

**MERCER COUNTY COMMUNITY COLLEGE**

**COURSE OUTLINE**  
**Revised Spring 2008**

**PHY 107**

Course Number

**INTRODUCTION TO UNIVERSITY PHYSICS**

Course Title

**Science and Health Professions**

Division

**15 Weeks**

Length of Semester

**2**  
Credits

**2**  
Class Hours

**0**  
Lab Hours

**Text:** Title: **Fundamentals of Physics** Extended  
Author: Halliday & Resnick  
Publisher: John Wiley & Sons  
Edition: 8<sup>th</sup>

Catalog Description:

PHY 107

University Physics I      2 Credits

The first course in a four-semester calculus-based sequence intended for student majoring in engineering science or the physical sciences. The topics studied are kinematics, force, Newton's second law, work, energy, momentum, conservation of energy. Fall offering. 2 lecture hours.

**Prerequisites:** None

**Co requisite:** MAT 151

**Reading level:** High

**Writing level:** High

**Dominick Misciascio**  
**Course Coordinator**

This course is divided into three units of five weeks each.

**General Objectives:**

- I. The student will be able to demonstrate an understanding of the development of classical physics, beginning with Newton about 1600 A.D. and including several other physicists who contributed to the experimental mathematical approach to the explanation of natural phenomenon.
- II. The students will solve physics problems by applying mathematical logic and methods to prove the natural laws of physics and definitions.
- III. The student will demonstrate the use of the calculators, and build on knowledge of simple trigonometry would be helpful but a concurrent course in trigonometry.

**Specific Objectives:**

**Unit I: Fundamental Quantities, Kinematics (5 weeks)**

- I. Fundamental Quantities
  - a. The student will be able to differentiate between fundamental quantities and derived quantities.
  - b. The student will be able to learn that the three fundamental quantities in physics are mass, length, and time.
  - c. The student will be able to learn that there are three systems of measurement.
  - d. Metric (M.K.S.), Gaussian (C.G.S.), and British (F.P.S.) and will have to be able to convert from one system to another.
  - e. The student will be able to learn the common prefixes used in the Metric systems (deci, centi, milli, micro, and kilo) and their scientific notation equivalents.
- II. Structure and Properties of Matter
  - a. The student will be able to learn the nature of matter and the atomic structure of matter.
  - b. The student will be able to learn mathematical definitions of density and specific gravity, and be able to solve problems by using these definitions.

Unit I. – continued:

III. Kinematics – The description of motion:

- a. The student will be able to learn the mathematical definition of velocity and its units in the three systems of measurement.
- b. The student will be able to solve problems dealing with velocity as a vector and speed as a scalar quantity.
- c. The student will be able to learn the principle of vector addition and subtraction by solving problems dealing with velocity and displacement by a graphical method.
- d. The student will be able to learn the mathematical definition and dimension of acceleration in the three systems and to solve problems dealing with acceleration.
- e. The student will be able to solve (one-dimensional-motion-constant acceleration) problems using the following formula and mathematical logic methods:

1.  $v_f = v_o + at$

2.  $s = \left( \frac{v_f + v_o}{2} \right) \times t$

3.  $v_f^2 = v_o^2 + 2as$

4.  $s = v_o t + 1/2at^2$

- f. The student will be able to solve the free-falling bodies problems by using the following formula and mathematical logic and methods:

1.  $v_f = v_o + gt$

2.  $s = \left( \frac{v_f + v_o}{2} \right) \times t$

3.  $v_f^2 = v_o^2 + 2gs$

4.  $s = v_o t + 1/2gt^2$

where  $g = -980 \text{ cm/sec}^2$ ,  $-9.8 \text{ m/sec}^2$ , or  $-32 \text{ ft/sec}^2$

- g. The student will be able to use the components of vectors in solving problems dealing with x- and y- components of velocities displacements.
- h. The students will be able to solve problems dealing with horizontal projection and trajectory motion problems.

Unit I Test should be given at this point. (End of 5<sup>th</sup> week)

**Unit II****I. Dynamics**

- a. The student will be able to learn the three laws of Newton and their importance as the foundation of dynamics of physics.
- b. The student will be able to learn the mathematical form of Newton's Second Law of Motion.  $F = ma$
- c. The student will be able to learn the units of force in the three systems of measurements.
- d. The student will be able to distinguish the difference between mass and weight.
- e. The student will be able to learn the principle of isolating bodies in solving motion problems. (Atwood's machine, elevator, and frictionless incline plane.)
- f. The student will be able to learn the mathematical formula for Newton's law of Gravitation:  $F = \frac{GM_1M_2}{D^2}$  and be able to solve problems using this formula.

**II. Statics and Friction**

- a. The student, while using the principle of isolating bodies and  $F_x=0$  and  $F_y=0$ , will be able to solve simple static equilibrium problems.
- b. The student will be able to learn the definition of center of gravity and apply it to solve static equilibrium of a rigid body problem.
- c. The student will be able to learn the mathematical definitions of torque and use it to solve equilibrium of a rigid body problem.
- d. The student will be able to learn that the force due to friction which opposed motion and is directly proportional to the normal force and will be able to solve motion problems involving sliding friction.

Unit II Test should be given at this point (End of 10<sup>th</sup> week)

**Unit III:** Conservation of Momentum, and Energy, Rotation, Waves, and Vibrations. (5 weeks)

**I. Work, Energy and Power**

- a. The student will be able to learn the definition of work and energy and their dimensions in the three systems of measurements and these quantities are scalar.
- b. The student will be able to learn the law of conservation of energy and solve problems dealing with this principle.
- c. The student will be able to learn the definition of power and its dimensions in the three systems of measurements.

II. Momentum and Impulse

- a. The student will be able to learn the definition of momentum and impulse and their units in the three systems of measurements.
- b. The student will be able to learn the law of conservation of momentum and apply the law to solve collision problems.
- c. The student will be able to learn that momentum and impulse are vector quantities and vector analysis will be applied to solve problems.

Unit III Test should be given at this point (End of 15<sup>th</sup> week)

**PHY 107 – INTRODUCTION TO UNIVERSITY PHYSICS**

**ASSESSMENT**

**Homework:** The student should reach each assigned Chapter carefully before he or she comes to class. The assignments will be collected each week and a grade will be based on 10 of the 15 highest grades. Late homework will not be accepted.

**TESTS:** There will be 3 Unit Tests during the semester. The final exam will consist of material on the 4<sup>th</sup> Unit only. There will be no makeup tests.

**GRADING:** Three Unit tests each for 20% of the final grade.  
Homework Assignments for 20% of the final grade.  
Final Exam for 20% of the final grade.