

Common Course Outline

PHYS 252

General Physics III

4 Semester Hours

Community College of Baltimore County

Description

PHYS 252 - General Physics III includes kinetic theory, thermodynamics, thermal energy and heat transfer, and selected topics in modern physics; serves as the third course in a sequence of three calculus-based courses in the basic principles of physics for students who plan to major in Engineering, Mathematics or Physical Sciences.

4 credits; 3 lecture hours, 1 recitation hour, and 3 laboratory hours.

Prerequisites: A grade of C or better in PHYS 151.

Co-requisite: PHYS 251 (May be taken concurrently).

Overall Course Objectives

Upon completion of this course, the student will be able to:

1. analyze arrangements of lenses and mirrors using geometric optics;
2. apply geometric optics to optical instruments;
3. measure and compare the speed of light with the speed of electromagnetic waves;
4. measure and compare the behavior of light waves and electromagnetic waves;
5. apply the tenets of special relativity to problem solving;
6. compare and contrast the behaviors of waves and small particles;
7. demonstrate the particle nature of light (photoelectric effect) and the wave nature of particles (diffraction of electrons);
8. apply the Wilson-Sommerfeld quantisation rule to simple physical systems;
9. analyze the hydrogen atom with both the Bohr and Schrödinger models;
10. estimate the sizes of atoms and nuclei;
11. predict the results of sub-atomic reactions;
12. perform a collaborative laboratory investigation;
13. use computer-based data collection methods;
14. plot and analyze data using Excel;
15. evaluate the results of experiments in terms of supporting or disproving theoretical concepts;
16. find, evaluate, use, and locate appropriate resources such as the accepted values of measured quantities or useful physical relationships not discussed in class by using appropriate technology or other more traditional reference sources;

17. write coherent laboratory reports that follow the required format;
18. properly acknowledge reference sources and others' contributions to collaborative work;
19. find, evaluate, use, and locate reliable information, such as the accepted values of measured quantities or useful physical relationships not discussed in class by using appropriate technology or other more traditional reference sources;

Major Topics

- I. The nature and propagation of light
- II. Geometric optics
 - A. Ray tracing
 - B. 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. Constant force
 - E. 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: Grading procedures will be determined by the individual faculty member, within the following guidelines:

- a minimum of 3 proctored examinations and final (with limited notes) that count as 60% to 70% of the final grade.
- a minimum of 6 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.
- a minimum of 11 laboratory exercises with formal, typed reports that count as 20% to 25% of the final grade. Lab exercises given as Common Graded Assignments will count as 10% of the overall course grade.
- 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 for attendance. However, assignments may be given that can only be completed within a certain class period.

Written Assignments: Students will use appropriate academic resources.

Other Course Information

This course is the third of a three-course set. It may be taken concurrently with PHYS 251.

Date Revised: 10/30/17