Course Description:

Students begin their exploration of physics by reviewing the International System of Units (SI), scientific notation, and significant digits. They then learn to describe and analyze motion in one and two dimensions. Students learn about gravity and Newton's laws of motion before concluding the course with an examination of circular motion, energy, and simple machines. Students apply mathematical concepts such as graphing and trigonometry in order to solve physics problems.

Module	Lesson Title	Objectives
Module 1	History of Science	• Explain how over the course of history, scientists have made key contributions to thedevelopment of science.
	Physics-The Basic Science	• Explain how the study of nature's rules (physics) is essential to the development ofhumankind.
	The Scientific Method	• State the steps of the scientific method. • Understand how the scientific method guides experimentation and scientificdiscovery.
	Writing a Laboratory Report	• Understand the importance of completing laboratory investigations. Design and complete a controlled experiment using the scientific method. • Write a properly formatted laboratory report.
	Technology in Science	• Understand the enhancement of scientific investigation and human capabilitiesthrough technology. • Explain the advantages of using digital transmission and storage of information.
	Error and Significant Figures	• Distinguish between accuracy and precision. • Utilize accurate and precise measurements in physics.
Module 2	Measurements in Experiments	• Know and use metric units (SI) and prefixes that are applicable and appropriate formeasurements in physics.
	Mathematics as the Language of Physics	• Use graphs, tables, and equations to summarize experimental data.

Module	Lesson Title	Objectives
	1D Vectors and Displacement	• Distinguish between a vector and a scalar quantity. • Distinguish between distance and displacement. • Calculate distance and displacement.
	Velocity	• Distinguish between speed and velocity. • Calculate an object's speed and velocity. • Distinguish between average and instantaneous velocity.
	Acceleration	• Define acceleration. • Determine when acceleration is positive and when it is negative. • Determine when an object is speeding up or slowing down. • Use kinematic equations to solve problems involving acceleration.
	Free Fall Acceleration	• Define free fall. • Use kinematic equations to solve problems involving free fall.
Module 3	Vectors in Two Dimensions (Trigonometry)	• Find the resultant vector when adding two perpendicular vectors using PythagoreanTheorem and the tangent function. • Use vector addition to solve problems involving displacement.
	Two-Dimensional Vector Addition	• Find component vectors of a two-dimensional vector quantity using trigonometry. • Find the resultant vector when adding multiple two-dimensional vectors usingPythagorean Theorem and the sine and cosine functions. • Use vector addition to solve problems involving displacement and velocity.
	Projectile Motion- Part 1	• Describe the horizontal and vertical motion of an object moving as a projectile. • Utilize vector calculations and kinematic equations to solve problems dealing withprojectiles launched horizontally.

Module	Lesson Title	Objectives
	Projectile Motion- Part 2	• Utilize vector calculations and kinematic equations to solve problems dealing withprojectiles launched at an angle.
	Relative Motion	• Understand that frame of reference affects velocity measurements. • Calculate relative velocity given specific frame of reference scenarios.
	What is a Force?	• Define force. • Distinguish between the different types of forces. • Draw a freebody diagram to represent all of the forces acting on an object.
Module 4	Net Force & Newton's 1st Law	• Calculate the net force acting on an object using vector mathematics.
	Newton's 2nd Law	• State Newton's Second Law of Motion. • Use Newton's Second Law of Motion to calculate the acceleration, mass, or net forceacting on an object.
	Newton's 3rd Law	• State Newton's Third Law of Motion.Define action-reaction pairs. • Determine the action-reaction pairs of force given specific scenarios.
	Normal Force & Apparent Weight	• Define normal force. • Calculate the weight of an object with zero net force and apparent weight of anobject with a net force.
	Force of Friction	• Define force of friction. • Utilize knowledge of the force of friction to solve problems pertaining to accelerationwhen friction is present.
	More Challenging Force Problems	• Apply knowledge of kinematics and dynamics to solve complex motion problems.

Module	Lesson Title	Objectives
Module 5	Pressure	• Define pressure. • Use the equation for pressure (P=F/A) to solve problems relating to pressure.
	Newton's Law of Universal Gravitation	• Define the force of gravity. • Distinguish between the strong, weak, electromagnetic, and gravitational forces. • Use the Universal Law of Gravitation in problem solving.
	Circular Motion	• Define centripetal acceleration. • Calculate speed, velocity, and acceleration when an object is moving in a circle.
	Centripetal Force	• Define centripetal force. • Calculate speed, velocity, acceleration, and force when objects are moving in a circle. • Apply concepts of centripetal force to satellite motion. • Prove that centrifugal force is not a real force.
	Work	• Define work and determine whether work is done given a specific scenario. • Solve problems using the definition of work.
	Energy	• State the Law of Conservation of Energy. • Calculate gravitational potential energy or kinetic energy of an object. • Apply the law of conservation of energy to problem solving.
Module 6	Power	• Define power. • Solve problems using the definition of power.
	Momentum and Impulse	• Define and calculate impulse and momentum. • Use the Impulse-Momentum Theorem to solve problems. • Design a device that minimizes the force on an object during a collision.
	Conservation of Momentum	• State the Law of Conservation of Momentum. • Use the Law of Conservation of Momentum in solving problems. • Distinguish between elastic, inelastic, and recoil collisions.

Module	Lesson Title	Objectives
	Collisions	• Use the Law of Conservation of Momentum in solving problems dealing withcollisions.
	Torque	• Define torque. • Calculate the torque acting on a lever arm. • Understand the concept of balanced torques and use the concept to solve problems.
	Simple Machines	• Define and determine the mechanical advantage and efficiency of a simple machine. • Distinguish between the different types of simple machines. • Explain what a compound machine is.