

Miami-Dade Community College

PHY2048 – Physics with Calculus I

Course Description: This is a foundational physics course with calculus for science and engineering majors, covering mechanics (kinematics and dynamics of translation, rotation, and vibration), statics and dynamics of fluids.

Pre-requisite: High school Physics or PHY 1025 or PHY 2053 or departmental approval

Math Pre-requisite: MAC 2311 or high school Calculus.

Course Competencies:

Note:

In all the following, the application of each topic will include:

- solving problems, using the methods of algebra and calculus;
- performing units conversions as necessary to obtain a consistent set of units of measure for a particular problem,
- drawing a sketch or graph when needed,
- associating each concept and formula with practical aspects of everyday life and current technology,

with a strong emphasis on problem solving.

Competency 1: The Student will demonstrate an understanding of the scientific method
a. by explaining how the scientific method differs from day to day application of observation, generalization, and prediction.

Competency 2: The Student will demonstrate an understanding of basic kinematics by :
c. explaining the difference between average and instantaneous velocity or acceleration;
d. applying techniques from calculus to calculate the velocity and acceleration of an object when the position is given as a function of time;
e. using kinematics equations to calculate a later position and velocity for an object undergoing constant acceleration in one or two dimensions;
f. using the Galilean formulas to transform a velocity or acceleration from one reference frame to another;
g. calculate centripetal acceleration for an object moving in a circle.

Competency 3: The Student will demonstrate an understanding of translational dynamics and gravity by :
a. sketching a "free body" diagram to represent the forces acting on a system of masses;
b. expressing static or kinetic friction in terms of the normal forces;
c. writing and solving a set of component force equations for each mass in the system;
d. calculating the properties of a circular orbit.

- Competency 4: The Student will demonstrate an understanding of the concepts of work and energy by:
- using integration to calculate the work which a force does on a moving object;
 - calculating the power which a force supplies to a moving object;
 - using conservation of energy to solve a dynamics problems.
- Competency 5: The Student will demonstrate an understanding of the concepts of momentum and center of mass by:
- locating the center of mass of an object or a system of objects;
 - finding the momentum change resulting from an impulse;
 - solving a collision problems using conservation of momentum in one or two dimensions.
- Competency 6: The Student will demonstrate an understanding of rotational quantities by:
- using the equations of rotational kinematics to calculate a later angular position and angular velocity for an object undergoing a constant angular acceleration;
 - calculating the moment of inertia for a symmetrical object;
 - finding the resultant torque caused by one or more forces acting on an object;
 - find the acceleration of a rotating object subject to torques;
 - find the kinetic energy of a rotating system;
 - solving a collision problem involving angular momentum.
- Competency 7: The Student will demonstrate an understanding of the behavior of solids and fluids by:
- applying equations of stress and strain;
 - find the force generated by pressure at a given depth in a fluid;
 - solving statics problems involving buoyancy;
 - applying Bernoulli's equation to fluid flow.
- Competency 8: The Student will demonstrate an understanding of harmonic motion by:
- finding the angular frequency and period of oscillation for a mass subject to a linear restoring force;
 - finding the position, velocity, acceleration, and energies as functions of time for an object undergoing simple harmonic motion;