



PHYS 2010

Division: Natural Science and Mathematics

Department: Physics

Course: PHYS 2010

Title: College Physics I

Catalog Description:

PHYS 2010 is the first semester of a two-semester sequence in algebra/trigonometry-based general physics. The course is designed for students majoring in pre-medical, pre-dental, pre-pharmacy, and other biological sciences. The topics covered include the study of kinetics, statics, dynamics, momentum, energy, rotational motion, gravitation, solids and fluids, and thermodynamics.

General Education Requirements: N/A

Semesters Offered: Fall

Credit/Time Requirement: Credit: 4; Lecture: 4; Lab: 0

Clock/Hour Requirements: 0

Offered for Non-Credit: No

Corequisites: PHYS 2015

Justification:

This course is a necessary component of the curriculum for pre-medical, pre-dental, pre-pharmacy, and other biological science majors. It is fully transferable to all higher education institutions in the state of Utah (same course number at all institutions).

Student Learning Outcomes:

Students will know the important scientific laws and principles, such as Newton's Laws. Students will also understand that science is a process to gain knowledge.

Students will be able to solve paper-and-pencil physics problems and apply them to real life.

Students will believe that the physical world is interesting, and that science is a valuable way to understand it.

Content:

- Introduction
 - Standards of length, mass, and time
 - The building blocks of matter
 - Dimensional analysis
 - Significant figures
 - Conversion of units
 - Order of magnitude calculations
 - Mathematical notation

- Coordinate systems and frames of reference
- Trigonometry
- Problem solving strategy

- Motion in One Dimension
 - Displacement
 - Average velocity
 - Instantaneous velocity
 - Acceleration
 - Motion diagrams
 - One-dimensional motion with constant acceleration
 - Freely falling objects

- Vectors and Two-Dimensional Motion (Kinematics)
 - Vectors and scalars
 - Properties of vectors
 - Components of a vector
 - Velocity and acceleration in two dimensions
 - Projectile motion
 - Relative velocity

- The Laws of Motion (Kinematics)
 - The concept of force
 - Newton s First Law
 - Newton s Second Law
 - Newton s Third Law
 - Applications of Newton s Laws
 - The force of friction

- Work and Energy
 - Work
 - Kinetic energy and the work-energy theorem
 - Potential energy
 - Conservative and nonconservative forces
 - Conservation of mechanical energy
 - Nonconservative forces and the work-energy theorem
 - Conservation of energy in general
 - Power

- Momentum and Collisions
 - Momentum and impulse
 - Conservation of momentum
 - Collisions
 - Glancing collisions

- Circular Motion and the Law of Gravity
 - Angular speed and angular acceleration
 - Rotational motion under constant angular acceleration
 - Relations between angular and linear quantities
 - Centripetal acceleration
 - Forces causing centripetal acceleration
 - Describing motion of a rotating system
 - Newton's Universal Law of Gravitation
 - Gravitational potential energy
 - Kepler's Laws
 - The vector nature of angular quantities

- Rotational Equilibrium and Rotational Dynamics
 - Torque
 - Torque and the second condition for equilibrium
 - The center of gravity
 - Examples of objects in equilibrium
 - Relationship between torque and angular acceleration
 - Rotational kinetic energy
 - Angular momentum

- Solids and Fluids
 - States of matter
 - The deformation of solids
 - Density and pressure
 - Variation of pressure with depth
 - Pressure measurements
 - Buoyant forces and Archimedes Principle
 - Fluids in motion
 - Other applications of Bernoulli's Equation
 - Surface tension, capillary action, and viscosity
 - Transport phenomena

- Thermal Physics
 - Temperature and the Zeroth Law of Thermodynamics
 - Thermometers and temperature scales
 - Thermal expansion of solids and liquids
 - Macroscopic description of an ideal gas
 - Avogadro's Number and the Ideal Gas Law
 - The kinetic theory of gases

- Heat
 - The mechanical equivalent of heat

- Specific heat
 - Conservation of energy: calorimetry
 - Latent heat and phase changes
 - Heat transfer by conduction
 - Convection
 - Radiation
 - Hindering heat transfer
 - Metabolism and losing weight
 - Application: global warming and greenhouse gases
- The Laws of Thermodynamics
 - Heat and Internal Energy
 - Work and heat
 - The First Law of Thermodynamics
 - Heat engines and the Second Law of Thermodynamics
 - Reversible and irreversible processes
 - The Carnot Engine
 - Entropy
 - Entropy and disorder

General Education Outcomes:

6) Apply computational skills to a variety of contexts.

Students solve 15-20 homework problems per chapter; most of which require computation. They receive scores and feedback on their assignments. They also learn to use graphing calculators and other computational tools to aid their solution of physics problems.

7) Apply scientific reasoning to a variety of contexts.

Students frequently answer questions in front of the class. The tests also have a significant portion dedicated to conceptual questions where students must apply scientific reasoning. The homework also requires scientific reasoning to solve the problems.

Key Performance Indicators:

Homework problems: 15%-30% of the final grade

Quizzes: 15%-30% of the final grade

Tests: 20%-40% of the final grade

Comprehensive final exam: 15%-35% of the final grade

Representative Text and/or Supplies:

College Physics, current edition by Raymond S. Serway and Jerry S. Faughn.

Optimum Class Size: 18

Maximum Class Size:

PHYS 2010

Signatures:

I hereby submit this course syllabus:

Ted Olson, , Professor

I hereby find this course consistent with the goals and resources of the Physics Department:

Ted Olson, , Professor, Chair

I hereby find this course consistent with the goals and resources of the Natural Science and Mathematics Division:

Dan Black, EdD, Associate Professor, Dean

I have discussed the need for library resources related to this class with the person submitting the syllabus:

Lynn Anderson, MLIS, Technical Services Librarian (Main Campus)

Michelle Olsen, MLS, Campus Librarian (Richfield Campus)