

PHYS 151

General Physics I

4 Credits: (3 lecture hours and 3 laboratory hours)

Community College of Baltimore County
Common Course Outline

Description

PHYS 151 – General Physics I: includes Newtonian mechanics, kinematics and dynamics of translational, rotational, and simple harmonic motions, momentum, energy, and gravitation. It serves as the first 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 Physics. The course requires knowledge of algebra, trigonometry, and calculus.

Pre-requisites: MATH 251 with a grade of C or higher; and ACLT 053 or (ESOL 052 and ESOL 100)

Overall Course Objectives

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

1. solve problems by analyzing uniformly accelerated motion;
2. perform vector addition by graphical and component methods;
3. apply Newton's Laws of Motion to problems involving force analysis;
4. develop models from the Force Laws for Work and Energy, and Impulse and Momentum;
5. analyze circular motion using centripetal force;
6. apply Newton's Law of Universal Gravitation to solving problems;
7. apply the principle of Conservation of Mechanical Energy to solving problems;
8. apply the principle of the Conservation of Linear Momentum to analyzing collisions;
9. analyze rotational motion applying torque and Newton's laws;
10. apply force and torque analysis to static systems;
11. analyze simple harmonic motion to solving problems;
12. use computer-based data collection methods;
13. use appropriate computer programs and software tools to plot and analyze data;
14. evaluate the results of experiments in terms of supporting or disproving theoretical concepts;
15. find, evaluate, use, and cite appropriate resources, including the accepted values of measured quantities;
16. perform a collaborative laboratory investigation;
17. write a coherent laboratory report;
18. evaluate professional behavior within the scientific community including the ramifications of misconduct;
19. properly acknowledge reference sources and others' contributions to collaborative work;
20. compare and contrast the role that Physics has had within various cultures; and

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For more information, see your professor's syllabus.

21. describe the universal applicability of the laws of physics, making them the intellectual property of all cultures.

Major Topics

- I. Introduction
 - a. Standards of length, mass, and time
 - b. Dimensional analysis
 - c. Problem solving strategies
- II. Motion in One Dimension
 - a. Linear displacement
 - b. Velocity
 - c. Acceleration
 - d. Freely falling objects
- III. Vectors
 - a. Vectors and their properties
 - b. Displacement, velocity, and acceleration in two dimensions
 - c. Motion in two dimensions
- IV. Laws of Motion
 - a. Newton's first law
 - b. Newton's second law
 - c. Newton's third law
 - d. Frictional forces
- V. Energy
 - a. Work
 - b. Kinetic and gravitational potential energy
 - c. Spring potential energy
 - d. Conservative and non-conservative forces
- VI. Momentum and collisions
 - a. Momentum and impulse
 - b. Conservation of momentum
 - c. Collisions
- VII. Rotational Motion
 - a. Rotational Kinematics
 - b. Relations between angular and linear quantities
 - c. Torque and angular acceleration
 - d. Angular momentum
- VIII. Equilibrium of Rigid Bodies
- IX. Law of Gravitation
 - a. Newtonian gravitation
 - b. Kepler's laws
- X. Oscillations and Mechanical Waves
 - a. Simple harmonic motion
 - b. Waves
- XI. Sound and Hearing
- XII. Global Developments in Physics

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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; these laboratory exercises include assessment of the General Education Outcomes.
- 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 an approved four-credit General Education course in the Biological and Physical Sciences category that fulfills the laboratory requirement. Please refer to the current CCBC Catalog for General Education course criteria and outcomes.

Multiple assignments will infuse CCBC General Education Program objectives; at least one assignment worth a minimum 10% of the total course grade will allow students to demonstrate General Education Program outcomes. Students are required to make use of appropriate academic resources.

This course is the first of a three-course series that also includes PHYS 251 and PHYS 252.

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