Course Information Form (CIF)

Course Code: PHY 141 (IAI P2 900L, PHY 911)

Course Title: Mechanics

Department: Natural Sciences
PCS Code: 1.1 - Baccalaureate/Transfer
CIP Code: 14.1101
Repeatability: 0

Effective Date: Summer 2026

Credit Hours

Catalog Notation: 3-3-4
Credit Hour Distribution:

Lecture: 3	Lab: 3	Clinical: 0	**Total: 4**

General Course Information

Catalog Description

Basic principles of mechanics for physics, chemistry, engineering, and mathematics majors. Kinematics, dynamics, conservation laws of momentum, angular momentum, energy, rigid bodies, oscillations, gravitation, fluids.

General Course Objectives

The three-semester series, of which PHY 141 is the first, is a required part of engineering education and provides a calculus-based physics background for serious science students.

Minimum Placement Levels

English	Reading	Math
None	Placement out of CCS 098	None

Prerequisites

Credit in MAT 128 or equivalent

Methods of Evaluation

2-3 exams, 12-16 homework assignments, 10-13 lab reports, and a final exam.

Instructional Materials and Additional Supplies

Macmillan Achieve, This is the online system that will be used for pre-lecture videos and homework assignments. This system is designed to work with the free OpenStax University Physics textbook.

Course Content

General Learning Outcomes (GLOs)

- Reasoning and Inquiry: Students will demonstrate the ability to solve problems using deductive reasoning and logic, quantitative reasoning, or the scientific method.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Measurement and Operational Definitions	1. Define physical quantities of position, distance, displacement, speed, velocity, acceleration, and mass, and identify the SI units used to measure them.	2	0	0
Measurement and Scientific Method	1. Measure physical dimensions of circular objects and analyze the expected experimental error based on the tools and techniques used to make the measurements.	0	3	0
1D Kinematics	1. Solve one-dimensional problems using principles that govern the position, velocity, and acceleration of moving objects.	3	0	0
Freefall	1. Measure the position of a dropped object and use statistical analysis techniques such as linear regression to determine acceleration. Verify that the acceleration does not depend on mass or initial height.	0	4	0
Vectors	1. Work problems in the addition, subtraction, and multiplication of vectors.	2	0	0
2D Kinematics	1. Solve two-dimensional problems using principles that govern the position, velocity, and acceleration of moving objects.	4	0	0
Projectile Motion	1. Measure the position of a projectile and use statistical analysis techniques such as linear regression to determine velocity and acceleration.	0	4	0
Newton's Laws	1. Describe Newton's laws of motion and use them to determine the resulting motion for objects under the influence of forces.	3	0	0
Accelerometer	1. Explore Newton's 2nd Law by comparing an experimentally measured acceleration with the expected value based on the angle of an accelerating, hanging object.	0	3	0
Additional Forces	1. Apply Newton's laws of motion to analyze situations with specific forces, including friction and tension.	4	0	0
Static and Kinetic Friction	1. Measure the coefficients of static and kinetic friction of a coin on a ramp.	0	4	0
Kinetic Energy and Work	1. Define kinetic energy and work and use the work-kinetic energy theorem to analyze systems of interacting masses.	2	0	0
Uniform Circular Motion	1. Use a circular motion apparatus to compare the centripetal acceleration calculated using forces with the centripetal acceleration expected based on the speed of the object. Both calculations rely on different measurements from the experiment.	0	3	0
Conservation of Energy	1. Define mechanical and potential energy and apply the conservation of mechanical energy to analyze systems.	4	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Energy Conservation	1. Collect experimental data of kinetic energy being converted into gravitational potential energy. Compare the results of these experiments with the theoretical expectation.	0	4	0
Gravitation	1. Connect the familiar gravitational force to the more general law of gravitation, and use the law of gravitation to analyze systems of bodies.	3	0	0
Momentum	1. Define linear momentum and use the conservation of momentum in one and two dimensions to analyze collisions.	3	0	0
Momentum and Collisions	1. Apply the principles of momentum conservation to predict the result of a 2D collision and compare to experimental results.	0	3	0
Rotation	1. Identify analogies between translation and rotation and apply rotational kinematic equations to analyze rotational motion.	3	0	0
Rolling	1. Analyze how the shape of a rolling object affects its kinetic energy. Compare the motion of a rotating object with a non-rolling object with negligible friction.	0	4	0
Torque and Angular Momentum	1. Identify analogies between force and momentum and torque and angular momentum and apply principles of angular momentum conservation to analyze rotation problems.	3	0	0
Angular Momentum	1. Study the effects of decreasing the radius or increasing the radius of a circular motion apparatus. Verify that angular momentum is conserved in the process.	0	3	0
Equilibrium	1. Identify the conditions for different types of equilibrium and analyze systems in equilibrium to find unknown parameters.	3	0	0
Torque and Equilibrium Lab	1. Create a balanced equilibrium of objects of different masses. Determine the mass of various objects through static equilibrium equations/experiments.	0	3	0
Fluids	1. Describe the principles that govern the pressure and flow of fluids and use them to solve fluid dynamic problems.	3	0	0
Buoyancy	1. Experimentally determine the buoyant force and use this force to determine the density of an object.	0	3	0
Oscillations	1. Use the principles of force and torque to derive the features of the oscillatory motion of spring-mass systems and torsion and physical pendulums.	3	0	0
Simple Harmonic Motion	1. Analyze a linear oscillator using principles of simple harmonic motion.	0	4	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
45	45	0