

# Common Course Outline

## PHYS 101

### Fundamentals of Physics I

4 Credits

## Community College of Baltimore County

### Description

**PHYS 101 -4 Credits - Fundamentals of Physics I** introduces the topics Newtonian kinematics, dynamics, statics, momentum, energy, and heat. This course is appropriate for students interested in health care professional schools (*e.g.*, medical, physical therapy, pharmacy, dental) and for students in technical programs that require non-calculus based physics. Students majoring in engineering, mathematics, or physics may be required to take the PHYS 151, 251, 252 sequence.

**4 Credits:** 3 lecture hours and 3 laboratory hours per week

**Prerequisites:** MATH 135 with a grade of B or higher, or MATH 163 with a grade of C or higher, or MATH 165 with a grade of C or higher, or any 200-level MATH course and ACLT 052 or ACLT 053.

### 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, Impulse and Momentum;
5. analyze circular motion using centripetal force;
6. apply Newton's Law of Universal Gravitation;
7. use the principle of Conservation of Mechanical Energy in solving problems;
8. use the principle of the Conservation of Linear Momentum in analyzing collisions;
9. analyze rotational motion applying torque and Newton's law ;
10. apply force and torque analysis to static systems;
11. analyze simple harmonic motion;
12. perform a collaborative laboratory investigation
13. use computer-based data collection methods;
14. plot and analyze data using appropriate computer programs and software tools;
15. evaluate the results of experiments in terms of supporting or disproving theoretical concepts;
16. find, evaluate, use and locate appropriate resources, including the accepted values of measured quantities;
17. write coherent laboratory reports;
18. evaluate professional behavior within the scientific community and explain 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
21. describe 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
  - 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. 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. Oscillations and Mechanical Waves
  - A. Simple harmonic motion
  - B. Waves: frequency, amplitude, and wavelength
- XI. Sound and Hearing
- XII. Thermal Physics
  - A. Temperature
  - B. Zeroth Law of Thermodynamics
  - C. Thermometers and Temperature Scales
  - D. Ideal Gas Law
  - E. Heat and Internal Energy

- F. Sensible Heat
  - G. Specific Heats and Calorimetry
  - H. Latent Heat and Phase Changes
  - I. Energy Transfer.
- XIII. Global Developments in Physics

### **Course Requirements**

Grading procedures will be determined by the individual faculty member but will include the following:

### **Grading/exams:**

- Minimum of 3 exams and a final that count as 70 % of the final grade
- 6 quizzes and/or homework problem sets that count as 10% of the final grade. Occasionally, department assessment tools may be administered; any credit for such assignments shall be included in this category.
- 11 laboratory exercises that count as 20% of the final grade. At least six of these must be formal written reports. 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.

### **Writing:**

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. Students are required to make use of appropriate academic resources.

### **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 two-course sequence.

Date Revised: 05/16/19