

## **COURSE OUTLINE** Applied Physics I

**Course Description:** PH109. Applied Physics. 3 hours credit. Prerequisite: MA114 or equivalent. This is a course in applied science for those who plan to pursue careers as technicians or who just want to keep pace with the advances in technology. Students perform practical laboratory experiments that relate each concept of the four energy systems. It blends an understanding of these basic principles with practice in practical applications. It will give the student a firm foundation for understanding today's and tomorrow's technology.

**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:**

Textbook: Hewitt, Paul G. (2002). *Conceptual Physics* (9<sup>th</sup> edition). Addison-Wesley..

Computer: On-line course, access to internet for WEBCT

### **Learning Outcomes:**

The intention is for the student to be able to analyze scientific materials in various forms demonstrating:

1. An understanding of the scientific method
2. An ability to read, communicate and understand scientific materials
3. Knowledge of basic math skills
4. An ability to apply scientific reasoning to real world problems

### **Primary Learning PACT Skill(s) that will be DEVELOPED and/or documented in this course:**

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

1. Critical thinking
  - The student will demonstrate scientific reasoning through a variety of mathematical, graphical, experimental, and written assignments.
2. Writing
  - The student will write laboratory reports, which include observations, and analysis of the experiment.
  - The student will write a research paper on an approved topic in physics.

Secondary skills (developed but not documented)

- Speaking
- Computer literacy
- Internet use
- Teamwork

Ethical conduct

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

These learning outcomes and the primary learning PACT skills will be demonstrated by:

1. Write laboratory reports, including purpose, procedural, observations, and analysis of the experiment using scientific reasoning
2. Writing a research paper or preparing a project upon a topic of physics as assigned by the instructor.
3. Final assessment of the course using the departmental final.

**Course Content:**

- I. Themes - Key recurring concepts that run throughout the course:
  - A. Scientific method
  - B. Scientific reasoning
- II. Issues - Key issues that will be addressed in this course: 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 physics and computer interfacing, collection and analysis of data
- III. Concepts – Key concepts that must be understood to address the issues:
  - A. Mathematics
  - B. Visual/conceptual
  - C. Scientific Methods
  - D. Scientific Reasoning
  - E. Modeling
  - F. Scientific writing
  - G. Scientific principles
  - H. MLA writing format
  - I. Word processing
  - J. Excel spreadsheet
  - K. Graphing
  - L. Characteristics and impact of science in the world around them
- IV. Skills/Competencies - Actions that are essential to achieve the course outcomes:
  - A. Mathematics
  - B. Writing
  - C. Reading
  - D. Speaking
  - E. Computer Literacy
  - F. Computer Spreadsheet/Graphing
  - G. Internet Use
  - H. Teamwork

**Learning Units**

- I. Lecture

- A. Introduction to Science and Physics
  - 1. define what science is and list requirements
  - 2. define the term physics
  - 3. point out the importance of physics as it relates to science and the universe
  
- B. Units and Measurements
  - 1. demonstrate competence in measuring by using common tools
  - 2. convert between units and unit systems
  - 3. grasp an understanding of units and numbers in the metric system
  - 4. define quantitative and qualitative measurements
  
- C. Simple motion
  - 1. describe qualitatively speed and velocity
  - 2. illustrate difference between average and instantaneous speed and velocity
  - 3. discuss differences between speed and velocity
  - 4. describe qualitatively acceleration
  - 5. introduce and elaborate on acceleration due to gravity
  
- D. Newton's Laws of Motion
  - 1. define the concept of force and its units of measure
  - 2. Introduce the concept of gravity
  - 3. explain the concept of inertia
  - 4. introduce Newton's Three Laws of Motion
  - 5. differentiate between mass and weight
  - 6. uncover the concept of free fall
  - 7. briefly introduce the concept of friction
  
- E. Energy
  - 1. become familiar with the different forms of energy
  - 2. define and differentiate between kinetic and potential energy
  - 3. introduce the Law of Conservation of Energy
  
- F. Work, Energy, and Simple Machines
  - 1. Introduce the concept of work and the appropriate units
  - 2. introduce the concept of power and the appropriate units
  - 3. present the meaning of efficiency
  - 4. identify what a simple machine is
  - 5. discuss the mechanical advantage of a pulley, lever, incline plane, and a wheel and axle
  
- G. Thermal Energy
  - 1. define the term heat
  - 2. differentiate between temperature and heat
  - 3. define the Kelvin scale
  - 4. introduce the 1<sup>st</sup> Law of Thermodynamics

#### H. Power Plants (energy Production and Introduction into the Atom)

1. discuss and identify the components of the atom
2. briefly overview about nuclear physics
3. Identify the different ways in which electricity can be produced
4. label and discuss the major components of a nuclear, coal burning, and hydroelectric plants
5. learn how a generator produces electricity

#### I. Electricity

1. define what electricity is and its association with an atom
2. differentiate between conductors and insulators
3. introduce the electricity and force connection
4. transfer of electrical charge

#### J. Magnetism

1. discuss the process of becoming magnetic (domains and aligning of dipoles, and behavior of the atoms in such a substance)
2. differentiate the different types of magnetism (hard and soft)
3. introduce the concept of magnetic poles

#### K. Electromagnetism

1. introduce the connection of electricity and magnetism
2. introduce the magnetic field with a coil
3. discuss the factors effecting a magnetic field
4. discuss the basic principle of electromagnetic induction

#### L. Sound

1. Identify and label the major components of a wave
2. discuss what sound is and how it is produced
3. introduce the phenomenon of Doppler Effect
4. differentiate between pitch, loudness, and octave
5. describe the phenomenon of resonance
6. briefly describe how an ear hears sound

#### M. Light

1. Become aware that light is a form of energy
2. calculate  $c$
3. identify the different components of the electromagnetic spectrum
4. discuss what color is and how we see it
5. determine what polarized light is
6. discuss how a CD and player works

#### **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 may include tests, projects, quizzes, homework, written assignments and laboratory experiments. Other methods may be used at the discretion of the instructor.