon completion of this course, students will be able to:

1. compare the behavior of light waves and electromagnetic waves;
2. analyze arrangements of lenses and mirrors using geometric optics;
3. apply geometric optics to optical instruments;
4. apply physical optics to spectroscopic instruments;
5. apply the tenets of special relativity to problem solving;
6. estimate the sizes of atoms and nuclei;
7. compare and contrast the behaviors of waves and small particles;
8. demonstrate the particle nature of light (photoelectric effect) and the wave nature of particles (diffraction of electrons);
9. apply the Wilson-Sommerfeld quantization rule to simple physical systems; and
10. analyze the hydrogen atom with both the Bohr and Schrödinger models.

Major Topics

I. The nature and propagation of light
II. Geometric optics
    a. Laws of reflection and refraction
    b. Ray tracing
    c. Thin lens equation
III. Optical instruments
IV. Interference and diffraction
V. Special relativity
    a. Length contraction
    b. Time dilation
    c. Momentum and energy
    d. Doppler effect

VI. Photons, electrons, and atoms
   a. Heisenberg Uncertainty Principle
   b. Sizes of atoms and nuclei
   c. Photo-electric effect
   d. Compton scattering
   e. X-Ray diffraction
   f. Electron diffraction
VII. The 'old' quantum mechanics
   a. Wilson-Sommerfeld rule
   b. Simple harmonic oscillator
   c. Particle in a one-dimensional box
   d. Particle under the influence of a constant force (bouncing ball)
   e. Rotors
   f. Bohr atom
VIII. Wave mechanics
   a. Schrödinger equation
   b. Particle in a box
   c. Simple harmonic oscillator
   d. Tunneling
   e. Hydrogen atom
   f. Orbital angular momentum and electron spin
IX. Nuclear Physics
   a. Properties of nuclei
   b. Stability and radio-activity
   c. Fission and fusion

Course Requirements

Grading will be determined by the individual faculty member, but shall include the following, at minimum:

- four proctored examinations with limited, instructor-provided notes, one of which may be a comprehensive final, that count as 60% to 70% of the final grade.
- six quizzes and/or homework problem sets that count as 10% to 15% of the final grade. Occasionally, department assessment tools may be administered; any credit for such assignments shall be included in this category.
- eleven laboratory exercises that count as 20% to 25% of the final grade.

The instructor may require additional assignments that count up to 10% of the final grade, for a total of 100%.

No more than 2% of the final grade can be earned extra credit.

Attendance will be taken each class period as *per* college policy, but no points will be awarded or docked for attendance. However, assignments may be given that can only be completed within a certain class period.

Written assignments and research projects: Students are required to use appropriate academic resources in their research and cite sources according to the style selected by their professor.

Other Course Information

This course is the third of a three-course set that also includes PHYS 151 and PHYS 251. It may be taken concurrently with PHYS 251.

Date Revised: 12/16/2025