Miami Dade College

Course Description

PHY1025 |Basic Physics | 3.00 credits

This course will help students to facilitate the transition from high school to college/university physics. The course will emphasize problem-solving techniques. Topics may include units of measure, particle mechanics, conservation laws, and basic field concepts.

Course Competencies:

Competency 1: The student will demonstrate knowledge, comprehension, application and synthesis of units and dimensions by:

1. Stating and recognizing the fundamental dimensions of mass, length, and time.
2. Expressing the dimensions of physical quantities in terms of these fundamental dimensions.
3. Evaluating the consistency of formulas through consideration of the dimensions involved.
4. Stating approximate measurements of ordinary objects using either SI or British units.
5. Converting between different units of measure.
6. Stating and recognizing the decimal pattern and prefixes used in the metric system.
7. Deriving the conversion factors for area and volume units from the related length conversion factors.
8. Stating and recognizing the units of all the physical quantities discussed in this course.
9. Expressing the units of complex physical quantities discussed in this
10. course in terms of simpler units.

Competency 2: The student will demonstrate comprehension and application of scientific notation by:

1. Converting powers of ten to their ordinary decimal representation.
2. Converting between scientific and standard notation.
3. Performing calculations with scientific notation.
4. Utilizing a scientific calculator in doing calculations.

Competency 3: The student will demonstrate comprehension and application of significant figures by:

1. Counting the number of significant figures in a given measurement.
2. Keeping track of the proper number of significant figures when expressing values of physical quantities.
3. Performing mathematical operations.

Competency 4: The student will demonstrate knowledge, comprehension, and application of applied geometry by:

1. Measuring lengths using rulers marked in centimeters and in inches.
2. Measuring and drawing angles using a protractor.
3. Stating and applying formulas for areas and volumes of bodies.
4. Calculating the perimeter of a polygon.
5. Calculating areas and volumes of symmetric bodies.
6. Stating and applying the formulas for the area and circumference of circles.

Competency 5: The student will demonstrate knowledge, comprehension, and application of applied trigonometry by:

1. Solving problems involving the lengths of sides and measures of angles in right triangles
2. Using the Pythagorean theorem and the definition of sine, cosine, and tangent.

Competency 6: The student will demonstrate knowledge, comprehension, application, and analysis of the relationship between two directly proportional variables by:

1. Recognizing the conditions under which two variables are directly proportional.
2. Recognizing analytically or graphically when two quantities are in direct proportion.
3. Obtaining graphically or analytically the constant of proportionality between those quantities.

4. Calculating unknown values of directly proportional quantities
5. Using known values of those quantities.

Competency 7: The student will demonstrate knowledge, comprehension, application, and evaluation of vectors by:

1. Distinguishing between vectors and scalars.
2. Distinguishing between the magnitude and direction of a vector.
3. Representing vectors graphically accurately and to scale.
4. Obtaining the components of vectors graphically and by trigonometry.
5. Converting vectors from polar to rectangular coordinates and vice versa.
6. Adding and subtracting vectors graphically accurately and to scale
7. Adding and subtracting vectors using the method of components.
8. Multiplying a vector times a scalar graphically and analytically.
9. Applying vectors to solve physics problems.

Competency 8: The student will demonstrate knowledge, comprehension, and application analysis and evaluation of translational kinematics by:

1. Stating, recognizing and applying the definitions of the fundamental kinematic quantities -- position, displacement, distance, velocity, speed, and acceleration.
2. Distinguishing between the concepts of instantaneous and average change in general and as they apply to velocity, speed, and acceleration.
3. Plotting position, displacement, velocity, and acceleration vs. time graphs from given data.
4. Calculating instantaneous and average velocities from position or displacement vs. time graphs.
5. Calculating instantaneous and average accelerations from velocity vs. time graphs.
6. Calculating displacements from velocity vs. time graphs.
7. Solving problems involving the kinematics (in one and two dimensions) of motion with constant velocity motion with constant acceleration free-fall projectile motion uniform circular motion.
8. Identify and calculate parameters of circular motion, such as period, tangential velocity, and angular velocity.
9. Distinguish between linear and angular velocity and between linear and angular acceleration.

Competency 9: The student will demonstrate knowledge, comprehension, application, and evaluation of Newton's laws of motion by:

1. Stating, recognizing, and applying the definitions of force, mass, and weight.
2. Distinguishing between mass and weight.
3. Stating, recognizing, and applying Newton's three laws of motion
4. and the law of universal gravitation.
5. Stating and applying the concept of gravitational field.
6. Stating, recognizing, and applying the definitions of the normal force, the tension exerted by a string, and the forces of static and kinetic friction.
7. Stating, recognizing, and applying Hooke's law.
8. Identifying all the forces involved in given physical situations.
9. Drawing free-body diagrams representing the forces involved in given physical situations
10. Solving problems involving forces and their effects by identifying the forces involved, drawing a free-body diagram, and applying Newton's laws.
11. Stating and recognizing the definition of centripetal acceleration.
12. Distinguishing between centripetal and centrifugal force.
13. Solving problems involving uniform circular motion.
    Deriving and applying the law of conservation of momentum.

Competency 10: The student will demonstrate knowledge, comprehension, application and evaluation of work and energy by:

1. Stating, recognizing, and applying the definitions of work, kinetic energy, and potential energy and power.

2. Distinguishing between conservative and non-conservative forces.
3. Stating and applying the work-energy theorem and the principle of conservation of energy.
4. Solving dynamics problems using work-energy methods.

Competency 11: The student will demonstrate knowledge, comprehension, and application of translational and rotational equilibrium by:

1. Stating, recognizing, and applying the definition of torque.
2. Stating or recognizing the conditions of translational and rotational equilibrium.
3. Solving problems involving translational and rotational equilibrium.
4. Applying rotational kinematic equations.
5. Distinguish between linear and angular momentum.
6. State the rotational energy of a body and apply the work-energy theorem to a rotating rigid body.

Competency 12: The student will demonstrate knowledge, comprehension, and application of the electric field by:

1. Stating the definition of electric charge.
2. Distinguishing between positive and negative charges.
3. Stating and recognizing Coulomb's law.
4. Stating and recognizing the charge of the proton and the electron.
5. Stating, recognizing, and applying the definition of electric field.
6. Stating and recognizing the properties of electric lines of force.
7. Inferring the magnitude and direction of the electric field given the lines of force.
8. Drawing electric lines of force when given a simple charge distribution.
9. Solving problems involving the relationship between the electric
10. field and the force on electric charges.

Learning outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Solve problems using critical and creative thinking and scientific reasoning
- Use quantitative analytical skills to evaluate and process numerical data