PHYS 211: Calculus Based Physics I

A. Course Description

Credits: 5

Prerequisites: MATH 210 Calculus I or instructor's permission.

Lab Hours/ Weeks: Corequisites: None

Lecture Hours/ Week :

MnTC Goals: Goal 03 - Natural Science

This is the first course of a two semester sequence covering the fundamental concepts of physics. This course covers Newton's laws of motion, work, energy, linear momentum, rotational motion, gravity, equilibrium and elasticity, periodic motion, fluid mechanics, temperature, heat, and the laws of thermodynamics. Laboratories emphasize application of physics concepts and quantitative problem solving skills. Intended for science majors and general education students with strong mathematical background.

B. Course Effective Dates: 08/26/2006 - 05/03/2011 05/04/2011 - Present

C. Outline of Major Content Areas:

See Course Description for major content areas.

D. Learning Outcomes (General)

1. Formulate and test hypotheses by experiment in physics, including the collection of data, statistical and graphical analysis of results, and interpretation of its sources of error and uncertainty.
2. Ability to use the above listed physics knowledge in quantitative problem solving.
3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.
4. Demonstrate quantitative reasoning skills and competency with arithmetic, algebra, calculus and elementary statistics at a level appropriate for graduates of bachelors degree programs in the sciences.
5. Demonstrate understanding of scientific facts and theories in physics.
6. Demonstrate understanding of the properties of vectors, describe motion in terms of position, velocity and acceleration, and use vectors to describe projectile and circular motion.
7. Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.
8. Recall, describe and apply the concepts, knowledge and vocabulary of physics at the level necessary for success in a second semester Calculus-Based Physics course.
9. Understand and analyze rotational motion in terms of angular displacement, velocity and acceleration, the connection between force and torque.
10. Understand and apply Newton's laws of motion, the concepts of work, energy and power, and the connection between forces and motion and apply the principles of energy and linear momentum conservations in solving problems involving kinetic and potential energy and collisions between objects.
11. Understand the concepts of heat and internal energy and the first law of thermodynamics as applied to heat engines.
12. Understand the properties and phenomena of fluids including buoyancy and laminar flows, and the properties and phenomena of gasses including gas laws and the kinetic theory of gases.

E. Learning Outcomes (MN Transfer Curriculum)
Goal 03 - Natural Science

1. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.

2. Demonstrate understanding of scientific theories.

3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.

4. Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

G. Special Information

Note: First day attendance required except by instructor permission.