**Course Name: Calculus-Based Physics I**

**Course Number:**     PHY* E221

**Credits:** 4

**Catalog description:** Provides a solid foundation for engineering majors in physical quantities, vectors, equilibrium, motion, Newton's Law, motion in a plane, work and energy, impulse and momentum, moments and rotation. 3 hours lecture, 3 hours laboratory.

**Prerequisite:** MAT*254

**Corequisite, or Parallel:** none

# General Education Competencies Satisfied:

**HCC General Education Requirement Designated Competency Attribute Code(s):**
☒ **SCKX**                **Scientific Knowledge & Understanding**

**Additional CSCU General Education Requirements for CSCU Transfer Degree Programs:**
☒ **SCRX**                **Scientific Reasoning**

**Embedded Competency(ies):**
*None.*

**Discipline-Specific Attribute Code(s):**

☒ **SCI**                **Science elective**

## Course objectives:

**General Education Goals and Outcomes:**

☒ **Scientific Knowledge & Understanding:** Students will gain a broad base of scientific knowledge and methodologies in the natural sciences. This will enable them to develop scientific literacy, the knowledge and understanding of scientific concepts and processes essential for personal decision making and understanding scientific issues.

☒ **Scientific Reasoning (*for CSCU Transfer Degree Programs*):** Students will become familiar with science as a method of inquiry. Students will develop a habit of mind that uses quantitative skills to solve problems and make informed decisions.

**Course Specific Objectives:**

1. Create graphs.
2. Differentiate among various systems of units of measurement.
3. Manipulate a scientific and/or graphing calculator.
4. Learn how to add vectors together.
5. Analyze uniformly accelerated motion in a straight line.
6. Analyze freely falling bodies.
7. Understand relative velocity.
8. Study motion in a plane.
9. Use energy considerations to solve problems.
10. Use momentum considerations to solve problems.

**Course Content:**

Models, measurements, and vectors
       Unit consistency and conversions
       Vectors and vector addition
       Components of vectors
       Unit vectors

Motion along a straight line
       Average velocity
       Instantaneous velocity
       Average and instantaneous acceleration
       Motion with constant acceleration
       Freely falling bodies
       Relative velocity along a straight line

Motion in a plane
       The velocity vector
       The acceleration vector
       Projectile motion
       Uniform circular motion
       Relative velocity

Newton's laws of motion
       Force Newton's first law
       Mass and Newton's second law
       Mass and weight Newton's third law

Applications of Newton's laws
       Equilibrium of particles
       Applications of Newton's second law

Contact forces and friction
Dynamics of circular motion
Motion in a vertical circle

Work and kinetic energy
Conservation of energy Work
Work done by a varying force
Work and kinetic energy
Power

Conservation of energy
Potential energy and conservative forces
Gravitational and potential energy
Elastic potential energy
Conservative and non-conservative forces

Momentum and impulse
Momentum
Conservation of momentum
Inelastic collisions
Elastic collisions
Impulse


Rotational motion
Angular velocity and acceleration
Rotation with constant angular acceleration
Velocity and acceleration relations
Kinetic energy of rotation

Dynamics of rotational motion
Torque
Torque and angular acceleration
Rotation about a moving axis
Work and power in rotational motion
Angular momentum
Conservation of angular momentum

Equilibrium and elasticity
Conditions for equilibrium
Center of gravity
Solving equilibrium problems
Couples

Date Course Created:

Date of Last Revision: 03/03/2017