

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

There are several general goals that students completing a physics course should have. Among these general goals are

- (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.

There are several rather specific goals that students completing a physics course should have. A non-inclusive topical course by course list primary outcomes is shown below.

### **PHY 211 GENERAL PHYSICS I LABORATORY / 1 credit**

Experimental techniques for Physics I. Corequisite: PHY 210.

### **PHY 241 FUNDAMENTALS OF PHYSICS I LABORATORY / 1 credit**

Experimental techniques for Fundamentals of Physics I. Corequisite: PHY 240.

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

- (1) Perform simple experiments designed to complement class-room material.
- (2) Analyze data collected in a systematic manner and explore the compliance of this data with anticipated theoretical results.
- (3) Write a detailed technical report covering the particular experiment at hand.
- (4) Ability to discuss with colleagues the physical system under study.
- (5) Develop an experiential-based method of inquiry leading to a scientifically creative individual.

At the present time, approximately 10 experiments are performed. The particular topics presented in the lab experience are essentially dictated by two factors: the pace of the associated course and the availability of lab equipment. The lab course, owing to the necessity and expense of having multiple setups is necessarily slowly evolving. Particular lab choices were determined firstly by availability of existing equipment (in the Fall of 2001) and secondly by the pace of the course. The present incarnation of the lab experiments is composed of the following experiments:

- (a) Forces and Force Tables (hands-on experience with vectors)
- (b) Bernoulli's Equation (motion in two dimensions).
- (c) Atwood's Machine (measurement of acceleration due to gravity)
- (d) Inclined planes and friction (statics, dynamics and non-conservative forces)
- (e) Circular Motion and Hook's law.
- (f) Equilibrium of rigid bodies (statics, torque, and equilibrium)
- (g) Archimedes' principle (fluid statics and dynamics)
- (h) Simple harmonic oscillation.
- (i) Standing waves and vibrations.
- (j) Thermodynamics (linear expansion and calorimetric measurements)