

## **Educational Goals for Physics Students & Assessable Learning Outcomes**

### **PHY 210 GENERAL PHYSICS I / 3 credits**

Newtonian mechanics, sound propagation, heat transfer, and thermodynamics using algebra and trigonometry. Prerequisite: MTH 110 or permission of instructor.

#### **General Education Objectives (proposed)**

- 1. Students can apply critical thinking to pose and answer questions.**
- 2. Students can use the processes and methods of science and mathematics to demonstrate how reproducible results give rise to the discovery of fundamental laws and the development of theories.**
- 3. Students can articulate a basic knowledge of current scientific understanding of the universe and the scientific and mathematical laws that govern it.**
- 4. Students can summarize, interpret, analyze, and critically evaluate data and reports relating to the natural sciences and mathematics.**

#### **Physics Program Objectives**

There are several general goals of the Physics program that students completing the physics program should have. A non-exhaustive list of these program objectives include:

- (a) Ability to perform a mathematical formulation of a physical system
- (b) Ability to discuss (mathematically and linguistically) a physical system drawing upon a well-developed foundation built upon physical fundamentals.
- (c) Ability to formulate complex arguments based upon physical foundations and which are testable by experimentation.
- (d) Ability to produce technologically enabled students with an understanding of the basis for experimental design.

#### **A non-exhaustive list of intended learning outcomes follows**

- (a) Ability to convert units.
- (b) Ability to work with algebraic vectors.
- (c) Ability to describe 1-dimensional motion in the presence of uniform accelerations.
- (d) Ability to describe 2-dimensional motion in the presence of uniform accelerations.
- (e) Ability to use Newton's laws of motion in algebraic form.
- (f) Ability to construct and use free-body diagrams in problem formulation.
- (g) Ability to apply principles of energy conservation for conservative and non-conservative systems.
- (h) Ability to work with Newton's law of gravitation and gravity in general as an example of a conservative force.
- (i) Ability to provide mathematical analysis necessary to describe systems undergoing uniform circular motion.
- (j) Ability to apply principles of momentum conservation to physical systems.
- (k) Ability to provide mathematical analysis necessary to describe systems undergoing non-uniform circular motion in the presence of uniform external torques.
- (l) Ability to provide mathematical analysis necessary to describe systems undergoing simple harmonic oscillation and the effect of linear restoring forces upon systems.
- (m) Ability to provide mathematical analysis necessary to describe pulses, waves, traveling harmonic waves, transverse and longitudinal oscillations.
- (n) Ability to work with Archimedes' principle and Bernoulli's equation<sup>4</sup>.
- (o) Ability to model the non-leaky ideal gas thermodynamically and to expand this theory to cover systems with more than one degree of freedom.
- (p) Calorimetry and linear expansion.
- (q) Ability to apply the four laws of thermodynamics.
- (r) Ability to apply black body radiation<sup>6</sup>, Newton's law of cooling and the greenhouse effect.