PHYS 111: COLLEGE PHYSICS A

Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2025
Credits:	4
Total Contact Hours:	108
Lecture Hours :	54
Lab Hours:	54
Hours Arranged:	0
Outside of Class Hours:	108
Total Student Learning Hours:	216
Prerequisite:	MATH 151 or higher.
Strongly Recommended:	ENGL C1000.
District General Education:	B2. Natural Sciences - Physical Sciences, B3. Natural Sciences - Laboratory
Transferable to CSU:	Yes
Transferable to UC:	Yes - Approved
Grading Method:	Standard Letter

Catalog Course Description

A trigonometry-based physics course including mechanics, energy, matter, properties of materials, wave motion, and thermodynamics. This course is designed for architecture and liberal arts students who require or are interested in a physics course beyond algebra-based physics. This course is the first in a two-course sequence for students planning to enter medicine, dentistry, pharmacy, optometry, forestry, and (4 year) nursing. (Life Science majors who need calculus-based physics must also take PHYS 111C.) 54 lecture hours, 54 lab hours.

Course Objectives

- use the correct notation for physical quantities and properly use significant figures when making calculations.
- create and interpret kinematic graphs.
- solve quantitative kinematics problems for linear motion, projectile motion and circular motion and interpret the results.
- identify the specific forces acting on an object and draw an accurate free-body diagram of an object.
- Understand the relationship between torque, force and the force's distance from the pivot/axis of rotation.
- Understand the relationship between mass, size, symmetry and rotational inertia
- use Newton's Laws of motion to predict and/or explain physical phenomena, especially with respect to biological systems.
- Apply Newton's Laws of Motion to solve quantitative static, dynamic equilibrium, and dynamics problems for linear and rotational motion and interpret the results.
- Conservation Laws & Thermodynamics
- Understand and apply the Impulse-Momentum Theorem and identify situations in which linear momentum or a component of linear momentum is conserved.
- identify the various types of energy for a system.
- analyze problem statements and then translate the information between verbal, pictorial, graphical, and algebraic representations.
- Understand the basic energy model to identify and analyze situations in which total energy is or is not conserved.
- understand the thermal properties of matter.
- use Conservation of Energy to solve quantitative problems and interpret their results.
- Understand and use energy conservation as expressed in the first law of thermodynamics
- Understand and apply the concept of power to calculate the power supplied to or dissipated by a system.
- Properties of Matter
- Describe atomic-level models of solids, liquids, and gases; and recognize and use the state variables that characterize macroscopic phenomena.
- Understand and use the ideal-gas law.
- Distinguish between the four basic ideal gas processes (isobaric, isochoric, isothermal and adiabatic) and understand the thermodynamics of these processes.
- Identify heat transfer mechanisms.
- Design and implement laboratory investigations to analyze phenomena appropriate to the course
- Distinguish between and use the concepts of specific heat, molar specific heat and latent heat.
- Obtain a qualitative understanding of entropy, the second law of thermodynamics, and some of the implications of the second law on the reversibility/irreversibility of processes.
- Fluids
- distinguish between fluid properties such as density, pressure, and viscosity.
- use the ideal-fluid model to predict and/or explain how fluids flow.
- Understand Bernoulli's equation as a statement of conservation of energy and mass.
- Understand the importance of viscosity in fluid flow.
- use Bernoulli's Equation and Poiseuille's Equation to solve quantitative problems related to fluid flow and interpret the results.
- Waves
- Define and give characteristics and examples of longitudinal, transverse, and surface waves.
- Develop expertise in clear, cogent reporting of experimental design, observations, analysis, and conclusions in a variety of formats ranging from informal discussion and oral presentations to formal laboratory papers.
- Apply the equation for wave velocity in terms of frequency and wavelength.
- Describe the relationship between the energy of a wave and its amplitude.
- Define the resonant frequency and give examples of resonance.
- Distinguish between constructive and destructive interference. State and apply the principle of superposition
- Describe the formation and characteristics of standing waves.
- Vectors
- understand the basic properties of vectors; recognize and use the basic unit vectors.

- decompose a vector into its components and to reassemble vector components into a magnitude and a direction; add and subtract vectors both graphically and using components.
- Force & Motion
- differentiate between the concepts of position, velocity, and acceleration; and recognize the relationship between velocity and acceleration when an object is speeding up, slowing down, or at a turning point for both linear motion and circular motion.

Major Course Content

1. Kinematics
    a. Displacement
    b. Velocity
    c. Acceleration
2. Vectors
3. Dynamics
    a. Identifying Forces
    b. Newton's Laws of Motion
    c. Applying Newton's Laws
    d. Elasticity/Stresses and Strains
    e. Rotational Statics & Dynamics
4. Conservation Laws
    a. Conservation of Momentum
    b. Conservation of Energy
    c. Thermodynamics
5. Properties of Matter
    a. Thermal Properties of Matter
        i. Atomic Models of Matter
        ii. Ideal Gas Processes
        iii. Heat Transfer Processes
        iv. Calorimetry
    b. Fluids
        i. Density & Pressure
        ii. Ideal-Fluid Model
        iii. Fluid Statics
        iv. Fluid Dynamics
        v. Viscosity
6. Waves
    a. Wave Propagation
    b. Wave Superposition
    c. Interference & Resonance

Lab Content

1. Motion
2. Newton's Laws of Motion
3. Torque and Rotational Motion
4. Impulse & Momentum
5. Conservation of Energy
6. Calorimetry
7. Fluids
8. Waves

Examples of Required Writing Assignments

Written responses to short answer questions on homework and exams. Lab reports will be 3-7 page documents structured in a clear and organized fashion. They will provide detailed, yet succinct information that communicates the work performed in lab. The formal lab reports will contain the following components: abstract, problem statement, hypothesis, data collected, results and analysis of results, and conclusion. The lab reports will convey students' ability to understand the goal of the experiment performed, the understanding of the applicable Physics concepts, as well as the ability to perform the experiment attentively and to communicate the results of the experiment in a logical manner.

Examples of Outside Assignments

Answer conceptual questions such as "A bungee jumper has leapt off a bridge and is nearing the bottom of her fall. What forces are being exerted on the bungee jumper?" Solve quantitative problems such as "Weightlifting can exert extremely large forces on the body's joints and tendons. In the strict curl event, a standing athlete lifts a barbell by moving only his forearms, which pivot at the elbow. The record weight lifted in the strict curl is over 200 pounds (about 900 N). The figure below shows the arm bones and the biceps. The main lifting muscle when the forearm is horizontal. What is the tension in the tendon connecting the biceps muscle to the bone while a 900 N barbell is held stationary in this position?"
Write lab reports

Instruction Type(s)

Lab, Lecture, Online Education Lab, Online Education Lecture

IGETC Area 5: Physical and Biological Sciences

5A. Physical Science, 5C. Science Laboratory