

PHY 251 GENERAL PHYSICS I

COURSE DESCRIPTION:

Prerequisites: RED 090 or satisfactory score on placement test and MAT 271
Corequisites: MAT 272

This course uses calculus-based mathematical models to introduce the fundamental concepts that describe the physical world. Topics include units and measurement, vector operations, linear kinematics and dynamics, energy, power, momentum, rotational mechanics, periodic motion, fluid mechanics, and heat. Upon completion, students should be able to demonstrate an understanding of the principles involved and display analytical problem-solving ability for the topics covered. Laboratory experiments, some of which are computer-based, and computer-based tutorials enhance and consolidate the basic principles discussed in the theoretical section of the course. *This course has been approved to satisfy the Comprehensive Articulation Agreement for the general education core requirement in natural sciences-mathematics.* Course Hours Per Week: Class, 3. Lab, 3. Semester Hours Credit, 4.

LEARNING OUTCOMES:

Upon completion of this course, the student will demonstrate basic knowledge in the following:

- a. Basic international units of physics.
- b. Vectors.
- c. Motion.
- d. Laws of motion.
- e. Circular motion.
- f. Work and energy.
- g. Linear momentum.
- h. Rotation of rigid bodies.
- i. Angular momentum.
- j. Static equilibrium
- k. Oscillatory motion
- l. Universal gravitation.
- m. Mechanics of solids and fluids.
- n. Wave motion.
- o. Sound waves.
- p. Superposition and standing waves.
- q. Temperature, thermal expansion, and ideal gases.
- r. Heat and the first law of thermodynamics.
- s. Kinetic theory of gases.
- t. Heat engines and entropy.

OUTLINE OF INSTRUCTION:

- I. Measurement
 - A. Standards of length, mass and time
 - B. Dimensional analysis
 - C. Calculations and significant figures

- II. Vectors
 - A. Coordinate systems
 - B. Vectors and scalars
 - C. Properties of vectors
 - D. Vector components

- III. Motion
 - A.

- A. Linear momentum and impulse
 - B. Conservation of linear momentum
 - C. Collisions in one and two dimensions
 - D. Center of mass
 - E. Motion of a system of particles
- VIII. Rotation of a rigid body
- A. Angular velocity and acceleration
 - B. Rotational kinematics
 - C. Relationships between angular and linear quantities
 - D. Rotational kinetic energy
 - E. Moments of inertia
 - F. Torque
 - G. Work and energy in rotational motion
- IX. Angular momentum
- A. Vector product and torque
 - B. Angular momentum of a particle
 - C. Conservation of angular momentum
- X. Static equilibrium
- A. Conditions of equilibrium
 - B. Center of gravity
 - C. Rigid bodies in equilibrium
- XI. Oscillatory motion
- A. Simple harmonic motion
 - B. Mass on a spring
 - C. Energy of the simple harmonic oscillator
 - D. The pendulum
- XII. Universal gravitation
- A. Newton's law of gravity
 - B. Measurement of the gravitational constant
 - C. Weight and the gravitational force
 - D. Kepler's laws
 - E. Gravitation and planetary motion
 - F. Gravitational potential energy
 - D.

F.

- XX. Heat engines and entropy
 - A. Heat engines and the second law of thermodynamics
 - B.