Course Outline for: PHYS 1121 Physics 1 for Scientists and Engineers

A. Course Description:

1. Number of credits: 5
2. Lecture hours per week: 4
   Lab hours per week: 2
3. Prerequisites: MATH 1510 (C or higher)
4. Corequisites: None
5. MnTC Goals: Goal #3 - Natural Sciences

In this first semester of a two-semester sequence covering calculus-based introductory physics, students explore the mathematical description of motion (kinematics) and use forces and torques to analyze the behavior of objects and systems (dynamics)—including applications to both rectilinear motion and rotating systems. The course also explores additional approaches using conservation of linear momentum, conservation of angular momentum and conservation of energy and explores periodic oscillations, thermal physics, universal gravitation and additional applications are explored.

B. Date last reviewed/updated: February 2025

C. Outline of Major Content Areas:

1. Kinematics
2. Dynamics
3. Rotational motion
4. Gravitation
5. Conservation of Energy
6. Conservation of Momentum
7. Oscillations
8. Optional topics include Fluids and Thermal Physics

D. Course Learning Outcomes:

Upon successful completion of the course, the student will be able to:

1. Analyze a wide variety of physical situations using a small set of fundamental physical principles - including explaining and predicting motion. (Goal 3a, 2c)
2. Solve problems by using vector components, constructing free body diagrams and applying Newton's 2nd Law to the rectilinear motion of objects and systems. (Goal 3a, 2a)
3. Apply the Laws of Conservation of Energy and Momentum to determine the behavior of simple physical systems. (Goal 3a, 2a)
4. Analyze simple rotational systems using torque, moment of inertia, rotational energy and angular momentum. (Goal 3a, 2c)
5. Analyze data from observations of the physical world. (Goal 3b, 2c)
6. Critically interpret the limitations and uncertainty of data. (Goal 3b)

7. Model complicated physical systems by making approximations and idealizations in order to be able to apply fundamental principles. (Goal 3a, 2c)
8. Communicate results with reasoned arguments, supported by experimental evidence, both orally and in writing. (Goal 3c)

E. Methods for Assessing Student Learning:

Methods for assessment may include, but are not limited to, the following:

1. Written and/or oral reports
2. Homework
3. Projects
4. Quizzes
5. Exams
6. Final Exam

F. Special Information:

None