

Scope & Sequence

Exploring Creation with Physics, 2nd Edition



GRADE LEVEL: 12th and/or working knowledge of Algebra 1, Geometry and basic Trigonometric functions.

TEXT SUMMARY: The science of physics is an attempt to explain everything that is observed in nature. This text is an overview of the advances made over the last three thousand years in that monumental task. It is designed as a college-prep physics course. Some important concepts covered are one and two-dimensional motion, Newton's laws and their applications in nature, work and energy, electricity, magnetism, momentum, periodic motion, waves and optics. This course uses quantitative applications to teach the details of how matter interacts in nature.

SEMESTER I: QUARTER 1

Module & Major Themes	Timeline/Summary	Main Themes	Supporting Experiments
MODULE 1 <i>Motion in One Dimension</i>	2 WEEKS Module 1 provides an introduction to and basic understanding of distance, displacement, speed, velocity and acceleration.	<ul style="list-style-type: none"> • Distance and Displacement • Speed and Velocity • Acceleration 	<ul style="list-style-type: none"> • Measuring Average Velocity • Measuring an Object's Acceleration
MODULE 2 <i>One-Dimensional Motion Equations and Free Fall</i>	2 WEEKS Module 2 provides an introduction to mathematical applications used in analyzing one-dimensional motion. Module 2 also introduces the concept of free fall.	<ul style="list-style-type: none"> • Relating Velocity, Acceleration, Time, and Displacement • Using Mathematical Equations For One-Dimensional Motion • Free Fall • Terminal Velocity 	<ul style="list-style-type: none"> • The Acceleration Due to Gravity Is the Same for All Objects • Determining a Person's Reaction Time • Factors That Affect Air Resistance
MODULE 3 <i>Two-Dimensional Vectors</i>	2 WEEKS Module 3 provides an introduction to vectors and the use of vectors in analyzing two dimensional motion.	<ul style="list-style-type: none"> • Vectors • Adding and Subtracting Two-Dimensional Vectors: Graphical and Analytical Approaches • Vector Components • Determining a Vector's Components From Its Magnitude and Direction • Applying Vector Addition to Physical Situations 	<ul style="list-style-type: none"> • Vector Components • Vector Addition
MODULE 4 <i>Motion in Two Dimensions</i>	2 WEEKS Module 4 provides an introduction to quantitative science by applying two dimensional vectors to navigation and projectile motion.	<ul style="list-style-type: none"> • Navigation in Two Dimensions • Projectile Motion in Two Dimensions • The Range Equation 	<ul style="list-style-type: none"> • The Two Dimensions of a Rubber Band's Flight • Measuring the Horizontal Speed of an Object Without a Stopwatch

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SEMESTER I: QUARTER 2

Module & Major Themes	Timeline/Summary	Main Themes	Supporting Experiments
MODULE 5 <i>Newton's Laws</i>	2 WEEKS Module 5 provides an overview of Newton's Laws of Motion. Module 5 also provides an introduction to friction.	<ul style="list-style-type: none"> • Sir Isaac Newton • Newton's First Law • Newton's Second Law • Mass and Weight • The Normal Force • Friction • An Equation for the Frictional Force • Newton's Third Law 	<ul style="list-style-type: none"> • Inertia • The Frictional Force
MODULE 6 <i>Applications of Newton's Second Law</i>	2 WEEKS Module 6 provides an in-depth study of Newton's Second Law of Motion applied to situations when multiple forces are involved.	<ul style="list-style-type: none"> • Translational Equilibrium • Translational Equilibrium and Measuring Weight • Rotational Motion and Torque • Rotational Equilibrium • Objects on an Inclined Surface • Applying Newton's Second Law to More Than One Object at a Time 	<ul style="list-style-type: none"> • Measuring Acceleration in an Elevator • What Causes Rotational Acceleration? • Measuring a Coefficient of Static Friction
MODULE 7 <i>Uniform Circular Motion and Gravity</i>	2 WEEKS Module 7 provides an analytical and quantitative approach to circular motion and gravity.	<ul style="list-style-type: none"> • Uniform Circular Motion • Centripetal Force and Centripetal Acceleration • Frictional Force • Gravity • Circular Motion Technology • Gravity and the Motion of Planets 	<ul style="list-style-type: none"> • Centripetal Force
MODULE 8 <i>Work and Energy</i>	2 WEEKS Module 8 provides an introduction to the concepts of work and energy and the role that friction plays in analyzing these two concepts.	<ul style="list-style-type: none"> • Defining Work and Energy • Kinetic and Potential Energy • The First Law of Thermodynamics • Friction, Work and Energy • Energy and Power 	<ul style="list-style-type: none"> • Energy in a Pendulum • Estimating the Work Done by Friction

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SEMESTER II: QUARTER 3

Module & Major Themes	Timeline/Summary	Main Themes	Supporting Experiments
<p>MODULE 9 <i>Momentum</i></p>	<p>2 WEEKS Module 9 provides an introduction to the concept of momentum and its relationship to impulse. Module 9 also provides an overview of the conservation of momentum and angular momentum.</p>	<ul style="list-style-type: none"> • Momentum • Impulse • The Conservation of Momentum • The Mathematics of Momentum Conservation • Angular Momentum 	<ul style="list-style-type: none"> • Egg Drop • Momentum and Energy Conservation
<p>MODULE 10 <i>Periodic Motion</i></p>	<p>2 WEEKS Module 10 provides an introduction to periodic motion. Module 10 also provides a study of uniform circular motion and teaches a mathematical approach in examining a mass/spring system and a simple pendulum.</p>	<ul style="list-style-type: none"> • Hooke's Law • Uniform Circular Motion • The Mass/Spring System • Potential Energy in Mass/Spring System • The Simple Pendulum 	<ul style="list-style-type: none"> • Hooke's Law • The Characteristics of a Mass/Spring System
<p>MODULE 11 <i>Waves</i></p>	<p>2 WEEKS Module 11 provides an introduction to waves and the different types of waves that have been found in nature.</p>	<ul style="list-style-type: none"> • Waves • The Physical Nature of Sound • The Doppler Effect • Speed of Light • Light as a Wave • Light as a Particle • Biographies of Two Important Physicists 	<ul style="list-style-type: none"> • Frequency and Volume of Sound Waves • The Doppler Effect
<p>MODULE 12 <i>Geometric Optics</i></p>	<p>2 WEEKS Module 12 provides an introduction to optics (the study of the behavior of light) and provides an in-depth look at the use of mirrors and lenses in examining the behavior of light.</p>	<ul style="list-style-type: none"> • The Law of Reflection • Flat/Spherical mirrors • Ray Tracing in Convex and Concave Spherical Mirrors • Snell's Law of Refraction • Converging/Diverging Lenses • The Human Eye 	<ul style="list-style-type: none"> • The Law of Reflection • Real and Virtual Images in a Concave Mirror • Measuring the Index of Refraction of Glass
<p>MODULE 13 <i>Coulomb's Law and the Electric Field</i></p>	<p>2 WEEKS Module 13 provides an introduction to electrostatics by building on the basic understanding of electric charge.</p>	<ul style="list-style-type: none"> • The Basics of Electric Charge • Electrostatic Force/Coulomb's Law • Multiple Charges and the Electrostatic Force • The Electric Field • Calculating the Strength of the Electric Field • Applying Coulomb's Law to the Bohr Model of the Atom 	<ul style="list-style-type: none"> • Attraction and Repulsion • Making and Using an Electroscope

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SEMESTER II: QUARTER 4

Module & Major Themes	Timeline/Summary	Main Themes	Supporting Experiments
MODULE 14 <i>Electric Potential</i>	<p style="text-align: center;">2 WEEKS</p> Module 14 provides an introduction to electrical potential and its relationships to potential energy and potential difference. Module 14 also provides an overview of the application of electrical potential in capacitors and televisions.	<ul style="list-style-type: none"> • Electric Potential, Potential Energy, and Potential Difference • Conservation of Energy in an Electrical Potential • Capacitors • An Application of Capacitors • How a Television Makes Its Picture 	<ul style="list-style-type: none"> • Making a Parallel-Plate Capacitor and Storing Charge
MODULE 15 <i>Electric Circuits</i>	<p style="text-align: center;">2 WEEKS</p> Module 15 provides an introduction to electric circuits and their abilities to harness the kinetic energy of freely moving charges. Module 15 also provides an overview of circuit design and mathematical applications used to analyze circuits.	<ul style="list-style-type: none"> • Batteries, Circuits, and Conventional Current • Resistance • Electric Heaters • Electric Power • Switches and Circuits • Series and Parallel Circuits • Fuses and Circuit Breakers • Current and Power in Series and Parallel Circuits • Analyzing More Complicated Circuits 	<ul style="list-style-type: none"> • Current and Resistance • Building a Simple Circuit to Turn on a Light Bulb • Series and Parallel Resistors
MODULE 16 <i>Magnetism</i>	<p style="text-align: center;">2 WEEKS</p> Module 16 provides an introduction to the concept of magnetism. Module 16 also provides a in-depth look at magnetization, magnetic fields and the use of magnets in producing electricity.	<ul style="list-style-type: none"> • Permanent Magnets • Magnetic Fields • How Magnets Become Magnetic • Earth's Magnetic Field • The Magnetic Field of a Current-Carrying Wire • Faraday's Law of Electromagnetic Induction • Alternating Current 	<ul style="list-style-type: none"> • Oersted's Experiment • Diamagnetic, Paramagnetic, and Ferromagnetic Compounds

ADDITIONAL INFORMATION: This text also includes Review Questions at the end of each module, which serves to guide a student in studying for the provided module tests. Additional study tools are the Practice Problems and the Extra Practice Problems for each module. These are to be solved after each module and serve to give the student review and practice of the important quantitative skills just covered. These are also additional study tools for the module tests. Answers for the Review Questions, Practice Problems, Extra Practice Problems and the Tests are provided for the instructor. Two additional resources offered for added teacher/student support are a multi-media companion CD containing videos, word pronunciations, mathematics support, etc. specific to this course and the Apologia website providing links to additional websites for more in-depth exploration of the topics in the text.