

Common Course Outline

PHYS 251

General Physics II

4 Semester Hours

Community College of Baltimore County

Description

PHYS 251 – General Physics II introduces electricity and magnetism, kinetic theory, thermodynamics, thermal energy, and heat. It builds on PHYS 151 as the second course in a three-semester set of calculus-based courses in the basic principles of physics for students majoring in Engineering, Mathematics, or a physical science.

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

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

Overall Course Objectives

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

1. apply Coulomb's law of electrostatic force;
2. solve problems of force and motion in electric fields;
3. develop models of electric potential from energy and electrostatic force concepts;
4. demonstrate that there are often several ways to model processes and behavior, explain the limitations of those models, and discuss the ethics of using and misusing models;
5. analyze elementary Direct Current (DC) circuits with Ohm's relationship and Kirchhoff's rules;
6. apply the Lorentz magnetic force laws;
7. solve induction problems with Faraday's law and Lenz's law;
8. analyze series Resistor-Inductor-Capacitor Alternating Current (RLC AC) circuits using Kirchhoff's rules;
9. solve problems related to energy and entropy;
10. derive relationships for the kinetic theory of gases;
11. perform a collaborative laboratory investigation;
12. use computer-based data collection methods;
13. plot and analyze data using Excel;
14. evaluate the results of experiments in terms of supporting or disproving theoretical concepts;
15. 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;

16. write coherent laboratory reports that follow the required format;
17. properly acknowledge reference sources and others' contributions to collaborative work;
18. 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;
19. explain the expectations of professional behavior within the scientific community and the ramifications of misconduct, 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. Electric Charge and Electric Field
 - A. Coulomb's law
 - B. Electric field
- II. Gauss's Law
- III. Electric Potential
- IV. Capacitance and Dielectrics
 - A. Capacitance
 - B. Series and parallel combinations of resistors
- V. Current, Resistance, and Electromotive Force
 - A. Current
 - B. Resistance
 - C. Ohm's relationship
 - D. Batteries
 - E. Series and parallel combinations of resistors
 - F. Power
- VI. Direct-Current Circuits
 - A. Resistor network reduction
 - B. Kirchhoff's rules
 - C. Resistor-capacitor (RC) circuits
 - D. Inductor-resistor (LR) circuits
- VII. Magnetic Field and Magnetic Forces
 - A. Magnets and the earth's magnetic field
 - B. Lorentz force
 - C. Magnetic fields of simple configuration currents
 - D. Ampère's law
 - E. Magnetic effects and domains
- VIII. Electromagnetic Induction and AC Circuits
 - A. Faraday's law
 - B. Self-inductance
 - C. LR circuits

- D. Mutual inductance and transformers
- E. AC LRC circuits and resonance
- IX. Temperature and Heat
 - A. Zeroth law of thermodynamics
 - B. Thermal expansion
 - C. Mechanisms of heat transfer
- X. Thermal Properties of Matter
 - A. Ideal gases
 - B. Heat capacities and calorimetry
 - C. Latent heat and phase changes
- XI. First Law of Thermodynamics
 - A. Work
 - B. Internal energy
- XII. Second Law of Thermodynamics
 - A. Heat engines
 - B. Carnot cycle
 - C. Entropy
- XIII. Global Developments in Physics
- XIV. Universal Application of Physics Principles

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: Multiple assignments will infuse CCBC General Education Program objectives. Students will use appropriate academic resources.

Other Course Information

This course is an approved 4-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 second of a three-course set and may be taken concurrently with PHYS 252.

Date Revised: 10/25/2017