

BLOOMSBURG UNIVERSITY
Bloomsburg, Pennsylvania

COURSE SYLLABUS

DEPARTMENT: Physics DATE PREPARED: January 25, 1999

COURSE TITLE: **Introductory Physics I** CREDIT HOURS: 4

PREPARED BY: Douglas J. Dunham COURSE NUMBER: 54.111

PREREQUISITES: None

CATALOG DESCRIPTION:

Presents an intuitive approach to selected topics such as kinematics, mechanics, work, energy, fluids, and heat. Not intended for students specializing in physics or chemistry. Calculus is not used. Six hours per week 3 lecture/3 laboratory.

GOALS AND/OR OBJECTIVES:

- A. To provide the background in classical mechanics necessary for the development of our present and future understanding of our physical and biological worlds
- B. To treat in some detail the extremely important to science concepts of work and energy
- C. To introduce the study of both macroscopic and microscopic mechanical and thermal properties of matter.
- D. To demonstrate the methods of reasoning employed in physics, the most exact of the sciences

CONTENT OUTLINE:

- A. Scalars and Vectors
Physical quantities and standards, systems of units, scalar and vector quantities, graphical representation of vectors, graphical addition and subtraction of vectors, components of vectors, vector addition by components.
- B. Kinematics
Coordinate systems, displacement and distance, speed and velocity, acceleration, linear motion with constant acceleration, gravitational acceleration, projectile motion, graphical analysis of velocity and acceleration.
- C. Newton's Laws of Motion
Newton's three laws of motion, applications of Newton's Laws, free body diagrams, frictional forces.
- D. Circular Motion
Kinematics and dynamics of circular motion, centripetal acceleration, Newton's Law of Gravitation, satellites, weightlessness.
- E. Work and Energy

Work, energy, kinetic energy, gravitational potential energy, elastic potential energy, work-energy principle, conservation of energy, nonconservative forces, power.

F. Linear Momentum

Momentum, conservation of momentum, elastic and inelastic collisions, impulse, center of mass.

G. Rotational Motion

Angular velocity, angular acceleration, torque, moment of inertia, angular momentum.

H. Statics

Conditions for equilibrium, problem solving techniques.

I. Fluids

Density, specific gravity, pressure, Pascal's Principle, Archimedes' Principle, buoyancy.

J. Thermal Energy, Temperature and Heat

Thermal energy, temperature, heat, conservation of energy, specific heat, calorimetry, phase changes, thermal expansion, conduction, convection, radiation, evaporation.

METHODS:

The course is presented through 3 lecture/discussion periods of one hour and one laboratory period (three hours) per week. A student-instructor dialog is strongly encouraged. During the lecture/discussion period, the instructor presents formal lectures and reviews example problems from the body of the text, as well as a sample of assigned homework problems. The laboratory experiences are designed to illustrate principles developed in the lecture/discussion period, to familiarize students with standard measuring instruments and measurement techniques through "hands on" experiences, and to demonstrate elementary data analysis techniques. Written reports are required for each laboratory experiment performed in order for students to gain experience in organizing experimental procedures and presentation of results.

EVALUATION PROCEDURES:

Students are evaluated by means of a number of procedures which may include unit exams, assigned homework, laboratory reports, class and laboratory performance, laboratory exams, quizzes, and a comprehensive final exam.

SUPPORTING MATERIALS:

Blatt, F. J., Principles of Physics, Allyn and Bacon, 1986.

Cutnell, John D. and Kenneth W. Johnson, Physics, 3rd Ed., Wiley, 1995.

Giancoli, D. C., Physics: Principles with Applications, 5th Ed., Prentice Hall, 1998.

Hecht, Physics: Algebra/Trig, 2nd Ed., Brooks/Cole, 1998.

Nolan, Peter J., Fundamentals of College Physics, WCB, 1993.

O'Dwyer, John, College Physics, 3rd Ed., Brooks/Cole, 1990.

Sears, Francis W, Mark Zemansky and Hugh Young, College Physics, 7th Ed., Addison Wesley, 1991.

REQUIRED TEXT:

Giancoli, D. C., Physics: Principles with Applications, 5th Ed., Prentice Hall, 1998
Required.

LEARNING OBJECTIVES

1. To provide the background in classical mechanics necessary for the development of the physical and biological worlds.
2. To stress the extremely important to science concepts of work and energy.
3. To introduce the study of both macroscopic and microscopic mechanical and thermal phenomena.
4. To introduce the methods of reasoning employed in physics, the most exact of the sciences.

CONTENT

A. Measurement

Physical quantities and standards, systems of units, scalar and vector quantities, graphical representation of vectors, graphical addition and subtraction of vectors, components of vectors, vector addition by components.

B. Kinematics

Reference systems, displacement and distance, speed and velocity, constant velocity, linear motion with constant acceleration, gravitational acceleration, projectile motion, graphical analysis of velocity and acceleration.

C. Newton's Law of Motion

Newton's three laws of motion, applications of Newton's Laws, free body diagrams, frictional forces.

D. Circular Motion

Kinematics and dynamics of circular motion, centripetal acceleration, Newton's Law of Gravitation, satellites, weightlessness.

E. Work and Energy