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 <u>demonstrate an understanding of the concepts of work and energy by:</u>

a. using integration to calculate the work which a force does on a moving object;
b. calculating the power which a force supplies to a moving object;
c. 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:

a. locating the center of mass of an object or a system of objects;
b. finding the momentum change resulting from an impulse;
c. 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:

a. using the equations of rotational kinematics to calculate a later angular position and angular velocity for an object undergoing a constant angular acceleration;
b. calculating the moment of inertia for a symmetrical object;
c. finding the resultant torque caused by one or more forces acting on an object;
d. find the acceleration of a rotating object subject to torques;
e. find the kinetic energy of a rotating system;
f. solving a collision problem involving angular momentum.

Competency 7:	The Student will demonstrate an understanding of the behavior of solids and fluids by:

a. applying equations of stress and strain;
b. find the force generated by pressure at a given depth in a fluid;
c. solving statics problems involving buoyancy;
d. applying Bernoulli's equation to fluid flow.

Competency 8:	The Student will demonstrate an understanding of harmonic motion by:

a. finding the angular frequency and period of oscillation for a mass subject to a linear restoring force;
b. finding the position, velocity, acceleration, and energies as functions of time for an object undergoing simple harmonic motion;

The mission of Miami-Dade Community College is to provide accessible, affordable, high quality education
by keeping the learner's needs at the center of decision making and working in partnership
with its dynamic, multi-cultural community.