

## **COURSE OUTLINE** **Basic Physics I**

### **Course Description**

PH 130. Basic Physics 1. 5 hours credit. Prerequisite: MA 120 with a C or better or equivalent. This course will enable the student to approach physics with practical applications. Force, work, rate, and momentum and resistance are taught in the course. Students are shown how these five concepts are applied to four energy systems – mechanical, fluidal, electrical, and thermal. Students perform practical laboratory experiments that relates each concept to the four energy systems.

### **Course Relevance**

The impact of physics in everyday life is phenomenal. The ability to see physics in action is necessary to develop a fuller knowledge and understanding of the world around us. Physics will enrich the student's appreciation of the world and help him/her better understand the studies of science and the scientific methods.

### **Required Materials**

Hewitt, P. G.. (2010). *Conceptual physics*. (11<sup>th</sup> ed.). Addison-Wesley.

This is an online course. Access to the course by the use of ANGEL

### **Learning Outcomes**

The intention is for the student to be able to:

1. Understand the scientific method.
2. Read, communicate and understand scientific materials.
3. Demonstrate knowledge of basic math skills.
4. Apply scientific reasoning to real world problems.

### **Learning PACT Skills that will be DEVELOPED and/or documented in this course**

Through the student's involvement in this course, he/she will develop his/her ability in the following PACT skill areas:

#### **Personal Development Skills**

1. Personal management
  - Through the production of either an essay or questionnaire the student will reflex on their personal management skills.

#### **Analytical Thinking Skills**

1. Critical thinking
  - Through the production of various mathematical, graphical, experimental and written assignments, the student will demonstrated scientific reasoning.

#### **Communication Skills**

1. Creation and delivery of messages

- Through a variety of methods using either the internet and/or computer the student will produce a product to express their findings laboratory reports.

### **Technology Skills**

#### 1. General computer use

- Through the production of electronic-facilitated research, preparing the graphs, and manipulation of data, the student develops basic computer skills

### **Major Summative Assessment Task(s)**

These learning outcomes and the Learning PACT skills will be demonstrated by

1. Writing laboratory reports, which includes observations, and analysis of the experiment.
2. Completing the departmental comprehensive final.
3. Writing a research paper or assignment.
4. Completing a student self-assessment.

### **Course Content**

- I. Skills/Competencies – Actions that are essential to achieve the course outcomes:
  - A. Apply basic mathematical concepts
  - B. Write a research paper
  - C. Prepare lab reports
- II. I. Themes – Key recurring concepts that run throughout this course:
  - A. Scientific method
  - B. Scientific reasoning
- III. Issues – Key areas of conflict that must be understood in order to achieve the intended outcome:
  - A. The balance between the conceptual and mathematical models.
  - B. The cumulative nature of science and the world.
  - C. The cumulative influence of scientific discoveries and the subsequent application of the discoveries.
  - D. The balance between lab science and computer interfacing, collection, and analysis of data.
- IV. Concepts – Key concepts that must be understood to address the issues:
  - A. Mathematics
  - B. Scientific method
  - C. Scientific reasoning
  - D. Scientific writing
  - E. Scientific principles
  - F. MLA writing format
  - G. Word processing
  - H. Excel spreadsheet
  - I. Graphing

### **Learning Units**

- I. Introduction to science and physics
  - A. Define what science is and list requirements
  - B. Define the term physics

- C. Point out the importance of physics as it relates to science and the universe
- II. Units and measurements
    - A. Demonstrate competence in measuring by using common tools
    - B. Convert between units and unit systems
    - C. Grasp an understanding of units and numbers in the metric system
    - D. Define quantitative and qualitative measurements
  - III. Simple motion
    - A. Describe qualitatively speed and velocity
    - B. Illustrate difference between average and instantaneous speed and velocity
    - C. Discuss differences between speed and velocity
    - D. Introduce and elaborate on acceleration due to gravity
  - IV. Newton's Laws of Motion
    - A. Define the concept of force and its units of measure
    - B. Introduce the concept of gravity
    - C. Explain the concept of inertia
    - D. Introduce Newton's Three Laws of motion
    - E. Differentiate between mass and weight
    - F. Uncover the concept of free fall
    - G. Briefly introduce the concept of friction
  - V. Energy
    - A. Become familiar with the different forms of energy
    - B. Define and differentiate between kinetic and potential energy
    - C. Introduce the Law of Conservation of Energy
  - VI. Work, energy, and simple machines
    - A. Introduce the concept of work and the appropriate units
    - B. Introduce the concept of power and the appropriate units
    - C. Present the meaning of efficiency
    - D. Identify what a simple machine is
    - E. Discuss the mechanical advantage of a pulley, lever, incline plane, and a wheel and axle
  - VII. Thermal energy
    - A. Define the term heat
    - B. Differentiate between temperature and heat
    - C. Define the Kelvin scale
    - D. Introduce the 1<sup>st</sup> Law of Thermodynamics
  - VIII. Power plants (energy production and introduction into the atom)
    - A. Discuss and identify the components of the atom
    - B. Briefly overview about nuclear physics
    - C. Identify the different ways in which electricity can be produced

- D. Label and discuss the major components of a nuclear, coal burning, and hydroelectric plants
- E. Learn how a generator produces electricity

IX. Electricity

- A. Define what electricity is and its association with an atom
- B. Differentiate between conductors and insulators
- C. Introduce the electricity and force connection
- D. Transfer of electrical charge

X. Magnetism

- A. Discuss the process of becoming magnetic (domains and aligning of dipoles, and behavior of the atom in such a substance)
- B. Differentiate the different types of magnetism (hard and soft)
- C. Introduce the concept of magnetic poles

XI. Electromagnetism

- A. Introduce the connection of electricity and magnetism
- B. Introduce the magnetic field with a coil
- C. Discuss the factors effecting a magnetic field
- D. Discuss the basic principle of electromagnetic induction

XII. Sound

- A. Identify and label the major components of a wave
- B. Discuss what sound is and how it is produced
- C. Introduce the phenomenon of Doppler Effect
- D. Differentiate between pitch, loudness, and octave
- E. Describe the phenomenon of resonance
- F. Briefly describe how an ear hears sound

XIII. Light

- A. Become aware that light is a form of energy
- B. Calculate  $c$
- C. Identify the different components of the electromagnetic spectrum
- D. Discuss what color is and how we see it
- E. Determine what polarized light is
- F. Discuss how a CD and player works

XIV. Work in the laboratory in accordance with good laboratory practices

XV. Gather and record qualitative and quantitative data accurately

XVI. Handle and evaluate data in logical, productive, and meaningful ways

XVII. Construct a graph and interpret graphical data.

**Learning Activities**

Independent and collaborative learning activities will be assigned within and outside the classroom and laboratory to achieve the intended course outcomes. Classroom discussion, lecture, and textbook reading assignments will also contribute to the learning process.

**Grade Determination**

Grade determination will be based on the research paper, tests, lab reports, and comprehensive final exam. Other methods such as quizzes, homework may be used at the discretion of the instructor. The departmental final, and student self evaluation is a department requirement.