

# **COURSE OUTLINE**

## **PHYS-104**

### **Fundamentals of Physics II**

**4 Semester Hours**

**Science Core Course**

## **HOWARD COMMUNITY COLLEGE**

### **Description**

Physics 104, a course designed mainly for science majors and preprofessional students, will enable the student to solve problems involving the major concepts in physics to include wave motion, sound, electrostatics, electric currents, circuits, electronics, magnetism, electromagnetic interactions, nature and properties of light, optics, and some modern physics. The student will develop the ability to interpret and apply the experimental laws and fundamental principles of physics to describe the behavior of the physical world. In the laboratory program, the student will develop the ability to appraise, use and interpret data collected (often by MBL) to express mathematically and/or explain the physical phenomena observed. Prerequisite: MATH-133 and PHYS-103. (3 hours lecture, 3 hours lab)

### **Statement on General Education and Liberal Learning**

A liberal education prepares students to lead ethical, productive, and creative lives and to understand how the pursuit of lifelong learning and critical thinking fosters good citizenship. General education courses form the core of a liberal education within the higher education curriculum and provide a coherent intellectual experience for all students by introducing the fundamental concepts and methods of inquiry in the areas of mathematics, the physical and natural sciences, the social sciences, the arts and the humanities, and composition. This course is part of the general education core experience at Howard Community College.

### **Overall Course Objectives**

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

1. Identify and address their physics alternate concepts (misconceptions).
2. Interpret physics facts and principles.
3. Apply physics principles to solve problems and explain practical physics applications to include an oral explanation to the class.
4. Develop the ability to appraise, use and interpret experimental laboratory data and/or computer data collected to correctly solve and/or explain the physical phenomena observed (including one short lab group oral summary of the previous week's lab).
5. Demonstrate an understanding of the terminology of physics including units, name of equipment and vocabulary.
6. Develop skill in performing elementary physics experiments to obtain satisfactory results and conclusions.
7. Operate correctly each piece of apparatus.
8. Observe all safety regulations in the laboratory.
9. Write, using correct data collection, organization and analysis techniques, a complete formal laboratory report written (utilizing proper grammar) to include: title of experiment, objectives, data and observations, results and conclusions.
10. Utilize a microcomputer for collection and analysis of lab data (microcomputer-based labs with probes), simulation, and problem/concept drill.

## **Major Topics**

- I. Wave Motion
  - A. Harmonic Motion and Oscillations
  - B. Physical Properties and Applications of Wave Motion
  - C. Superposition and Standing Waves
  - D. Sound Including Doppler Effect
  
- II. Static and Current Electricity
  - A. Electrostatic Field Properties including Electric Potential and Capacitance.
  - B. Electric Current including EMF, Resistance and Ohm's Law, Electric Power, and Measuring Instruments
  - C. Direct Current Circuit Theory including Series/Parallel Resistors
  
- III. Electromagnetism
  - A. Magnetic Field Properties and Applications
  - B. Electromagnetic Interactions, Fields and Devices, e.g., Motors, Generators, Transformers, etc.
  - C. Alternating Current Theory, Devices and Circuits
  - D. Electronics including Semi-conductors, Transistors and Integrated Circuit Devices
  
- IV. Light and Optics
  - A. Light Properties, e.g., Wave Particle Properties, Reflection, Refraction, Diffraction, Interference and Polarization
  - B. Lens and Mirror Optics (including ray diagrams)
  
- V. Modern Physics (if time permits)
  - A. Spectra and Quantum Phenomena
  - B. Relativity
  - C. Nuclear and Atomic Physics

## **Course Requirements**

**Grading/exams:** Grading procedures will be determined by the individual faculty member but will be calculated on the basis of exams, assigned homework problems, and lab experiments. The course includes a comprehensive final exam. Written formal lab reports will be required.

**Writing:** Specific writing assignments will be determined by the individual faculty member but will include formal lab reports.

**Oral Communications:** Specific oral communications assignments will be determined by the faculty member but will include at least an oral report to the class, a group lab oral summary, and problem solution explanation to the class.

## **Other Course Information**

This course is a Science core course, Science elective and an Arts and Sciences elective.