

# Common Course Outline

## PHYS 151

### General Physics I

4 Credits

## Community College of Baltimore County

### Description

**PHYS 151 – General Physics I** serves as the first course in a set of three calculus-based courses in the basic principles of physics for students majoring in Engineering, Mathematics, or a physical science. The course includes Newtonian mechanics, kinematics and dynamics of translational and rotational motions, simple harmonic oscillations, momentum, energy, and gravitation. The course demands a mathematical knowledge of algebra, trigonometry, and calculus.

**4 Credits; 3 lecture hours; 3 laboratory hours**

**Prerequisites:** (MATH 251 with C or higher) and (PHYS 101 or permission of Physical Science Coordinator); and (ACLT 052 or ACLT 053).

### Overall Course Objectives

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

1. solve problems analyzing uniformly accelerated motion;
2. perform vector addition by the 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, Impulse and Momentum;
5. analyze circular motion;
6. apply Newton's Law of Universal Gravitation;
7. apply the principle of Conservation of Mechanical Energy in solving problems;
8. apply the principle of the Conservation of Linear Momentum in analyzing collisions;
9. demonstrate that there are often several ways to model processes and behaviors, that there are limitations to those models, and that there are ethical ramifications to using and misusing models;
10. analyze rotational motion;
11. apply force and torque analysis to static systems;
12. analyze simple harmonic motion;
13. perform a collaborative laboratory investigation;
14. use computer-based data collection methods;
15. plot and analyze data using Excel;
16. evaluate the results of experiments in terms of supporting or disproving theoretical concepts;

17. 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;
18. write coherent laboratory reports that follow the required format;
19. properly acknowledge reference sources and others' contributions to collaborative work, and
20. discuss the universal applicability of the laws of physics, making them the intellectual property of all cultures and segments of humankind.

## **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
  - A. Velocity
  - B. Acceleration
  - C. 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
  - A. Newton's second law
  - B. Newton's third law
  - C. 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
  - A. Conservation of momentum
  - B. Collisions
- VII. Rotational Motion
  - A. Rotational kinematics
  - A. Angular speed and angular acceleration
  - B. Relations between angular and linear quantities
- VIII. Law of Gravitation
  - A. Newtonian gravitation
  - B. Kepler's laws
- IX. Rotational Dynamics
  - A. Torque and equilibrium

- B. Torque and angular acceleration
- C. Angular momentum
- X. Equilibrium of Rigid Bodies
- XI. Oscillations and Mechanical Waves
  - A. Simple harmonic motion
  - B. Waves – frequency, amplitude, and wavelength
- XII. Sound and Hearing
- XIII. Global Developments in Physics
- XIV. Universal Application of Physics Principles

### **Course Requirements**

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 typed, formal 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: At least eleven formal typed laboratory reports will be required. Students are required to make use of appropriate academic resources. 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 at least 5 of the 7 General Education Program outcomes.

### **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.

This course is the first of a three-course set.